THE

PROCEEDINGS

OF THE

LINNEAN SOCIETY

OF

NEW SOUTH WALES.

FOR THE YEAR

1899.

Vol. XXIV.

WITH FIFTY-FOUR PLATES.

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PART II. (No. 94.)

(Issued October 10th, 1899.)

Note.—By an oversight the first line on p. 4 of the cover of the first Part of this Volume appears as Proceedings, 1898, Part 4, instead of 1899, Part 1.

Also the last six plates in this Part should have been lettered xxvi.-xxxi. instead of xxv.-xxx.

PART III. (No. 95.)

(Issued December 9th, 1899.)

Note.—As two Plates in the last Part are lettered xxv., there is no Plate xxxi. in this Part.

By an oversight, the cover of this Part is lettered Vol. xxv., Part 3, instead of Vol. xxiv., Part 3.

PART IV. (No. 96.)

(Issued April 7th, 1900.)

LIST OF PLATES.

PROCEEDINGS, 1899.

CORRIGENDA.

Page 351, line 16—for *Asplenum nidus* read *Asplenium nidus.*

Page 354, line 16—for *Hyymenanthera* read *Hymenanthera.*

Page 355, line 21—for *Phebalium Billiardieri* read *Phebalium Billardieri.*

Page 438, line 29—for PITHECOLOBIUM MULLERIANUM read PITHECOLOBIUM MUELLERIANUM.

Page 555, line 29—for *H. multipunctatis* read *H. multipunctatus.*

PROCEEDINGS

OF THE

LINNEAN SOCIETY

OF

NEW SOUTH WALES.

WEDNESDAY, MARCH 29TH, 1899.

The Twenty-fifty Annual General Meeting of the Society was held in the Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesday evening, March 29th, 1899.

Professor J. T. Wilson, M.B., Ch.M., President, in the Chair.

The Minutes of the previous Annual General Meeting were read and confirmed.

The President delivered the Annual Address.

PRESIDENTIAL ADDRESS.

It is gratifying to be able to report that the past Session has been characterised by satisfactory activity and progress in the Society's customary field of work, and by important developments in its founder's plans for an extended sphere of action in the future. Though not a matter which has affected the scientific life of the Society, it is nevertheless to be regretted that the number of effective Members has remained practically stationary. Five Ordinary Members were elected into the Society, one of whom subsequently retired, four Members have resigned, and death has deprived the Society of one of the Members resident in Tasmania.

Charles Edward Beddome died at Hobart on September 1st, 1898, aged 62 years. He joined the Indian Navy as a lad, and had attained the rank of lieutenant when this branch of the service was abolished. Mr. Beddome subsequently emigrated to Queensland, and for some time filled the position of Police Magistrate at Thursday Island, and elsewhere. Still later, he retired from the Government service, and turned his attention for some years to pastoral pursuits in the Port Curtis district, where he became owner of a cattle station. Finally he removed to Tasmania, where he spent the remainder of his life.

Mr. Beddome, like his brother, Colonel R. H. Beddome, well known for his researches on the Land Mollusca of India, was an ardent conchologist. In Tasmania he dredged and collected assiduously. The importance of his own collection was enhanced by his acquisition of one formed by Mr. W. Legrand containing the series studied by the late Rev. J. E. Tenison-Woods. His papers, which are not numerous, are to be found either in the Papers and Proceedings of the Royal Society of Tasmania or in the Proceedings of this Society. Mr. Beddome was elected a member of the Society in October, 1880.

The Proceedings for 1898 form a volume of 838 pages, illustrated with thirty-three plates, and comprising forty papers contributed during the Session. These may be classified as follows: Botanical, 16; ethnological, 2; palæontological, 1; embryological, 1; zoological, 20. Three Parts of the Proceedings, containing the majority of these papers, were published and distributed last year, in addition to two Parts of the Proceedings for 1897, which remained over from the previous year. The sheets of the concluding Part are printed off, and as soon as the lithographer has finished his share of the work the Part will be issued.

By the wreck of the s.s. China on her homeward voyage in March last, the Society had the misfortune to lose a package containing despatches for thirty-four Societies or Institutions in Great Britain, the United States, and Canada. Fortunately a number of Parts of the same issue had been sent by post, so that the package forwarded by the China was smaller than usual. A duplicate set was afterwards despatched to replace the publications thus lost. The package was insured, but the amount of the insurance is but a fraction of what it would cost to republish the Part, upon the surplus stock of which a rather serious inroad has been made.

Reference has already been made to the practically stationary condition of the Members' Roll. At a Special General Meeting to be arranged for at an early date, you will be asked to consider a recommendation from the Council that the operation of Rule vi., in so far as it relates to entrance fees, be suspended during the current year. With the same amount of capital invested, the Hon. Treasurer has had to struggle for several years past with a diminution in the annual income of about £200 per annum, due to the fall in the rate of interest on sound investments since the recent commercial crisis.

The annual subscription for original members (*i.e.*, those who joined in 1874) was one guinea, without entrance fee; from 1875-84 one guinea, with an entrance fee of one guinea. In 1885 this was altered to two guineas per annum, without entrance fee; and for Associate Members one guinea, without entrance fee. From 1893 to the present time the rates have been one guinea for all Members, with an entrance fee of two guineas for new Members; for Associate Members, one guinea, with an entrance fee of one guinea. In other words, under the present régime a Member pays for the first two years the same amount and no more than he would pay in the same period with an annual subscription of two guineas, without entrance fee, while thereafter he would pay only half. This alteration was made after the Society came into possession of the gifts and bequests of the late Sir William Macleay, but before the commercial crisis; and was adopted without hesitation, though at the time it was evident that it would involve a slight diminution in the annual income. It was meant to be an expression of the feeling that it would harmonise with Sir William's liberality to the Society if financial considerations had as little as possible to do with the exclusion of otherwise desirable candidates for membership. The amount annually exacted from effective members of the Society compares more than favourably with that due by members of other Australasian Societies of the same standing. The volumes of the Proceedings too are larger, and the printing and illustrations proportionally more costly than was the case in earlier years.

A year ago I was able to announce the appointment of Mr. R. Greig Smith, M.Sc., Lecturer in Agricultural Chemistry at the Durham College of Science, Newcastle-upon-Tyne, to be the first Macleay Bacteriologist. Mr. Smith arrived from England in September last and at once entered upon his duties. The first matter for consideration was the transformation of a large empty room into a laboratory as well fitted up and equipped for research as the resources at the disposal of the Council would permit. By November sufficient progress had been made to enable the Council to consider the plans and a scheme of expenditure submitted by the advisory sub-committee in conjunction with Mr. Smith, involving an outlay of about £660. A tender for tiling the floor was accepted, and a little later a second for the supply and fixing of the necessary fittings. I regret to say that through a disastrous accident to the kiln in which the tiles were being burnt, the first of these has not yet been carried out, but we have a promise that any further delay will not exceed three weeks. The second contract was finished within the time specified in February last, at a cost of £164 11s. This provides for the whole of the fittings and the fixing thereof, including cupboards, benches, tables, shelves, photographic room, the laying on of gas and water, hoods for carrying off heated air, and venetian shutters or blinds to the windows. You will have the opportunity this evening of seeing for yourselves what has so far been accomplished in this direction.

As regards equipment, progress may be reported as follows:—Mr. Smith was authorised before his departure from London to select and bring with him apparatus and chemicals either of a special character or as necessary for an interim equipment, to the extent of £70. Since his arrival two orders have been sent to

Europe for optical, bacteriological or other apparatus, and chemicals to cost about £200. The goods thus ordered should ere now have been despatched to their destination. In addition certain apparatus and supplies of chemicals have been obtained locally at a cost of £16.

When the arrangements still in contemplation or now in course of execution are completed, it will be conceded that the Society may be congratulated on the improvement effected in the Linnean Hall, and on its acquisition of a laboratory sufficiently well equipped to allow of bacteriological researches being systematically carried out under its auspices, and thus of adding to its importance and enlarging its sphere of influence. Very careful consideration throughout has been given to the subject, and while luxurious or extravagant expenditure has been avoided, no effort has been spared to make the available resources go as far as possible in providing a laboratory primarily of a utilitarian character. I need hardly say that throughout Mr. Greig Smith has heartily co-operated with the advisory sub-committee and the Council in carrying out the improvements.

With the arrival of the balance of the equipment, and the completion of the tiling of the floor, the last of the hampering restrictions to some extent now operating will disappear, and the Bacteriologist will then be in a position to settle down to steady work. As this is the first of our annual gatherings at which Mr. Smith has been present, I take the opportunity on behalf of the Society of offering him a hearty welcome, and of wishing him a very successful career in his new sphere of work.

In its capacity as trustee, the Society may, on this occasion, be congratulated that Sir William Macleay's intentions and directions are now on the point of realisation. It is not necessary to recapitulate the circumstances under which the trust unexpectedly devolved upon this Society. As far as the Society is concerned they may be allowed to drop out of mind. The bequest was an alternative one, but the Society was not concerned in taking the initiative or an active part in bringing about the final result. It is true that fully seven years have now elapsed since probate of Sir William's will was granted; but when allowance is made for the vicissitudes which for some time attended the carrying out of the terms of the bequest, and especially for the very serious commercial depression which meantime overtook the community, it may fairly be said that throughout the Council has faithfully endeavoured to administer the trust, and that its policy of proceeding slowly and deliberately has been a commendable one.

As far as the Society is concerned, effect has now been given to the trust. It now rests with the Macleay Bacteriologist and his successors to justify Sir William Macleay's conviction that it was a desirable thing for the scientific welfare of Australia that the status of Bacteriology should be raised; and that one effective way of accomplishing this was by the appointment of a Bacteriologist untrammelled by official or routine duties, and free to engage in research to the full extent of his ability and enthusiasm.

When, a year ago, I had the honour of addressing you from this chair, I chose for the subject of my remarks during a portion of my address, the somewhat threadbare question of how far mechanical, *i.e.*, physico-chemical, theories are capable of being utilised in the explanation of the phenomena of living activity.

I ventured to state the conviction that, in so far as a strictly scientific or natural-historical representation of these phenomena is the object aimed at, this can only be given in terms of physical cause, or mechanism.

By "strictly scientific or natural-historical explanation," I understand one which is susceptible of verification and of advancement by the objective and experimental methods of scientific procedure, which, as it appears to me, must necessarily operate upon the plane of physical causality. For experimental science, the world-order is conceived as a purely causal nexus.

It was pointed out at the same time that the validity of any such method of explanation was not absolute, but was relative to a particular aspect of reality; and that its adoption as the characteristic working conception of scientific procedure, does not preclude the necessity for an interpretation of the phenomena of life from the point of view of a philosophically more adequate synthetic principle than the elementary and abstract category of causality.

And there can be no doubt that this limitation of the conception of cause as a principle of synthetic interpretation becomes specially evident in the effort to apply it to the phenomena of life. In other words, the conception of mechanism fails to satisfy the demand of the intelligence for an explanation of the co-ordinate differentiation of living parts, and the co-ordinate and purposive adaptation to ends, which seem everywhere to be such characteristic features of organisation.

It was further insisted that the notion generated by the consideration of these features is one which is undeniably and radically distinct from that of mechanical causation, involving as it does the idea of determination by "consequent" rather than by "antecedent," which is the differential characteristic in all operations of mechanism.

Reason was also given for the conviction that the teleological notion of purpose—*i.e.*, of determination by end, or consequent—may not be "put aside as a mere preliminary illusion of the intelligence—as a fiction that we accustom ourselves to suppose," but on the contrary that it embodies for us a true and genuine aspect of reality.

The ultimate interpretation of organism in terms of purpose brings us, indeed, closer to reality than any merely mechanical one can ever do. For the conception of purpose does not negate mechanism; it includes, while it re-interprets it. The idea of determination by ends involves that of the means whereby the ends are realised. And in living organisms these means are necessarily chemical and physical, *i.e.*, in the broad sense mechanical. From this point of view, physical and chemical events themselves can no longer be regarded merely as causally determined links in an endless chain of transformations of energy. Such a view of them is partial, abstract, and schematic, and is thus in the strictest sense *unreal*.

The necessity for a recognition of the general principle of determination by ends as a synthetic and unifying principle of interpretation, has inspired at various epochs the advocates of what is called "vitalism" in biology. The older vitalism, of which it has been well said that it was merely "mechanism misunderstood," like the old theological "design argument," has served to bring "teleology" into disrepute during the greater part of the century. To disparage this much abused principle has been a shibboleth of not a little of the later biological literature of the century. It is to modern philosophical criticism that we are indebted for what I believe to be a clearer insight into the relative validity of the two principles of cause and purpose respectively, as applied to the interpretation of phenomena. Through it we may learn that the recognition of purpose in the interpretation of nature does not necessarily involve the intrusion of a new extraneous, super-physical form of "vital" energy. This would be "mechanism misunderstood." But through it we also learn to discard the widely prevalent view that the principle of mechanical causation, which forms the governing conception of physics end chemistry as scientific disciplines, is therefore to be regarded as the sole and only synthetic principle by which we can connect phenomena in the unity of a single system.

Having devoted a considerable portion of my former address to the attempt to set forth the position just outlined, I should have thought it unnecessary to return to it on the present occasion but for the circumstance that in the interval there has appeared in the issue of the "Nineteenth Century" for September, 1898, a contribution towards the discussion of this very question of "vitalism" versus "mechanism." A consideration of this may, on the present occasion, be deemed neither out of place nor wholly unprofitable.

The article in question is from the pen of my friend Dr. J. S. Haldane, Lecturer on Physiology in the University of Oxford, whose previous utterances on the same subject, together with his very high reputation as an experimental physiologist, entitle him to speak with some authority on behalf of that school of biologists to which the term "neo-vitalist" has been applied.

I am the more anxious to take note of the interesting essay referred to on account of the fact that in my last year's criticism of the neo-vitalist position it was Dr. Haldane's exposition of that position that I mainly relied upon, quoting at some length from a published essay of a good many years ago. It was thus with a great deal of interest that I perused the re-statement of the same position in his recent article.

A brief examination of the argument of this article may serve to bring the points at issue into prominence.

After pointing out that mechanical doctrines respecting the phenomena of life became dominant during the last fifty years in coincidence "not only with great advances in physics and chemistry, but also with the appearance of plausible physical and chemical theories to explain some of the most fundamental physiological processes," the writer follows up "some of the main lines in the development of the physico-chemical movement of recent times." And he endeavours to show in the case of the instances chosen—and they might be easily added to—that theories which treat cell-growth and nutrition as mere mechanical or chemical aggregation; or secretion, absorption, and excretion as simple cases of mechanical processes of filtration, osmosis, and diffusion, completely break down when tested by accurate experimental investigation. "To any physiologist," he continues, "who candidly reviews the progress of the last fifty years it must be perfectly evident that, so far from having advanced towards a physico-chemical explanation of life, we are in appearance very much further from one than we were fifty years ago." Thus he disposes of the first reason cited in favour of the rejection of vitalism in biology, viz., that there has been steady progress in the direction of explaining life in terms of physics and chemistry. The second objection to the vitalist position, viz., that it is without meaning as a positive hypothesis, is next passed in review. "This argument in its widest sense," he says, "is undoubtedly based on the metaphysical assumption that the universe, interpreted as it is in the physical sciences as a universe of matter and energy, corresponds to absolute reality, and is for this reason incapable of any further interpretation. The work of modern philosophy since Berkeley and Hume has shown that the assumption in question is without foundation." (I need hardly reiterate that with regard to this assumption I am in entire agreement with Dr. Haldane's attitude.)

But "the form in which the objection in question really presents itself to most physiologists is that, apart from all metaphysical arguments, vitalism presents no positive working hypothesis capable of being used to advance physiology."

It is with Dr. Haldane's treatment of this aspect of the problem of vitalism versus mechanism,—occupying the latter two thirds of his article,—that I shall more particularly concern myself with at this time.

I shall not dispute the proposition that, in the progress of the science of physiology, physico-chemical theories of living process have broken down all along the line. I readily admit that such theories have in every direction failed to accomplish that mechanical analysis of function which seemed to the physiologists of the later decades of the century to be so nearly within their grasp. Yet it would be grossly inaccurate to assert that the attempt to explain life as mechanism has resulted in nothing but failure. The fact is that mechanism after mechanism has been displayed, through the operation of whose chemical and physical properties the functional activity of the organism is subserved.

On the other hand it is true that the residual phenomena unexplained by these mechanisms may in a sense be held to embody the very essence of the mystery of organisation. It is not difficult to see that in the nature of the case this must be so. It is the penalty of the abstract character of the causal principle employed as the instrument of research. The forging of links in an endless chain of mechanical causation is a never-ending process,—the mystery ever recedes as we pursue it further into the recesses of organisation.

Does the recognition of even such a radical imperfection at the root of the physico-chemical conception really involve its rejection as the characteristic conception of scientific procedure? I do not think that this can be admitted. The objection would hardly be pressed by anyone with regard to the use of the idea in physics and chemistry, although, in the last resort, the criticism of the abstract idea of causality as a final principle, is as valid in that sphere as elsewhere. And if in a more obvious and pre-eminent way the mechanical hypothesis breaks down when it is offered as an explanation of vital phenomena, it does not do so without giving us splendid proof of its capabilities as a working hypothesis. The search for causes has resulted in the revelation of mechanism upon mechanism in the way of structural organisation; process in multicellular organisms is realised through material parts or organs more and more minute, as far as our means of observation enable us to proceed. Must we halt for ever upon the threshold of intracellular organisation? What is there in that organisation that we should feel obliged there to discard the conception of mechanism, elsewhere so serviceable? Do we here enter a new world for the first time? Assuredly not. The real obstacle to a mechanical theory of life is not met with at one point more than another, but all along the line. "Vitalistic or teleological interpretation," it was urged in last year's address, "is not a method which comes to our rescue when a physical interpretation fails us. In so far as it is valid at all, it is one which is present with us and which urges itself upon us *at every stage*, forbidding us ever to mistake a possible mechanical inter-connection of the phenomena of life for the real ground in thought of purposive adaptation."

In referring to the shortcomings of the attempted physico-chemical analysis of living process, Dr. Haldane avers that "we are now far more definitely aware of the obstacles to any advance in this (physico-chemical) direction, and there is not the slightest indication that they will be removed, but rather that, with further increase of knowledge, and more refined methods of physical and chemical investigation, they will only appear more and more difficult to surmount."

So far as I can see there are no more "obstacles" than there ever were to a mechanical view of living process. There must always be possible a "mechanical explanation" of the phenomena so long as observation continues to reveal underlying mechanical arrangements. And even Dr. Haldane does not suggest that we have run up against a blank wall in the experimental investigation of organism according to physical and chemical principles. He does not doubt that "by the further application of these principles we shall continue to extend our knowledge." And in the following extract from a private letter of earlier date than the article under consideration, he expressly disclaims the disposition to set bounds to progress in the direction indicated. "I do not mean," he says here, "that physico-chemical investigations will in any way cease to make as much progress as before in the domain of life, for one can see no limit to the progress of, say, physiological physics or chemistry. Nevertheless, every year makes it clearer that with all this progress we seem to get further and further from physico-chemical explanations of any of the elementary phenomena of biology, growth, development, nutrition, secretion, heredity, excitability, &c."

But when it is conceded that we do actually "make progress in the domain of life" by means of physico-chemical investigation, one is constrained to ask "does not the knowledge so gained, *just so far as it goes*, amount to an actual and genuine scientific explanation of the phenomena concerned"?

It seems to me radically wrong to assume, as Haldane appears to me to do when he speaks of "getting further and further from physico-chemical explanations of the elementary problems of biology," that such an explanation, or, indeed, any explanation of phenomena whatever, is to be conceived merely as an end-product of thought, or a terminal goal of scientific investigation. The explanation and interpretation of vital phenomena is always going on. *Solvitur ambulando.* As we learn the physics and chemistry of "living protoplasm," of those parts and substances which all will admit to be in some sense the embodiment of function, as we determine causes and effects of events in the way of process, and distinguish the actual from the apparent, and true modes of relatedness from false; as we thus proceed, I hold that we are, *de facto*, *explaining* living process in terms of mechanism, even if in so doing we may not be saying the last word about its significance.

Dr. Haldane does himself admit that "perfectly satisfactory physical explanations can, for instance, be given of the manner in which contractions of the muscles and of the heart respectively bring about the movements of the limbs and the circulation of the blood." Again, "we can explain, on purely physical and chemical principles, many isolated processes occurring in the living body." But it is pointed out, with perfect justice, that, underlying these more obvious mechanisms, there lies the more subtle operation of a cellular activity which does not yield to a physico-chemical analysis. According to the vitalistic view, any function, or any aspect of function, which is capable of being thus analysed is non-vital. "If we look, however, at the phenomena which are capable of being stated or explained in physico-chemical terms, we see at once that there is nothing in them characteristic of life."

This is, in truth, a short and easy mode of disposing of the mechanical interpretation of function; but if it be true that the progress of physiology has largely consisted in the elucidation of function-complexes by the recognition of elementary cell-phenomena underlying the grosser mechanical aspect of the processes, then we should appear to be justified in concluding from this reasoning that it is only in the elementary physiological activity of intracellular function that we can recognise any genuine manifestation of vitality.

I see nothing to be gained by the attempt to classify the functions of an organism into those which are characteristic of life and those which are not. Surely any and every process carried on as a part of the life of an organism is characteristic of life, whether it seem to be analysable into physico-chemical process or not.

Nor will it do to admit that explanations in terms of mechanism are appropriate for certain of the operations of organism, and then to pull up short at the problems involved in intracellular activity and deny the applicability of physico-chemical explanation to the phenomena there manifested. It is admitted on all hands that "the elementary problems of biology,—growth, development, nutrition, secretion, heredity, excitability, &c."—are at bottom intracellular problems. And in my humble opinion, if we knew as many facts regarding the material organisation of living cells, and were able to make the same kind of observation and experiment upon them as we can upon cell-complexes, we should then find that physics and chemistry could do for us exactly the same kind of thing,—not less,—and as certainly not more,—than they have done in explanation of those processes of which, Dr. Haldane thinks, we have already "perfectly satisfactory explanations."

In this connection it may be useful to recall the views upon the same subject of another distinguished young physiologist, as expressed in the interesting address on "the relations between morphology and physiology," to which probably most of you had the pleasure of listening at the opening of the biological section of the Australasian Association at its meeting in Sydney last year. There Professor Martin discourses, among other matters, concerning the limitations of the physiological physico-chemical movement of the last half century, "so far as a complete understanding of life is concerned." He remarks that, "The physiologists, too, having studied the chemistry and physics of phenomena associated with the life of higher animals, have tracked physiological activity into the cell. Here, for the time being, a view of the mechanism is lost, and cellular physiology does not appear capable of being successfully attacked along the same lines of mechanical interpretation which have proved so successful in dealing with the functions of compound organs."

"One must not imagine," he continues, "that morphological or physiological inquiry of the character which has been so fruitfully prosecuted during the last half-century is in any sense exhausted."

The body of the address is occupied in discussing the directions of progress of both morphology and physiology, and emphasis is laid on the fact that, in the case of both disciplines, the essential problems have been followed up to the threshold of the living cell. Thus Dr. Martin proceeds—"For the past fifty years the physiologists have been principally concerned with the analysis of the function of organs as such, and have more or less left aside the physiology of cells. In my opinion they have been quite wise in so doing. In this way all those physiological phenomena which can be measured according to physical standards and interpreted in terms of physics and chemistry and physics have, to a large extent, been separated off from those that cannot. Processes in which cells participate collectively as membranes or organs have been more or less sharply defined from those in which they operate by means of their individuality, and in which cases the phenomena are intracellular. Surely it was wise to ascertain to what extent a physiological result was due to the physical or chemical properties of the matter concerned, in order to know at what point the intervention of cellular activities is necessary" Throughout the whole discussion of the various phases of the physiological problem dealt with, Professor Martin appears to agree with Dr. Haldane that in every case of function-analysis the most characteristic and essential quality of the process has been "tracked" into the cell. But if I rightly interpret Dr. Martin's attitude, it differs from Dr. Haldane's in that the former finds no necessity for the abandonment, but only for the further prosecution of the methods of the last fifty years. As a physiologist, he has evidently "no desire to cry a halt at this point," even if "the *known* laws of chemistry and physics seem so hopelessly incapable of furnishing any interpretation" of the problems at issue. It is interesting to compare the attitude taken up by Haldane and Martin respectively in reference to such an apparently established physiological fact as that the tension of oxygen in arterial blood is frequently higher than it is in the air of the lung alveoli. This is interpreted by Haldane as signifying that here we have evidence of a defiance of physico-chemical law, *i.e.*, that the physical laws of the diffusion of gases do not hold in this case. There is a noteworthy difference in the view of the same facts of gaseous respiratory exchange taken by Martin. In his view the results of experiments show that "the exchange of gas between the blood plasma and the alveolar air is regulated to some extent according to the law of partial pressures." And, with regard to the above-mentioned strikingly anomalous behaviour of the respiratory oxygen (first announced by Bohr, and since confirmed by the work of Haldane and Lorrain Smith), Martin cautiously remarks that this fact "cannot be explained by diffusion across a membrane, with which one is so far acquainted in physical experiments." But it is to be observed that this inadequacy of physical explanation suggests to him, not a break in the continuity of mechanical theory as applicable to the phenomena under consideration, but simply a new physical hypothesis as to the material structure of a membrane which should allow of such novel behaviour. And so on, wherever the known laws of physics and chemistry seem incapable of accounting for the activities manifested in living matter, the question for Martin seems ever to be "if this be not a case of the operation of known mechanism, what is the actual and genuine mechanism underlying it: if the originally supposed mechanism is not the true cause of the operation, what is the real and actual antecedent cause?" And to me this appears to be the only genuinely *scientific* question, the only kind of question answerable by means of experimental scientific procedure.

The question may be brought into relief by the use of a familiar quotation from Clerk Maxwell—"Now one material system can differ from another only in the configuration and motion which it has at a given instant. To explain differences of function and development of a germ without assuming difference of structure is, therefore, to admit that the properties of a germ are not those of a purely material system." Here, of course, it is the one physiological process of development which is in view. For the present purpose we might write "living cell" in place of "germ" or germ-cell. On the lines of Clerk Maxwell's formula, the general contention here supported might be summarised thus :—Living activity can only be known to scientific investigation as manifested in changes in configuration and motion of certain bodies in space and time. Such a body is for science, therefore, a material system, and, as such, its function or change of motion or configuration implies material structural constitution, *i.e.*, a mechanism embodying and determining the functional change. A dissociation of function and structure—a divorce between mechanism and motion, living or other—is an impossibility for scientific thought.

That another interpretation of organism transcending that of mechanism, is not only possible but necessary for the human intelligence, I have freely admitted. For such a view it may be necessary to hold that as regards its organisation an organism is no mere object in space; in other words, that it is not "a purely material system." Nevertheless, it is only as an object in space that it can become for us an object of scientific investigation—as part of a material system exhibiting configuration and motion. It is with the changes in motion and configuration manifested by living objects in space that biology, both on its morphological and physiological sides, as a scientific discipline, has to do. And if, as I firmly believe, the conception of organism as a material system is inadequate to express the full concrete reality which organisation possesses for thought; this imperfection is to be remedied, not by the intercalation of the teleological conception at a supposed break in the continuity of possible mechanical interpretation—a break which represents merely the present limit of structural observation—but by a complete philosophical re-interpretation—a philosophical reconstruction—of biological fact, in the light of its significance for the general theory of knowledge.

I feel sure that Dr. Haldane would emphatically demur to my describing his proposition as one which aims at the intrusion of one category of explanation into the sphere of operation of a radically different one. But his assertion of a failure on the part of the mechanical principle to explain the elementary phenomena of organisation in the same manner in which it is admitted to explain certain non-elementary "processes occurring in the living body," and his demand at that point for the operation of another principle of explanation is, to my mind, tantamount to such an intrusion.

It may, however, be useful to endeavour to ascertain from other statements what precisely it is that Dr. Haldane thinks the new vitalism may do for biology. In the letter from which I have already quoted, the writer says: "It seems to me that we do want new working hypotheses for co-ordinating observations as to these elementary phenomena, and that just as the conceptions of mass and energy differentiated physics from mathematics, so the new biological conceptions will differentiate biology from the physical sciences. When this time comes we shall have got out of the present rather barren controversies between vitalists and anti-vitalists. These controversies will die of inanition, just like the old controversies about the possibility of an absolute vacuum, which used to perplex the physicists and mathematicians. There will then be a distinctively biological way of looking at organisms and their environment, just as there is a distinctively physical and a distinctively mathematical way of looking at the world."

What the precise character of these new and distinctively biological conceptions is to be, beyond the fact that they must be vitalistic, purposive, or teleological, I find it rather difficult to determine, although the latter and major portion of the Nineteenth Century article is devoted to the vindication and defence of vitalism as a positive working hypothesis.

In the attempt to demonstrate the positive content of this hypothesis and its alleged contribution to the advancement of physiological science, the writer summarises the change in the modern point of view, in relation to three typical series of functional facts, viz., those of cell-growth and maintenance; of glandular secretion and absorption; and of respiration.

As regards the first of these, it is pointed out that "the deposit of new material during growth only occurs in immediate association with a multitude of other processes, which we may distinguish as absorptive, excretory, respiratory, metabolic, &c., and which, occurring as they do in such unison that the cell develops and maintains itself, are characteristic of life." This he justly points out to be a great advance on the idea that organic growth was to be regarded as essentially similar to a process of crystallisation.

As regards the secretion and absorption of material by the glands and intestine, it is shown that these cannot any longer be regarded as due simply to filtration and diffusion, in that (1) the secreting or absorbing surface is always composed of living cells; (2) that the occurrence of secretion and apparently also of absorption involves processes of building up or growth, and breaking down or waste of the cell substance, and is bound up with various changes—respiratory, metabolic, electrical, &c.,—which occur in such unison that the secreting surface maintains itself; (3) that these processes are similar to those occurring in other cells.

Again, in regard to respiration he points out (1) that oxidation occurs within living cells; (2) that its occurrence is intimately associated with the various other characteristic evidences of vital activity occurring in equally characteristic unison; (3) that it occurs in all the cells of the body. And, he continues—"These results not only imply the failure of particular theories of growth, secretion, respiration, heat production, &c., but they entirely bear out the vitalistic contention that the life of an organism in its characteristic aspects can only be studied and understood as a whole, and that attempts to analyse life into a mere series of physical and chemical processes are based on a mistaken theory." "It is evident from the illustrations just given that the physiological comparison of cell with cell, or organism with organism, has led to an enormously increased insight into life, so that in this respect also the vitalistic theory has turned out to be an excellent working hypothesis. But for misleading physico-chemical theories the very fruitful method of comparing with one another different forms of vital activity might have been adopted all along, and would evidently have led to far more steady and continuous advance."

The writer then contrasts organism with mechanism with reference to the phenomena of self-repair, and adaptation to change in environment, of which he remarks that physico-chemical physiology has failed to give any account, although they may be traced in every elementary physiological process. And positive harm is done when the attention is directed away from these characteristic features of organisation, instead of towards these, as the assumption of a vital principle did.

On these grounds it is alleged that vitalism embodied not only a negative but a positive working hypothesis of great value.

Now I quite fail to see, in the considerations stated, any sufficient reason for refusing to persevere in the mode of explanation by which admittedly we have been led up to the present problems of cell-physiology. Nor can I see wherein, in regard to the phenomena mentioned, vitalism has operated as a working hypothesis distinct from those principles of physics and chemistry which we elsewhere invoke in explanation of changes of the motion and configuration of a material system.

The facts of development, growth, maintenance, adaptation and self-repair, to which Dr. Haldane alludes, are facts which are as patent to the physico-chemical investigator of life as to the vitalist. He has no desire to blink their occurrence. For him, also, the nature of the processes having those particular aspects, forms part of the subject matter of scientific research. It cannot be admitted that there is a single feature of the three lines of discovery adduced as instances of the operation of "vitalism" as a working hypothesis, which is in its nature beyond the recognition of science, working to explain phenomena from the physico-chemical point of view. As a matter of fact the present aspect which each of these problems presents is the fruit, not of vitalistic hypothesis, but of a triumphant reduction of all the grosser aspects of living process as cases of the operation of ordinary mechanical principles. It is not the reproach, but the reward, of modern physical biology that the result of its brilliant analysis is that the essential problems of life appear now to await solution in the arena of intra-cellular structure and function.

The older vitalists demanded a recognition of the non-mechanical character of the grosser aspects of living process. Even by the neo-vitalists it is now admitted that at least many of these can be explained "on purely physical and chemical principles," but they now turn round and calmly tell us that processes so explainable are not "characteristic of life." Yet it is solely the advances in the physico-chemical analysis of grosser function and structure which have enabled us to re-state the problems involved in the newer and more elementary terms of intracellular process. And with regard to the facts involved in the processes above referred to, of development, growth and maintenance, adaptation, and self-repair, it seems quite unwarrantable to predict that physico-chemical analysis will prove more futile here than at any previous stage of scientific development.

It is true, for instance, that the processes of secretion and absorption of material by cells can no longer be conceived as due simply to diffusion and filtration, but all that necessarily follows from the admission is the concession that the processes are in reality more complicated than was formerly supposed. Apparently there is involved an actual selection of material on the part of the cells concerned. Is such behaviour after all entirely outside the scope of all possible physico-chemical explanation, as the vitalist alleges it to be? Verworn remarks upon this very point that "The principle upon which this phenomenon is based is evidently the same as that which controls in general atoms and molecules, namely, affinity. It is surely no less wonderful that an atom of phosphorus unites very easily with an atom of oxygen, but not with an atom of platinum, than that an intestinal epithelium-cell takes up fat-droplets, but never pigment-granules. And it is no less comprehensible that a Vampyrella surrounds with its body-protoplasm and digests only Spirogyra threads and no other bodies, than that a drop of rancid oil, as Gad has shown, sends out amoeboid processes to an alkaline liquid, and uses the alkali for the manufacture of soap, but is inactive toward an acid liquid."

Again, one may ask, is not the repair of mutilated crystals a phenomenon which is worthy of being placed alongside the no doubt far more complicated phenomena connected with the self-repair of organisms? The regeneration of the other half of a hemi-gastrula resulting from the destruction *in situ* of one of the first two blastomeres of a developing ovum, however determined, must involve most highly complicated material rearrangements, and the process in the present state of knowledge must be admitted to be practically unintelligible as a mechanical procedure. But can one say so very much more with respect to the regeneration of the ideal form of a crystal which has undergone mutilation?

No one, I take it, would submit these parallels as of equal degrees of complexity. Yet, though the phenomena concerned may be widely incommensurate, as purely objective phenomena they suggest somewhat analogous explanations.

In the latter portion of his paper Dr. Haldane seeks to point out the "way out of the difficulty in which the shortcomings of both the physico-chemical and vitalistic theories have placed physiology."

This attempt he makes with the aid of an appeal to the modern development of scientific anatomy or morphology.

"The fundamental assumption of morphology is," he says, "that each part of an organism is determined as regards its mode of existence by its relations to other parts. That this determination is real and not merely apparent, is shown by the facts (1) that morphological plan is so persistent in spite of disturbing influences; (2) that parts which are removed tend to be reproduced." It is this conception of a morphological plan which is regarded as the vivifying principle of modern anatomy. In other words, it is the idea of homology as morphological identity. I think that upon the whole it is correct to say that it is this idea which is specially characteristic of the morphology of the latter half of the century. But it seems to me that the real ground of the principle as operative in modern science is entirely misconceived, when it is stated as follows :—"The ground idea of the new anatomy was evidently that of the existence of an immanent type or plan which an organism or group of allied organisms adheres to through every variety of outward modification. This idea dominates morphology and differentiates it from other sciences, just as the ideas of matter and energy dominate and differentiate physics." Such a statement of morphological faith might indeed have emanated from such a scientific anatomist as Sir Richard Owen, but it will certainly not symbolise the practically unanimous views of more recent morphologists. For them, "immanent type or plan" undoubtedly resolves itself into a community of structural character due to actual blood-relationship; an ideal "adherence to morphological plan" is reducible simply to community of origin.

This view of the essential nature of "homology" will alone afford a rational explanation of detailed morphological relationships. According to Dr. Haldane the conception of each part of an organism, regarded morphologically, "evidently involves the conception of its morphological relationships to other parts." In other words, the conception of each part involves that of the whole. "We can mentally separate the parts of a physical structure from the other parts of the same structure, but we cannot do so with the parts of a morphological structure." But whenever we seek to translate into detail what the actual morphological relationships of parts signify, *i.e.*, from the strictly morphological point of view, and apart from their functional significance, we find that we interpret these relationships systematically from the point of view of a theory of descent, and not from that of the existence of "an immanent type or plan" to which the organism "adheres through every variety of outward modification." No doubt "the method of comparing different organisms and different stages in the development of the same organism enables the morphologist to perceive a definite correlation among the parts," but the guiding hypothesis with which he is armed when endeavouring to read unity into the diversity of structural modification—to discover true morphological identity underlying manifold differences—is undoubtedly that of relationship by common descent, and no mere ideal of unity of type. And this is the case quite independently of the question whether or not the "modern doctrines of relationship by descent, heredity, and gradual differentiation of species by natural selection have furnished a key to" a physico-chemical interpretation of life. On the vitalistic view, of course these doctrines must be held to represent no advance along the line of such interpretation. Dr. Haldane holds that "the doctrine of natural selection does not in any way offer a physico-chemical explanation of the means by which the morphological and physiological characters of an organism are modified." Now this is just what it appears to me natural selection does offer, *so far as it goes*. It is an attempt to explain the facts of the admitted evolution of organic forms as a series of events linked together by purely causal connection. Last year I insisted upon its inadequacy as a complete principle of explanation on account of its fundamental assumption of (unexplained) variability. But that it is, nevertheless, an actually operative factor in development, through whose use we may be said to make progress in the recognition of the causal sequences in biological phenomena, I can see no reason for doubting. Yet no more here than anywhere else are we exempt from the inevitable re-interpretation of all such phenomena, when the causal principle is assigned its rightful place in a true theory of knowledge as an abstract and incomplete principle of interpretation.

It is also true that for a complete analysis of the facts of morphology we urgently require a tenable theory of heredity. And it is objected that "no attempt worthy of serious consideration has ever been made to furnish even the outlines of a physico-chemical theory of heredity."

The question of heredity is obviously bound up with that of the structure and properties of the living matter which is carried over from parent to offspring. Everyone must admit that the substance of the oosperm is in some sense the embodiment and the carrier of the characteristics of the parent organisms. As a material system the germ must necessarily possess, registered either in its physical structure, or in its chemical composition, or in both together, potential equivalents of those properties in which it resembles the parental organisation. To deny the existence of some such physico-chemical embodiment seems to me tantamount to asserting, not only that the properties of a germ are not those of a purely material sytem, but that the entire phenomena of reproduction are essentially unintelligible.

To admit so much is of course a very different thing from admitting the whole contention of the thorough-going preformationists. It amounts to no more than the assertion of a structural basis for organisation, not only in the ovum but in the developing organism itself. "Continuity of organisation," says Whitman, "does not of course mean preformed organs, it means only that a definite structural foundation must be taken as the starting-point of each organism," whose "organic unity must depend on intrinsic properties no less than does molecular unity."

"The indubitable fact on which we now build is no bit of inorganic homogeneity, but the ready-formed, living germ, with an organisation cut directly from a pre-existing, parental organisation of the same kind. The essential thing is not simply continuity of germ-substance of the same chemico-physical constitution, but actual identity of germ-organisation with stirp-organisation."

The facts of regeneration are confidently appealed to in order to support the contention that the differentiation of structure in an organism is governed by a general morphological idea of organic unity, and not by any sort of mechanical predetermination of its structural parts. And one may frankly admit the entire inability of conceiving how, by some physical arrangement of determinants, the half-embryo which results from the development *in situ* of one only of the first two blastomeres, should possess the capacity of regenerating the other half. Yet we are not entitled to adopt the extreme views formerly expressed by Driesch, which assume the absolute isodynamy of the early embryonic cells, according to which theory they may be "thrown about at will, like balls in a pile, without the least impairment of their power of development." "Their prospective value," according to Driesch, "is a function, of their position in the whole," which, in this connection, means their morphological relations to each other. Yet it has been shown in a large number of cases at a very early stage of development, and in some cases even from the first, there exists a degree of qualitative differentiation of the germ-material. Such was shown to be present in Amphioxus and Nereis by E. B. Wilson, several years ago. And if the fact of the regeneration of the missing halves of hemi-embryos proved fatal to the mosaic theory of development in its original form, more recent observations have shown that a fairly extensive predetermination of cytoplasmic regions may in certain cases be shown to exist. Thus in the case of the egg of Beroe, the experiments of Driesch and Morgan, and more lately those of Fischel, have shown that an isolated blastomere of the two- or four-celled stage gives rise to a half- or quarter-embryo; and also if part of an unsegmented egg were removed the rest generated an incomplete larva, showing certain defects which represent the portions removed.

A conclusive evidence of underlying mechanical arrangements in germinal structure would seem, moreover, to be derivable from experiments upon the influence of gravity upon the development of frogs' ova. In 1894, O. Schultze discovered that if the egg of a frog be turned upside down when in the two-cell stage, a whole embryo, (or half of a double embryo) might arise from each blastomere instead of a half-embryo, as in the normal development, and that the axes of these embryos show no constant relation to one another. Again, if, after destruction of one blastomere, the other be allowed to remain in its normal position, a half-embryo always results, precisely as described by Roux. If, on the other hand, the blastomere be inverted it may give rise either to a half-embryo or to a whole dwarf. According to Wilson, from whom I have largely quoted in reference to these experiments, we have here the most conclusive evidence that each of the two blastomeres contains all the materials, nuclear and cytoplasmic, necessary for the formation of a whole body; and that these materials may be used to build a whole body or half-body, according to the grouping they assume. After the first cleavage takes place, each blastomere is *set*, as it were, for a half-development, but not so firmly that a re-arrangement is excluded. It is through the interpretation of facts of this kind that Wilson believes that we can "reconcile the theories of cytoplasmic localisation and mosaic development with the hypothesis of cytoplasmic isotropy. Primarily the egg-cytoplasm is isotropic in the sense that its various regions stand in no fixed and necessary relation with the parts to which they respectively give rise. Secondarily, however, it may undergo differentiations through which it acquires a definite regional predetermination, which becomes ever more firmly established as development advances. This process does not, however, begin at the same time, or proceed at the same rate in all eggs. Hence the eggs of different animals may vary widely in this regard, at the time cleavage begins, and hence may differ as widely in their power of response to changed conditions."

For our present purpose the importance of the facts quoted lies in their testimony to the general fact of an ultra-microscopical organised structure of germ cells, which embodies and subserves the intracellular expressions of living activity, just in the same way as the visible bodily organs embody the more obvious and familiar aspects of bodily function.

It must therefore be maintained that neither the obscurity of the problem of heredity, nor the leadings of the extraordinarily striking phenomena of regeneration can be regarded as absolutely incapable of being brought into line with other biological facts as causally determined in the mechanical sense, far as we are at present from any such achievement.

And in the present connection it cannot be admitted that we are under any sort of compulsion to abandon the natural-historical interpretation of homology—the true guiding hypothesis of modern morphology—simply because we cannot effect a definitive analysis of its more important factors. Inability to do this does not, for example, deprive me of the solid conviction that the morphological relationship existing between, say, the presence of a marsupial pouch and an inflected mandibular angle, is to be interpreted simply as a common family character, transmitted by descent, and deriving its whole meaning from the fact of this transmission: and not as an instance of any recondite conformity to an immanent ideal "type."

Thus the supposed parallel or contrast between the progress of morphology and physiology will not help the vitalist argument. For in reality, morphology, just as much as physiology, has been advancing by the aid of hypotheses which are conceived as every bit as mechanical as those which have achieved no small measure of success in physiological science.

In neither case can we afford to dispense with that category of explanation which alone is appropriate to the investigation of the operation of any material system, extended in space, and manifesting its phenomena as a series of events in time.

A final quotation from the article under criticism will suffice to summarise the question at issue.

"All that is really shown by the partial success which has attended the application of physical and chemical principles of explanation in physiology is that in the course of investigation it is often possible to ignore for the time the distinctive features of life. For certain scientific purposes we may treat some part of the body as a mechanism, without taking into consideration the manner in which it is controlled and maintained; and in this way results of great value have been attained. But in doing all this we are deliberately ignoring or abstracting from all that is characteristic of life in the phenomena dealt with. The action of each bodily mechanism, the composition and structure of each organ, the intake and output of energy from the body, are all mutually determined and connected with one another in such a way as at once to distinguish a living organism from anything else. As this mutual determination is the characteristic mark of what is living, it cannot be ignored in the framing of fundamental working hypotheses."

With nearly the whole of this statement I am in substantial agreement. For, "certain scientific purposes," I should put, "for all strictly scientific purposes"; and as regards the last sentence, I consider that the teleological determination there referred to is incapable of incorporation in the working hypotheses of experimental science, except to that extent to which it can be translated into terms appropriate to the connections and relations of a material system.

But, after all, the points of agreement far outweigh the points of difference in the two stand-points compared. For both alike, the interpretation of the phenomena of life as in their essential character merely mechanical is based upon the untenable "metaphysical assumption that the universe, interpreted as it is in the physical sciences as a universe of matter and energy, corresponds to absolute reality, and is for that reason incapable of any further interpretation."

The full significance of Nature is not to be apprehended by the externalising operation of purely scientific interpretation, be the scope of its investigations never so extended. Not even a complete "astronomical knowledge" of the molecular dance of elementary physical particles could absolve us from the necessity of finding the ultimate explanation of all phenomena in terms of that single spiritual principle which alone makes knowledge possible, and for which alone even material bodies either live or move or have any being at all.

"Ihr folget falscher Spur;
Denkt nicht, wir scherzen!
Ist nicht der Kern der Natur
Menschen im Herzen?"

On the motion of Mr. A. H. S. Lucas, M.A., a very cordial vote of thanks was accorded to the President for his interesting Address.

The Hon. Treasurer, Mr. P. N. Trebeck, presented the balance sheet, duly certified by the Auditors. The Society's total income for the financial year ending December 31st, on both General and Bacteriological Accounts was £2,296 10s. 2d.; the total expenditure was £1,418 4s. 11d., leaving a credit balance of £82 8s. 10d. in favour of the first-named account, and a credit balance of £795 16s. 5d. in favour of the latter.

On the motion of Mr. Edgar R. Waite, F.L.S., the Hon. Treasurer's report was adopted.

No other nominations having been received, the Chairman declared the following gentlemen elected to fill eight vacancies in the Council :—Hon. James Norton, LL.D., M.L.C. (President), Cecil W. Darley, M. Inst. C.E., Professor T. W. E. David, B.A., F.G.S., Henry Deane, M.A., M. Inst. C.E., James R. Garland, M.A., J. H. Maiden, F.L.S., Professor J. T. Wilson, M.B., Ch.M.

And as Auditors: Hugh Dixson, J.P., Edward G. W. Palmer, J.P.

BALANCE SHEET.

Linnean Society of New South Wales.

	£	s.	d.
Jan. 1, 1898.			
To Balance from 1897	605	11	2
Paid in by Dr. Norton	2	1	0
Dec. 31.			
To Entrance Fees from three Members ...	6	6	0
,, Subscriptions from seventy-three Members	90	10	0
,, Interest received	1,353	15	0
,, Sales of Proceedings (including vols. sold to the Government, two years) ...	207	6	6
,, Extra Plates supplied to authors ...	6	13	0
,, Insurance on package of publications lost by wreck of China	24	7	6
	£2,296	10	2

	£	s.	d.
Dec. 31, 1898.			
By Ground Rent, Rates and Insurance ...	91	9	3
,, Exchange on country cheques	0	7	6
,, Printing	346	0	9
,, Plates and Illustrations	116	7	0
,, Stationery and Sundries...	4	11	3
,, Shipping Charges, Insurance, &c. ...	3	13	0
,, Salaries and Wages	478	0	0
,, Petty Cash (including Gas, Advertisements and Postage)	20	0	0
,, Telephone	4	10	0
,, Bacteriology Account	331	1	8
,, Beaumont & Sons, Painting Hall, &c.	22	4	6
,, Balance in Bank	878	5	3
	£2,296	10	2

ENDOWMENT (CAPITAL).

	£	s.	d.
Amount received from Sir William Macleay in his life-time	14,000	0	0
Further Sum bequeathed by Will £6,000, less Probate Duty	5,700	0	0
	£19,700	0	0

	£	s.	d.
Loan A	3,000	0	0
Loan B	5,000	0	0
Loan (portion of Loan C, secured with other money by mortgage for £24,000)	11,700	0	0
	£19,700	0	0

February 28th, 1899.
Audited and found correct.

Hugh Dixson,
E. G. W. Palmer, } Auditors.

P. N. Trebeck, Hon. Treasurer.

BACTERIOLOGY (INCOME).

		£	s.	d.			£	s.	d.
1898.					1898.				
Jan. 1	—To Balance from 1897	613	18	1	Mar. 26	By Draft and Exchange, Bacteriologist's allowance for passage money from England	70	14	1
Dec. 31	,, Interest on £12,300 @ 4% ...	492	0	0		,, Draft and Exchange, Purchase of Apparatus and Chemicals	70	14	1
	,, Interest on £700 @ 3% ...	21	0	0	July 23	,, Advertisements, Cablegrams, &c.	5	13	6
					Aug. 29	,, Microscope, Objectives, and Eyepieces	40	0	0
					Dec. 31	,, Salary (from Sept. 10th) ...	124	0	0
						,, Books ordered from Europe (including commission) ...	20	0	0
						,, Balance	795	16	5
		£1,126	18	1			£1,126	18	1

BACTERIOLOGY (CAPITAL).

	£	s.	d.		£	s.	d.
Legacy of £12,000, bequeathed by Sir William Macleay to the University of Sydney (less £600 probate duty), paid by the University into Court and ordered to be paid out to the Society	11,400	0	0	Loan (portion of Loan C)	11,400	0	0
Amount (out of interest received) ordered by the Council to be added to Principal	900	0	0	Also £900, from interest, included in Loan C	900	0	0
Further Amount (out of interest received) ordered by the Council to be added to Principal...	700	0	0	Cash in Bank awaiting investment ...	700	0	0
	£13,000	0	0		£13,000	0	0

February 28th, 1899.
Audited and found correct.

HUGH DIXSON,
E. G. W. PALMER, } Auditors.

P. N. TREBECK, Hon. Treasurer.

WEDNESDAY, MARCH 29TH, 1899.

The Ordinary Monthly Meeting of the Society was held at the Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesday evening, March 29th, 1899.

Professor Wilson, M.B., Ch.M., Vice-President, in the Chair.

DONATIONS.

(Received since the Meeting in November, 1898.)

Department of Agriculture, Brisbane—Annual Report for the Year 1897-8: Queensland Agricultural Journal. Vol. iii. Part 6 (Dec., 1898); Vol. iv. Parts 1-3 (Jan.-March, 1899). *From the Secretary for Agriculture.*

Geological Survey of Queensland—Report on the Mesozoic Coal Measures of Stanwell and Associated Formations (1898). By B. Dunstan, F.G.S. *From the Director.*

Royal Society of Queensland—Proceedings. Vol. xiv. (1899). *From the Society.*

Three Botanical Pamphlets (from Queensland Agric. Journ. Vol. iii. Parts 3-5: Sept.-Nov., 1898). By F. M. Bailey, F.L.S. *From the Author.*

Australian Museum, Sydney—Memoir iii. The Atoll of Funafuti. Part 7 (March, 1899). *From the Trustees.*

Department of Mines and Agriculture, Sydney—Agricultural Gazette of New South Wales. Vol. xi. Part 12, with T.p. and Index (Dec., 1898); Vol. xii. Parts 1-2 (Jan.-Feb., 1899): Records of the Geological Survey of New South Wales. Title-page and Index to Vol. v. (1898); Vol. vi. Part 1 (1898). *From the Hon. the Minister for Mines and Agriculture.*

Department of Public Health, Sydney—Report on Protective Inoculation against Tick Fever (1898). By F. Tidswell, M.B., Ch.M. : Pamphlet (Aust. Assoc. Adv. of Science, Sydney, 1898). By F. Tidswell, M.B., Ch.M. *From the Author.*

New South Wales Sea Fisheries—Report upon Trawling Operations off the Coast of New South Wales, between the Manning River and Jervis Bay, carried on by H M.C.S. "Thetis," under the Direction of Frank Farnell, Esq., M.P., together with Scientific Report on the Fishes by E. R. Waite, F.L.S. *From the Government Printer.*

Pamphlet: On Modifications in Form and Ornament of the Australian Aboriginal Weapon the Lil-Lil or Woggara, &c. (4to. 1897). By R. Etheridge, Junr. *From the Author.*

Royal Society of New South Wales—Abstract of Proceedings, December 7th, 1898. *From the Society.*

The Surveyor, Sydney. Vol. xi. No 12 (Dec., 1898); Vol. xii. Nos. 1-3 (Jan.-March, 1899). *From the Editor.*

Sydney Observatory—Records No. 150 (Results of Rain, River and Evaporation Observations made in New South Wales during 1899). By H. C. Russell, B.A., C.M.G., F.R.S. : No. 152 (Current Papers, No. 3). By H. C. Russell, B.A., C.M.G., F.R.S. *From the Director.*

Australasian Journal of Pharmacy, Melbourne. Vol. xiii. No. 156 (Dec., 1898) ; Vol. xiv. Nos. 157-159 (Jan.-March, 1899). *From the Editor.*

Field Naturalists' Club of Victoria—Victorian Naturalist. Vol. xv. Nos. 8-11 (Dec., 1898-March, 1899). *From the Club.*

Gordon Technical College, Geelong—The Wombat. Vol. iv. No. 1 (Nov., 1898). *From the College.*

Royal Society of Victoria—Proceedings. New Series. Vol. xi. Part ii. (1899). *From the Society.*

Public Library, Museum, &c., Adelaide, S.A.—Report of the Board of Governors for 1897-98. *From the Trustees.*

Royal Society of South Australia, S.A.—Transactions. Vol. xxii. Part ii. (Dec., 1898). *From the Society.*

Woods and Forests Department, Adelaide—Annual Progress Report for the Year 1897-98. *From W. Gill, Esq., F.L.S., Conservator of Forests.*

Canadian Institute, Toronto — Proceedings. New Series. Vol. i. Parts 3 and 6 (Sept. and Nov., 1898). *From the Institute.*

Geological Survey of Canada—Annual Report. New Series. Vol. ix (1896): Contributions to Canadian Palæontology. Vol. i. Part v. (1898). *From the Director.*

Royal Society of Canada — Proceedings and Transactions. Second Series. Vol. iii. (1897). *From the Society.*

Academy of Natural Sciences of Philadelphia—Proceedings, 1898. Part i. *From the Academy.*

American Academy of Arts and Sciences, Boston—Proceedings. Vol. xxxiii. Nos. 13-27 (March-July, 1898); Vol. xxxiv. No. 1 (Aug., 1898). *From the Academy.*

American Geographical Society, New York — Bulletin. Vol. xxx. Nos. 4-5 (1898). *From the Society.*

American Museum of Natural History, New York—Bulletin. Vol. x. Article iv. (pp. 51-59: March, 1898): Art. xi.-xii. (pp. 169-233: June, 1898); Art. xv.-xvi. (pp. 299-352: Aug.-Sept., 1898); Art. xviii.-xix. (pp. 449-464: Nov., 1898); Vol. xi. Part 1 (June, 1898): Memoirs. Vol. i. Part iii. (April, 1898); Vol. ii. Anthropology i. (June, 1898): Annual Report for the Year 1897. *From the Museum.*

American Naturalist. Vol. xxxii. Nos. 383-384 (Nov.-Dec., 1898); Vol. xxxiii. Nos. 385-386 (Jan.-Feb., 1899). *From the Editor.*

American Philosophical Society, Philadelphia—Proceedings. Vol. xxxvii. No. 157 (July, 1898. *From the Society.*

Boston Society of Natural History—Proceedings. Vol. xxviii. Nos. 8-12 (pp. 237-332: June-July, 1898). *From the Society.*

Botanical Society of America—Presidential Address, Aug. 19th, 1898. By J. M. Coulter, Ph.D. *From the Society.*

Buffalo Society of Natural Sciences—Bulletin. Vol. v. Nos. 1-5 (1886-97); Vol. vi. No. 1 (1898). *From the Society.*

Cincinnati Society of Natural History—Journal. Vol. xix. No. 4 (July, 1898). *From the Society.*

Field Columbian Museum, Chicago—Anthropological Series. Vol. ii. No. 3 (July, 1898). *From the Museum.*

Johns Hopkins University, Baltimore—Hospital Bulletin. Vol. ix. Nos. 90-92 (Sept.-Nov., 1898): University Circulars. Vol. xviii. Nos. 137-138 (Nov.-Dec., 1898). *From the University.*

Kansas University, Lawrence—Kansas University Quarterly. Series A. Vol. vii. No. 4 (Oct., 1898). *From the University.*

Museum of Comparative Zoology, Harvard College, Cambridge, Mass.—Annual Report of the Curator for 1897-98. *From the Director.*

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CONTRIBUTIONS TO THE MORPHOLOGY AND DEVELOPMENT OF THE FEMALE UROGENITAL ORGANS IN THE MARSUPIALIA.

I. On the Female Urogenital Organs of Perameles, with an Account of the Phenomena of Parturition.

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(Plates i.-xii.)

Introduction.

The present paper, forming the first of a series of papers I hope to contribute on the above subject, deals with the anatomy of the female urogenital organs in the genus *Perameles*. These present features of exceptional interest and importance, not only structurally, but also in relation to the act of parturition, and form a most excellent starting point from which to discuss the comparative morphology of the urogenital organs in the Marsupialia. In this present paper, however, I do not purpose entering into an extended discussion of this subject, but content myself with giving a fairly extended account of the adult structural condition of the organs, together with an account of the main phenomena connected with the act of parturition. The material at my disposal has consisted of a large number of sets of the female genital organs of either *P. nasuta* or *P. obesula*. Doubtless a careful comparison of the genital organs of these two species would reveal the presence of minute differences between them, but such, if present, may from the point of view of this research, be disregarded. In the literature of the subject, I can find only two references to the condition of the genital organs in *Perameles*. The first is a short account by Owen (**1**, p. 683) of the organs in *P. obesula*. His account is as follows:—"In *Perameles obesula* the uteri are wider in proportion to their length than in the Kangaroos. Each communicates with a vagina, expanding into a cæcum with semitransparent walls and greatly surpassing the uteri in size: the cæcum suddenly contract near the ora tincæ, to form long and slender vaginal canals which converge but terminate separately near the vulva. The urethra is of corresponding length and tenuity; its orifice is near those of the vagina, the urogenital passage having the least extent in this genus of *Marsupialia*." It may be noted that in this account no mention is made of a median vaginal apparatus. The second reference is contained in a short paper by Alix (2) entitled "Sur les organes de la parturition chez les Marsupiaux" and published in 1879. After remarking that he had several times confirmed his previous observation of the open condition of the median vaginal apparatus in *Halmaturus bennettii*, he goes on to say, "mais d'autre part je n'ai pas trouvé de communication entre le vagin médian et le vestibule urogénital soit sur le Sarigue, soit sur le Péramèle," a statement which certainly shows that Alix had recognised the presence of a median vagina in *Perameles*. At the time of writing an account of the process of parturition in my paper on the placentation of *Perameles* (3) I overlooked the above statement of Alix and misinterpreted the median vaginal canals as posterior prolongations of the uteri, an error which I trust will be sufficiently corrected in the present communication.

General Account of the Genital Organs.

In *Perameles* the female genital organs consist of the following parts—two ovaries, two oviducts, two uteri, two vaginæ (including the two lateral vaginal canals, with their cæca and a median vaginal apparatus), a urogenital sinus containing the clitoris and opening into the cloaca. The most distinctive feature of the urogenital organs of this form consists in the fact that the lateral vaginal canals and the urethra lie imbedded throughout their entire extent in an elongated mass of connective tissue (Plate i., fig. 1, *u s.*), to which I gave in a previous paper the name of urino- or better uro-genital strand, and which is developmentally none other than the persistent genital cord of the fœtus. Owing to the very considerable length of the urogenital strand, the various structures connected with its anterior end, viz., the bladder, the uteri and their appendages, and the vaginal cæca, are situated in the abdominal cavity well in front of the anterior end of the pubic symphysis. The strand itself is the only portion of the urogenital organs which lies in the proper pelvic cavity. At its posterior end, at the hinder margin of the pubic symphysis, the strand becomes continuous with the rounded thick mass in which the urogenital sinus and cloaca are situated. At the anterior end of the strand the urethra, occupying its mid-ventral line, expands into the bladder, while the lateral vaginal canals, occupying the dorso-lateral regions of the strand, are produced forwards into two large thin-walled outgrowths,—the vaginal cæca,—separated from each other by a common partition wall (Plate i., fig. 1, *vag.c.*), and lying immediately dorsal of the bladder, between it and the uteri. The posterior ends of the latter, as well as the median vaginæ, lie imbedded dorsally in the connective tissue at the anterior end of the strand. In Plate i., fig. 1, the urogenital organs are represented as viewed from the dorsal aspect. The apex of the bladder (*bl.*) is just visible below the enormous bilobed vaginal cæca (*vag.c.*). Each of the latter is seen to contract posteriorly and to pass back as the lateral vaginal canal (*l.vag.c.*) in the urogenital strand (*u.s.*). Dorsally to the vaginal cæca the two uteri (*ut.*) lie side by side. Their contracted posterior ends—uterine necks (*ut.n.*)—pass back to become imbedded together with the median vaginæ in the connective tissue of the anterior end of the urogenital strand. In the figure the rectum (*rect.*) and the cloaca (*cl.*) are shown opened up, exposing the opening of the urogenital sinus (*o.u.s.*) into the latter.

Peritoneal Relations of the Urogenital Organs.

When the peritoneum covering the ventral face of the rectum is traced back, it is found to leave the surface of the latter and to be reflected forwards on to the dorsal surface of the urogenital strand, just posterior to the anterior end of the pubic symphysis. The peritoneal pocket thus formed, corresponds to the rectouterine cul-de-sac or *pouch of Douglas* of human anatomists. The reflected peritoneum continues forwards on the dorsal surface of the urogenital strand up to about the middle of the uterine necks. At this level it is reflected from the uteri as a free peritoneal fold or duplication, which passes forwards about as far as the level of the anterior ends of the uteri, and whose free and lunated margin at that level lies in contact with the ventral aspect of the rectum. This fold separates the uteri from the rectum and forms the roof of a fair-sized pouch, which we may term the *dorsal uterine fossa.* In fig. 1 the fold has been removed in order to better expose the uterine necks. Into the fossa open the apertures of the peritoneal pouches enclosing the ovaries and fimbriated openings of the Fallopian tubes. Laterally the fold becomes continuous with the morphologically dorsal (mesially directed) surface of the broad ligament along a line parallel with and just ventral to the ureter, which runs backwards in the latter, and is continued forwards on each side of the rectum as a fold, continuous laterally with the reflection of the broad ligament, and carrying in its substance the ureter and the ovarian artery and vein.

The *broad ligament* is reflected from the lateral side of each uterus, and contains between its two layers the Fallopian tubes, ovaries and uteri. Dorsally to each uterus it forms a definite ovario-peritoneal pouch, in which are situated the corresponding ovary and the fimbriated opening of the Fallopian tube. Each ovarian pouch opens into the dorsal uterine fossa by a wide postero-mesially directed opening.

In *Perameles* and Marsupials generally, the Fallopian tube does not occupy the anterior free margin of the broad ligament but is situated some distance behind that margin as, *e.g.*, is the case in the Rabbit amongst higher mammals. These portions of the broad ligaments situated anteriorly to the Fallopian tubes are confluent in the mid-line between the anterior free portions of the uteri, and form a fold connecting them together. Brass (**4**) has termed this the "Ligamentum uterorum superius," without apparently appreciating its real nature.

The broad ligament after being joined by the above-mentioned free fold forming the roof of the dorsal uterine fossa, passes almost vertically upwards to become continuous dorsally with the parietal peritoneum. A duplication of it, however, forming the *utero-pelvic fold* of the broad ligament (Plate i., fig. 1, *ut.p.f.*) passes outwards and slightly forwards to join the parietal peritoneum dorso-laterally. The posterior free margin of this utero-pelvic fold is traversed by a well-defined thick band of a white colour—the *round ligament* of the uterus (fig. 1, *rd. lig.*). This contains smooth muscle fibres and fibrous tissue, and takes its origin from the lateral aspect of the anterior end of each uterus, shortly behind the junction of the Fallopian tube with the latter. It runs obliquely outwards, and on reaching the body wall bends back towards the region of the epigastric artery, where it is apparently lost. The round ligament may reach a length in *Perameles* of 2·3 cm., and a breadth of 1·5 mm. In *Macropus*, I find the round ligament is proportionately much smaller and much less conspicuous than it is in *Perameles*.

So far as I am aware the round ligament of the uterus has not previously been described in any Marsupial. In the Descriptive Catalogue of the Royal College of Surgeons' Museum (**5**), under the description of preparation 2740 (female organs of Kangaroo, *M. major*), occurs the following statement (p. 156): "the round or ovarian ligament may be seen extending from the ovary to the side of the uterus, upon which it is lost." But the true round ligament extends from the uterus, not from the ovary, and both in *Perameles* and in *M. major* is quite distinct from the proper ovarian ligament, even though situated almost directly under the latter.

Posteriorly the broad ligament extends back on each side, over the base of the vaginal caecum, to be continued as a peritoneal fold reflected from each side of the urogenital strand to the pelvic wall. This urogenital fold extends back, of course, only as far the posterior end of the pouch of Douglas.

The bladder is connected with the ventral abdominal wall by a median fold, which extends almost up to its apex. Brass (**4**) terms this the "Ligamentum vesicæ medium." From each side of the bladder there passes down a low ridge-like fold representing the obliterated hypogastric artery, much more strongly developed in *Macropus*, which proximally conveys the vesical artery and vein from the urogenital fold to the bladder.

Vessels.

The vesical arteries arise together with the internal iliacs from the aorta. They (fig. 1, *ves.v.*) pass in the lateral urogenital fold of peritoneum to divide into branches supplying the bladder, the lateral aspects of the uteri and vaginal cæca and the urogenital strand. The vesical veins join the iliac veins just before they unite to form the inferior vena cava.

The spermatic (ovarian) arteries arise separately from the dorsal aorta, the right in front of the left. They pass back to supply the ovaries, Fallopian tubes and anterior ends of the uteri.

Ovaries.

The ovaries (Plate i., fig. 1. *ov.*) are usually compressed oval bodies, with, except in young females, grooved and tuberculated surfaces. The Graafian follicles are small and do not project prominently, while the corpora lutea, when present, form prominent swellings 2·5 to 3 mm. in diameter. The ovaries have a maximum length of about 6 mm., and a breadth of about 3·5 mm. As before mentioned, they lie enclosed together with the fimbriated openings of the Fallopian tubes in peritoneal pouches formed by the broad ligaments. The pouches lie dorsal to the uteri and open posteriorly by wide apertures into the dorsal uterine fossa. In the natural position of the parts, the ovary is situated in its peritoneal pouch about opposite the mid-region of the body of the uterus (either just above the dorso-lateral surface of the same or quite external to it) and almost immediately above the round ligament. Its long axis may be directed either transversely, longitudinally or obliquely, the direction of the axes of the ovaries even varying on the two sides of the same individual. Each ovary has a broad usually oblique attachment to a thickened area of the broad ligament just above the round ligament and projects into the peritoneal pouch dorso-laterally. It is attached to the uterus by a short posterior ovarian ligament which joins the uterus in close proximity to the point of origin of the round ligament from the same. From the anterior point of attachment of the ovary there passes off a delicate short ligament which enters the round ligament and represents the anterior ovarian ligament. This close association of the ovarian ligaments with the round ligament is interesting in view of the statement of Mihalkovics (**6**, p. 418) that "die Anlage des Eierstockbandes mit dem runden Gebärmutterbande einen proximal-distalwärts sich erstreckenden continuierlichen Strang bildet."

Fallopian Tubes.

Each is a greatly convoluted thin tube measuring as much as 4 cm. in length, and sharply marked off from the uterus. The greater part of the tube lies in the antero-dorsal wall of the peritoneal pouch, above the anterior end of each uterus. Its peritoneal opening, connected with the anterior end of the ovary by the *infundibulo-ovarian fimbria*, is markedly fimbriated and during life closely invests the ovary from above.

Uteri.

The uteri of *Perameles* are somewhat club-shaped in form, very much broader and thicker in front than behind, and also very much longer than wide (Plate i., fig. 1, *ut.* and *ut. n.*). Each consists of a swollen anterior portion forming what we may, for convenience of description, term the "body" of the uterus, *i.e.*, the portion in which the young undergo their development, and of a much narrower posterior portion, not sharply marked off from the former, which may be termed the "neck," and which opens posteriorly into one of the median vaginal cul-de-sacs. In the organs represented in fig. 1 the body of the uterus had a length of 9 mm. and a breadth of 5·5 mm., while the uterine necks (including the median vaginæ) measured 11 mm. in length and 3·5 mm. in conjoint breadth.

The two bodies of the uteri lie with their mesial surfaces in close apposition, surrounded by a common peritoneal layer, except anteriorly, where they are separate over a short part of their extent and connected by the common median portion of the ligamenta lata (the ligamentum uterorum superius of Brass). The "bodies" alone of the uteri are visible when, after pulling aside the vaginal cæca, the organs are examined from the ventral aspect. They lie dorsal to the posterior portions of the vaginal cæca and are connected posteriorly with the latter by a low median peritoneal fold. Viewed from the dorsal aspect (Plate i., fig. 1) the uteri are seen throughout their extent. In fig. 1 it will be noticed that the groove between the bodies of the uteri fades away at the commencement of the contracted necks which, except for a faint median line, appear to form externally a single tube about half the thickness of one of the uteri. The cavities of the uterine necks are separated from each other posteriorly by a common partition wall and each opens into a very short median vaginal cul-de-sac. The two cul-de-sacs, also separated by a common partition wall, externally appear to form the direct continuation of the uterine necks and are not in any way outwardly marked off from the latter. They form the extreme posterior end of the portion marked *ut.n.* in fig. 1. While the bodies of the uteri are only connected with the vaginal cæca by a low median fold, the uterine necks become closely united over their entire breadth with the dorsal surface of the latter. Posteriorly, however, the cæca rapidly decrease in size to pass directly over into the lateral vaginal canals, while the latter at the same time take a very slight outward bend, with the result that in this region the hinder sections of the uterine necks, together with the median vaginal cul-de-sacs, come to lie imbedded in the connective tissue enclosed between the upper ends of the lateral vaginal canals.

About on a level with the union of the uterine necks with the dorsal surface of the cæca, the fundus of the bladder likewise becomes united with their ventral surface so that all three parts are here united into a single mass (Plate ii., fig. 3, *ut.n.*, *vag.c.*, *bl.*).

In a previous paper (**3**, p. 389) I gave a short account of the histology of the normal uterus, and need only add here a few remarks on the uterine musculature. This is essentially composed of circularly running non-striate fibres. Along the attachment of the ligamentum latum, oblique strands of fibres are found extending in from the musculature of the ligament, while in the connecting bridge between the bodies of the uteri similar oblique strands pass between the circular muscle layers. In both places, together with these oblique strands, there occur irregularly distributed bundles of longitudinal fibres, but these do not extend round the dorsal and ventral surfaces of the uteri to form a continuous layer of longitudinal muscles.

Both Owen (**1**), and Brass (**4**) who describes the histology of the uterus of *Phascolomys wombat*, agree in stating that the musculature of the uterus consist of an outer longitudinal and an inner circular layer of fibres. In representatives of the following genera, *Petrogale*, *Acrobates*, *Petaurus*, *Sminthopsis*, *Peragale*, *Dasyurus*, *Macropus*, *Myrmecobius*, *Tarsipes* and *Phascolomys*, I find, however, that the uterine musculature has the same simple character as in *Perameles*; in all these forms the musculature is essentially a circular one. Even in *Phascolomys* where the bundles of longitudinal fibres are strongly developed on the lateral and mesial surfaces of the uteri, they do not form a continuous layer all round the uterus.

This fact that the musculature of the uterus in Marsupials is esentially a circular one is a point of some little interest and has not, so far as I am aware, been emphasised. Sobotta (**7**) has shown that the proper fundamental musculature of the uterus is the circular layer which primitively forms the muscular investment of Müller's duct. The layer of longitudinal muscles and the intermediate layer carrying blood vessels are only differentiated later and reach a very varying degree of development in different mammals. Where then, as in Marsupials, we find continuous longitudinal and intermediate layers absent and the uterine musculature essentially composed of circularly running fibres, we can only regard the condition as a primitive one and as a mark of lowly organisation.

Vaginæ.

Vaginal cæca.—Posteriorly, as has been described above, the vaginal cæca are closely united to the uterine necks above and to the fundus of the bladder below, but anteriorly they become quite free and form a large bilobed sac (up to 4·5 cm. in length) with thin semi-transparent walls lying between the uteri above and the bladder below, and greatly exceeding either in size (Plate i., figs. 1 and 2, *vag.c.*). The cæca are separated from each other by a common median partition wall and each is directly continuous behind with the corresponding lateral vaginal canal, of which it simply forms a forward expansion. The cæca are lined by a layer of columnar epithelium which has usually a ridged appearance in surface view (fig. 2, *vag.c.*).

The vaginal cæca function as receptacula seminis. Of this I have been able to satisfy myself through the capture of a female specimen of *P. obesula* apparently just after an act of coitus. The uteri were slightly enlarged and congested, while the cæca were greatly dilated and filled by a clear viscid semifluid material together with masses of hard, opaque, caseous-looking substance of an albuminous nature. Microscopic examination of the viscid material revealed the presence of abundant spermatozoa with somewhat oblong heads pointed anteriorly and measuring ·005 mm. in length by ·002 mm. in breadth, and with tails averaging ·15 mm. in length (*cf.* **8**, p. 312). Usually the cæca contain only the hard, opaque material which is essentially similar to the "inspissated secretion commonly present both in the cul-de-sac and the lateral vaginal canals" of Macropus according to Owen (**8**) and noted by various observers from Home (**14**) onwards. According to Owen (**9**) these masses "most resemble those coagulated masses that are found in the vesiculæ seminales and sometimes in the urethra of the Agouti, Capromys, Guinea-pig and others of the Rodent order." Without doubt these hard masses are derived from the same source, viz., from the secretion accompanying the spermatozoa.

In certain species of Kangaroo Rats of the genus *Potorous* there are present, as described by Owen (**9**) and Brass (**4**), forward expansions of the vaginæ which form a large diverticulum situated between the bladder and the uteri, like the vaginal cæca of *Perameles*, and no doubt identical in function with the latter.

In *Macropus major*, Stirling (**10**) has shown that the lateral vaginal canals and the median vaginal canal act the part of seminal receptacles, and I also find that in *Trichosurus* and *Phascolarctus* the median vagina at the breeding season becomes much enlarged and is utilised for a similar purpose. In other cases where as in *Perameles* the median vaginal apparatus remains of small size, receptacula have been developed as forward outbulgings of the lateral vaginal canals. In *Peragale lagotis* vaginal cæca similar to those of *Perameles* occur, only they remain separate from each other, and such, Prof. W. B. Spencer informs me (*in litt.*), also occur in *Chœropus castanotis*.

Median Vaginal Cul-de-sacs and Associated Parts.

Here I propose to describe the condition and general relations of the median vagina in a young virgin female of *Perameles*, reserving the details of the changes consequent on parturition for a later section.

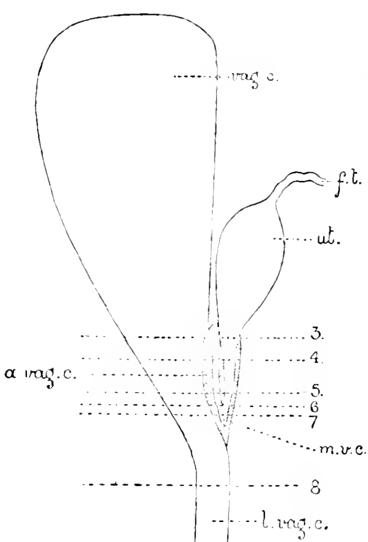

Fig. 1.

The accompanying text-fig. 1 is a diagrammatic lateral view of the anterior portion of the urogenital organs. The lines indicate the approximate positions of the sections through the genital organs of a virgin shown in figs. 3-8, Plates ii.-iv.

From the diagram it will be seen that the uterine neck continues back to open into a short terminal median vaginal cul-de-sac (*m.v.c.*). From the anterior end of this there arises ventrally a fine canal which passes forwards in the connective tissue ventral to the uterine neck to open into the vaginal cæcum. This fine canal, which throughout its entire extent is imbedded in connective tissue, represents the morphologically anterior portion of the lateral vaginal canal. We may now look at the structural relations of these various parts as seen in figs. 3-8.

In fig. 3, the uterine necks (*ut.n.*) separated by a common partition wall, the vaginal cæca (*vag.c.*) also separated by a common wall, and the bladder (*bl.*) are already united into a single mass. The section passes through the opening (*op.*) of the anterior portion of the lateral canal of one side into the cæcum, while the canal of the other side is seen in section in the common partition wall between the cæca. Fig. 4, thirty-seven sections behind fig. 3, shows the two canals (*a.vag.c.*) running back in the connective tissue of the wall between the vaginal cæca, which is at this level thicker than anteriorly. In other words, the vaginal cæca as they decrease in size at the same time bend slightly outwards. The uterine necks (*ut.n.*) are also smaller and now very distinctly invested by the surrounding connective tissue. In fig. 5, thirty-nine sections behind fig. 4, the vaginal cæca have passed over into the lateral vaginal canals (*l.vag.c.*), while the bladder has also passed over into the urethra (*ureth.*). The lateral vaginal canals are widely separated from each other, and passing in between them and the central mass of connective tissue are the ureters (*ur.*). The central mass of connective tissue encloses the uterine necks (*ut.n.*) and the anterior portions of the lateral canals (*a.vag.c.*) now somewhat larger and situated directly below the former. Fig. 6, thirty-eight sections behind fig. 5, shows the opening of the uterine neck of one side into the continuation of the canal, which we must now term the median vaginal cul-de sac (*m.v.c.*). On the other side the two are still separate (*ut.n.* and *a.vag c.*). Fig. 7, twenty-one sections behind fig. 6, shows the two median vaginal cul-de-sacs (*m.v.c.*) lying in the connective tissue between the lateral vaginal canals (*l.vag.c.*) and above the urethra (*ureth.*). They are separated by a common partition wall, and each is surrounded by a delicate layer of circular non-striate muscle fibres. Posteriorly, the vaginal cul-de-sacs gradually become smaller and finally end blindly and without opening into each other, twenty sections behind fig. 7. The cul-de-sacs end in a small cone-shaped mass of dense, deeply staining connective tissue seen in figs. 1 and 2 just behind the posterior end of the cul-de-sacs. This tissue is directly continuous with the thin strand (*c.t.*) lying between the lateral vaginal canals in fig. 8.

In fig. 2, Plate i., representing a dissection from the dorsal aspect of the anterior portion of the genital organs of a multipara, certain of the above described features are shown. The uteri have been opened up along their dorsal mid-lines and the dorsal walls of the median vaginæ have been removed. Each uterine neck (*ut.n.*) is seen to open by a scarcely projecting and ill-defined os into the corresponding vaginal cul-de-sac (*m.v.c.*). At the anterior ventral end of the left cul-de-sac is seen a deep depression (*x*) marking the point of origin of the anterior portion of the lateral canal. The course of the latter forwards in the connective tissue below the uterine neck is not visible externally, but the dorsal wall of the left vaginal cæcum has been removed to show its crescentic opening (*op.*) on the common partition wall.

It is thus evident that *Perameles* possesses a median vaginal apparatus which in the virgin consists like that of, *e.g.*, *Dasyurus* and *Phascolarctus*, of two separate cul-de-sacs. But whereas in these two forms the cul-de-sacs are of some size and approach posteriorly to within a comparatively short distance from the opening of the lateral vaginæ into the urogenital sinus, in *Perameles* the cul-de-sacs are small structures which terminate at a relatively very great distance from that sinus.

Ureters, Urogenital Sinus, &c.

Ureters.—The ureters enter the anterior end of the urogenital strand between the posterior portion of the uterine necks and the lateral vaginal canals (Plate iii., fig. 5, *ur.*) and pass forwards (fig. 4, *ur.*) to open into the bladder shortly above its base and close to its dorso-mesial line.

Urogenital Strand.—This, as already defined, is the name given to the elongated mass of connective tissue containing imbedded in it, the lateral vaginal canals throughout their entire extent, the urethra and anteriorly the uterine necks and median vaginal cul-de-sacs. In large specimens it may reach a length of as much as 6 cm., and a breadth of 6 mm. Its average length (from the posterior end of the median vaginæ to the urogenital sinus) is between 3 and 4 cms., with a breadth of 4-5 mm.

Fig. 8 represents a transverse section through the mid-region of the urogenital strand of the virgin above referred to. The median ventral portion of the strand is occupied by the urethra (*ureth.*), while the lateral vaginal canals (*l.vag.c.*) pass along in it dorso-laterally. The three ducts lie imbedded in the connective tissue of the strand, and strands of the same separate them from each other. Lying peripherally in the connective tissue and surrounding the three ducts is a very thin layer of involuntary muscle. I would direct special attention to the narrow strand of connective tissue separating the lateral vaginal canals, for it is here that the cleft-like pseudo-vaginal passage (**3**, p. 452) is found to occur after parturition has been effected, but in this strand in the virgin, indeed prior to the first parturition, "there is no trace of a median vaginal passage or any epithelial or other track which might indicate the site of a future passage of any kind whatever" (*loc. cit.* p. 429). The strand in question, as was above mentioned, is directly continuous with the deeper-staining mass of connective tissue situated around and just posterior to the ends of the median vaginal cul-de-sacs.

The lateral vaginal canals present a uniform structure throughout their course. They are lined by a mucous membrane consisting of dense connective tissue, clothed by a layer of columnar epithelium. External to the mucous membrane is a layer of non-striate muscle of no great thickness. The mucosa is thrown into distinct longitudinal ridges. At its posterior end the urogenital strand becomes continuous with the rounded mass in which the urogenital sinus and cloaca are situated.

Urogenital Sinus.—The urogenital sinus is a short and narrow chamber with a length of 4-7 mm., having as Owen pointed out (**1**, p. 683) "the least extent in this genus of Marsupialia." It opens on the ventral wall of the cloaca by a small aperture (Plate i., fig. 1, *o.u.s.*), situated from 3·5 to 5 mm. within the margin of the cloacal opening. Its lining is thrown into longitudinal ridges. The vaginal canals open together into its anterior end dorsally, while a short distance posteriorly the urethra opens on its floor under a slight median papilla. Also situated on the floor of the sinus some distance behind the urethral opening is the small clitoris. It lies in a distinct longitudinal depression, just within the margin of the opening of the sinus, and is bounded by lateral preputial folds which may be continued beyond the margin of the opening. In form the clitoris is bluntly cone-shaped, and measures from 1·5 to 2 mm. in length by about 1 mm. in greatest breadth. It is attached over its whole extent, though exceptionally its apex may be free and slightly bifid. It is stated by Owen and Brass that where the glans penis is bifurcate in the male, in the female the clitoris is likewise bifid, but this statement does not hold for *Perameles*.

I am unable to discover any reference in the literature to the minute structure of the clitoris in Marsupials: the following facts may therefore be of interest. Shortly in front of the clitoris two ducts leave the floor of the urogenital sinus and run back in the ventral wall of the latter to enter the clitoris proper. The lumina of these canals may be continuous or interrupted, or the ducts may even be entirely solid in different females. They run back enclosed below by a horse-shoe-shaped band of erectile tissue. Posteriorly, towards its apex, the clitoris is divided into two halves by a median septum (Plate v., fig. 9, *m.s.*) each half containing one of the canals below which is a horse-shoe-shaped mass of erectile tissue (*e.t.*). Eventually the canals open on the surface of the organ shortly behind its apex (fig. 9, *c.d.*).

In view of the above, it is interesting to note that according to Owen (**8**, p. 312) "in the *Perameles lagotis* not only is the glans [penis] bifurcate, but each division is perforated and the urethral canal is divided by a vertical septum for about half an inch before it reaches the forked glans."

There open into the dorsal corners of the urogenital sinus, slightly behind the opening of the urethra, the ducts of two large branching alveolar glands with muscular and fibrous trabeculæ. The glands somewhat resemble the human prostate gland and are not sharply marked off from each other. They lie partly imbedded in the voluntary musculature investing the posterior end of the urogenital strand, ventro-laterally to the urethra.

Cloaca.—The cloaca is a fairly large chamber having in large specimens a maximum depth of 9 mm. In some cases it is distinctly marked off from the rectum by the fact that the ridges of the latter terminate abruptly at the point of junction of the two, but in other cases the limit is not so well defined. The lining of the cloaca may be comparatively smooth, or in other cases thrown into ridges. In its wall is the large cloacal sphincter muscle. Imbedded ventro-laterally in the latter are two large oval so-called anal glands. A fine duct passes from the posterior end of each gland to open into the cloaca by a small aperture on its ventral wall some distance within the margin of the opening. Each gland is invested by a layer of non-striate muscle fibres, and in section presents a sponge-like appearance consisting of a large central lumen from which come off numerous glandular alveoli. There also occur in the walls of the cloaca numbers of branched tubular glands.

Parturition.

In my previous paper on the Placentation of *Perameles*, I described the condition of the genital organs in an immediately post-partum stage of *P. nasuta*, and showed conclusively that the young reached the exterior by way of a median cleft-like passage —which I termed the median pseudo-vaginal passage—situated in the connective tissue between the lateral vaginal canals. At the time of writing the above paper, however, I misinterpreted what is herein described as the common median vagina as "a posterior common portion of the two uteri (common uterine canal)" and hence came to the erroneous conclusion that the median pseudo-vaginal passage "has no connection whatever with the lateral canals" and regarded the apparently anomalous mode of birth in *Perameles* as seeming "to be without parallel in the whole mammalian class." As regards the first point, I shall show in the present account that in reality the pseudo-vaginal passage leads away from the posterior ends of the united median vaginal cul-de-sacs which themselves arise as outgrowths of the Müllerian ducts at the junction of their uterine and vaginal sections; while as regards the second, I hope to bring forward sufficient evidence to show that the mode of birth in *Perameles* must be almost exactly paralleled by the parturition phenomena seen in those Marsupials which like *Perameles* give birth to the young through a direct median passage.

If for the expression "common uterine canal" the reader substitute "common median vagina," the main facts in my previous short account of the parturition phenomena remain substantially correct.

The following account is based on the examination in serial sections of the female urogenital organs of nine specimens of *Perameles*, some of which were shortly described in my previous paper.

The specimens include the following :—

i. *P. nasuta*, with two new-born young. (Stage E of previous paper).

ii. *P. obesula*, with two 17·5 mm. young in pouch.

iii. *P. obesula*, with two 22 mm. young in pouch. (Stage F of previous paper).

iv. *P. obesula*, with four 3·7 cm. young.

v. *P. obesula*, with several 4 cm. young.

vi. *P. nasuta* (?), bred.

vii. *P. nasuta*, with early blastocyst in uterus. (Stage A of previous paper).

viii. *P. obesula*, with blastodermic vescicle in uterus. (Stage B of previous paper).

ix. *P. obesula*, with two 12·5 mm. young in uteri.

Description of Specimens i.-ix.

i. *P. nasuta* with two new-born young (g.l. 14 mm.).

The genital organs of this specimen were described in my previous paper (p. 425 *et seq.*, and fig. 25, Plate 32). The allantoic stalks, one from each uterus, were shown to extend down from the placental areas, not into the lateral vaginal canals but into a cleft-like passage,—the median pseudo-vaginal passage—for a distance of about 3 cm. The allantoic stalks were already in process of histological degeneration, the cells appearing mostly as clear spaces with nuclei staining deeply and homogeneously, and often irregular in shape.

A section through the urogenital strand is figured on Plate 33, fig. 35, and shows the two degenerating allantoic stalks in position in the cleft-like passage in the connective tissue between the lateral vaginal canals. The walls of the pseudo-vaginal passage "are entirely formed by the connective tissue core of the strand and they exhibit no histological differentiation into coats, muscular or other" (p. 427). Masses of coagulated blood were present in the passage and extravasated blood was also abundantly present in the surrounding connective tissue, the whole appearance of the passage and its surroundings strongly suggesting that an extensive rupture of the connective tissue and its contained vessels had taken place along the line of passage of the embryo, *i.e.*, the pseudo-vaginal passage.

ii. *P. obesula*, with two 17·5 mm. young in pouch.

Sections through the uterus show that the mucosa has almost regained its normal condition. The uterine epithelium forms a complete layer of low cubical cells. The cavity of the uterus contains a cellular detritus containing leucocytes and red blood corpuscles. In sections through the mid-portion of one of the uteri, two allantoic stalks are present, but disappear further back. They have evidently been broken across, for they reappear, curiously enough, in the cavity of one of the vaginal caeca, and from there pass down through the anterior forwardly directed portion of the lateral canal into the median vaginal canal. The neck portions of the uteri continue back as described for the virgin, and open eventually into the median vaginal canals. Their lining is greatly folded, and the lumen of each is largely occupied by a cellular detritus. As in the virgin, the posterior portions of the uterine necks and the median vaginæ lie imbedded in the connective tissue between the slightly bent upper ends of the lateral vaginal canals. From the anterior ventral end of each median vaginal canal there passes forwards in the connective tissue underlying the uterine necks, the duct-like anterior portion of the lateral canal to open into the corresponding vaginal caecum. The canals are now very much larger than in the virgin before described, and in one of them pass down the ruptured allantoic stalks to enter the median vaginal canal of the same side.

The two median vaginal canals continue on for some distance as laterally compressed canals separated by a common partition wall, the one containing two allantoic stalks and a cellular detritus, the other the detritus alone (Plate v., fig. 10, *m.v.c.* and *all.s.*).

Eventually, through the disappearance of the middle portion of the common partition wall, the two canals open into each other. The dorsal and ventral portions of the common wall rapidly diminish in size posteriorly and finally disappear, so that we have eventually in place of two separate canals, a single median canal,—the median vagina,—formed, as we have seen, by the union posteriorly of the two vaginal cul-de-sacs. Fig. 11, Plate vi., represents a section through the common median vagina (*c.m.v.*), and in it are plainly visible the sections of the two allantoic stalks (*all.s.*) surrounded by detritus. Posterior to the level of this section the common median vagina rapidly diminishes in size, it loses its thin muscular layer and finally its epithelial lining disappears on its lower side, thus allowing the two allantoic stalks to come into contact with the surrounding connective tissue (fig. 12, *all.s.* and *c.m.v.*). As the sections are traced back, the common median vagina disappears completely, and the allantoic stalks are left stranded in what is simply a mere rounded space—the pseudo-vaginal passage,—in the deeply staining dense mass of connective tissue surrounding the posterior end of the former, and situated between the lateral vaginal canals and above the urethra. The stalks extend back in the pseudo-vaginal passage, surrounded by dense connective tissue, over certainly one-third of the length of the urogenital strand. Posteriorly they are looped upon themselves, and some distance before they disappear come to lie quite free in a large cleft occupying almost the entire area between the urethra below and the lateral vaginal canals at the sides. They extend altogether through over six hundred sections of medium thickness, behind the posterior end of the common median vagina. The stalks measure in diameter ·36 mm. by ·26 mm. They are greatly degenerate, presenting a reticulate appearance, with deeply staining small fragmentary nuclei in the meshes. The positions of the allantoic vessels are just recognisable in some sections. The two stalks lie close together, but not in contact, since they are separated by a thin layer of connective tissue, which also forms a common adventitious sheath around them. And not only are the stalks invested and separated by connective tissue, but connective tissue corpuscles have now definitely invaded the degenerate tissue of the stalks. Posteriorly the stalks are found to have been infiltrated by maternal blood, but this is the only specimen in which I have found blood clots in such a position. The extravasted blood so abundantly present in and around the pseudo-vaginal passage of the previous specimen has now almost entirely disappeared.

Beyond the points of termination of the two stalks, the pseudo-vaginal passage can be traced on right up to near the point of opening of the lateral canals into the urogenital sinus. In the extreme posterior part of its course the passage is a much less definite one, consisting merely of a series of irregular clefts. Serial sections passing through the junction of the urogenital strand with the sinus fail to reveal the presence of any interruption in the lining of the latter. I am, therefore, unable to state definitely the actual position of the aperture by means of which the young reach the urogenital sinus.

That the present female had born young on at least one previous occasion, the following facts almost certainly demonstrate.

Towards the extreme posterior end of the common median vagina, just dorsal to the deeply staining mass of connective tissue enclosing the pseudo-vaginal passage with its two allantoic stalks, occurs a definite small triangular cleft. This can be traced posteriorly for a considerable distance, when it enlarges and opens into the above-described pseudo-vaginal passage containing the allantoic stalks. This cleft I regard as the pseudo-vaginal passage of a previous parturition, and this view is strengthened by the occurrence just below it of fragments of allantoic stalks incorporated in the connective tissue. These remnants are recognisable by their staining lighter than the surrounding dense connective tissue, by their reticulate fibrous appearance and by the presence in them of small spindle-shaped nuclei showing in places a distinct tendency to concentric arrangement.

A less altered remnant of a stalk which is not yet so definitely incorporated in the surrounding tissue, also occurs laterally to the pseudo-vaginal passage, and may belong to a later parturition than the above-described remnants. Both sets are traceable through a considerable number of sections. In the description of certain of the remaining specimens, similar persisting remnants of allantoic stalks will be shown to exist, and in such a condition as to necessitate the reforming of the pseudo-vaginal passage, over at least part of its extent, as has apparently been the case in the female under consideration.

The present specimen, then, shows us that after parturition is completed, the median vaginal cul-de-sacs open into each other posteriorly to form a short median epithelially lined canal—the common median vagina,—from the end of which there leads away the non-epithelially lined cleft-like pseudo-vaginal passage, in this stage definitely continuous with the common median vagina but with its opening into the urogenital sinus no longer recognisable.

iii. *P. obesula*, with two 22 mm. young in pouch. (Stage F of previous paper).

The genital organs of this specimen have already been described in my previous paper (pp. 431-2), but without figures. For completeness I here reproduce the main points in my previous description in explanation of figs. 13, 14 and 15.

Fig. 13 represents a section through the common median vagina shortly after the point of union of the two canals. It contains here an irregular detritus, but further back contains fragments of what are apparently greatly degenerated broken-up portions of allantoic stalks. Its lumen becomes continuous ventrally with that of the pseudo-vaginal passage, in which there almost immediately appear the sections of three allantoic stalks, a larger and more degenerate one measuring ·4 mm. by ·3 mm. in diameter and two smaller ones, each ·2 mm. in diameter (fig. 14, *all.s.*) As the genital organs reached me with only two young, it may be that the larger stalk has persisted from a previous parturition. These three persistent stalks completely occupy the lumen of the passage (fig. 14). They are closely surrounded by a loose connective tissue sheath derived from the surrounding tissue, and strands of the same pass in between and separate the stalks. They are here in a more degenerate condition than in the preceding specimen; the larger one has undergone marked fibrous degeneration, and into all three connective tissue corpuscles have penetrated. Fig. 15 represents a section through the urogenital strand behind the terminations of the allantoic stalks and shows very clearly the cleft-like nature of the pseudo-vaginal passage, here containing a detritus of red blood corpuscles and cellular elements.

The urogenital sinus and cloaca were not available for examination.

iv. *P. obesula*, with four 3·7 cm. young.

The two median vaginal canals, each with a greatly folded lining, continue back and eventually open into each other to form the here extremely short common median vagina, which extends through only four sections as compared with one hundred and thirty-one in specimen ii.

There is now no trace of allantoic stalks in any part of the median vaginal apparatus. The lumen of the median vagina must now be described as ending blindly, since the greatly degenerate and irregular remains of allantoic stalks which appear in the connective tissue forming its direct continuation can only be described as forming an integral part of the same, so closely are they interpenetrated and surrounded by it. (Plate xii., fig. 16, *all.s.*) As sections are traced posteriorly, the stalks become more distinct and easily recognisable, but vary greatly in size, in shape and in character. Surrounded and invested as they are by connective tissue, which is now definitely intergrown with the degenerate tissue of the stalks, they completely block the lumen of the pseudo-vaginal passage. The tissue of the stalks is now quite fibrosed and is invaded by large numbers of connective tissue corpuscles. These are often found aggregated into groups occupying what were originally the cavities of the allantoic vessels, and, with or without such groups as a centre, other corpuscles are found to have taken on a definite concentric arrangement.

Behind the terminations of the stalks, the pseudo-vaginal passage can be traced back into the terminal part of the urogenital strand, situated in the rounded mass enclosing the urogenital sinus and cloaca, but here it narrows and finally disappears some two hundred and fifty sections in front of the anterior end of the sinus. In these sections the connective tissue in the direct line of continuation of the passage is perfectly uniform in character, and exhibits not the faintest indication of the previous existence in it of the cleft by way of which the young reached the exterior.

v. *P. obesula*, with several 4 cm. young.

Only portions of the urogenital strand and the urogenital sinus were examined in this specimen.

Sections through the anterior portion of the urogenital strand reveal features very similar to those described for the preceding specimen. In fig. 17 the greatly degenerate remnants of the allantoic stalks (*all.s.*) are seen to almost completely block up the pseudo-vaginal passage. They are closely surrounded and interpenetrated by connective tissue and in places appear to be directly invaded by ingrowths of the latter. Posteriorly the passage appears as a long, narrow, empty cleft. In this specimen the cleft can be traced back into the fold separating the openings of the lateral canals into the sinus, but it fades away without reaching the lining of the latter. No trace of the opening into the sinus is perceptible.

vi. *P. nasuta* (?); no history, but from the condition of the genital organs evidently a multipara.

As is usual in multiparous specimens, the two median vaginal canals unite posteriorly to form a short common canal (fig. 18, *c.m.v.*) which ends somewhat abruptly. In the connective tissue, just behind its posterior end, appears the remnant of an allantoic stalk. Posteriorly the pseudo-vaginal passage becomes patent as a slit-like space containing dorsally small discontinuous fragments of stalks. Still further back there appears in the ventral corner of the passage a portion of another allantoic stalk which presents in section the markedly fibrosed appearance shown in fig. 19, Plate ix. This stalk measures in diameter ·18 mm. by ·12 mm. and extends through about sixty sections. In this stalk the concentric arrangement of certain of the connective tissue corpuscles is well shown. It is probable that this fibrosed stalk belongs to a later parturition than the fragmentary and small remnants of stalks occupying the dorsal part of the passage. After the appearance of this stalk, the dorsal half of the passage becomes separated off from the ventral and ends blindly, while the latter continues on as a narrow slit in which other fragmentary portions of stalks appear (fig. 20). In this specimen, also, the pseudo-vaginal passage can be traced almost up to the point of opening of the lateral canals into the urogenital sinus.

vii. *P. nasuta*, with an early blastocyst in one of the uteri. (Stage A of previous paper).

This specimen had borne young on at least one previous occasion. The two median vaginal canals unite posteriorly to form a single median common canal in the usual fashion in multipara.

In the connective tissue following on the posterior end of the median vagina are incorporated the fibrosed remnants of an allantoic stalk, which forms an integral part of the tissue, and is only distinguishable therefrom by its more homogenous appearance and its slightly deeper-staining qualities. Behind this the pseudo-vaginal cleft appears and posteriorly there is present in it another portion of an allantoic stalk with very much the appearance of the stalks in specimen iv. It is invested by a delicate layer of the surrounding tissue, so that the lumen of the passage is completely blocked. The matrix of the stalk is fibrosed and contains numerous connective tissue cells.

viii. *P. obesula*, with blastodermic vesicle in uterus. (Stage B of previous paper).

This female proves to have been in her first pregnancy. The two median vaginal canals end blindly without opening into each other, just as in the virgin previously described. Fig. 21 represents a section through the urogenital strand of this specimen. Except in size, it in no way differs from the section through that of the virgin shown in fig. 8.

ix. *P. obesula*, with two 12·5 mm. embryos in the uteri.

Like the preceding this female is also in her first pregnancy, and, as in her, the two median vaginal canals end blindly and separately. The lumina of the two cul-de-sacs are separated by the common wall with a least average thickness posteriorly of ·37 mm. There is no sign of any thinning of the wall nor any indication suggesting the subsequent union of the two canals.

The only point of importance in connection with the urogenital strand is the fact that the connective tissue lying between the lateral vaginal canals is now very vascular (fig. 22, *c.t.*), numerous large and small veins, running mainly longitudinally, being distributed through it.

General Remarks on Parturition.

If now we shortly summarise the facts concerning the parturition phenomena contained in the preceding pages, we reach the following conclusions:—The young in *Perameles* reach the exterior by way of a direct median passage, constituted in front by a comparatively short epithelially lined tube a few millimètres in length, formed by the union of the posterior portions of the median vaginal canals—the common median vagina—and behind by a relatively very long, cleft-like space 3-4 cms. in length—the pseudo-vaginal passage—lying in the connective tissue between the lateral vaginal canals and leading back from the posterior end of the former but, unlike it, "wholly destitute of any epithelial lining or any other specialised wall" (**3**, p. 429). Although I have not been able to demonstrate the presence of an opening from the pseudo-vaginal passage into the urogenital sinus in any of the specimens examined, there is not the slightest doubt but that such an opening must exist before parturition can be completed. Once that process is over, the opening, which must simply be of the nature of a rupture or breaking through by the young of the epithelial lining of the sinus, apparently rapidly heals up and must be reformed anew at every act of parturition as a temporary opening place for the exit of the young. The closure of this opening after each act of parturition is, without doubt, simply a necessary result of the fact that the median pseudo-vaginal passage is merely a solution of continuity entirely destitute of any epithelial lining with which the ruptured epithelium of the margin of the opening could become continuous. Its edges simply have to unite with each other with the consequent healing up and obliteration of the opening.

When the pseudo-vaginal passage is once formed, it persists throughout at least the greater portion of the posterior part of its extent as an empty cleft-like space which no doubt serves for the transmission of the young of successive gestations. But anteriorly, immediately behind the posterior end of the common median vagina, the pseudo-vaginal passage more or less completely loses its continuity with the lumen of the latter after each parturition owing to its becoming blocked up by the persistent remains of allantoic stalks, surrounded and enveloped by connective tissue sheaths. It is thus evident that in this region the false passage must be reformed at each parturition, and the same also holds true for the extreme posterior end of the passage over a greater or lesser extent.

The allantoic stalks left behind in the anterior portion of the median passage after each parturition very soon completely disappear from the uteri and median vaginæ, but portions of them remain recognisable in the upper portion of the pseudo-vaginal passage for a relatively very long time. The fate of these stalks has been traced in the preceding pages. They have been shown to undergo histological degeneration and to become surrounded and invaded by the adjacent connective tissue, a process resulting in their complete conversion into fibrosed masses and their final incorporation in the surrounding connective tissue. As regards the formation of the pseudo-vaginal portion of the median passage, I pointed out in my previous paper that it is "formed either just before or at the first act of parturition" (**3**, p. 429). I am now inclined to believe that the latter period is the correct one and that the passage is simply formed by the embryo as it passes down, as a longitudinal cleft-like rupture of the very vascular connective tissue core of the urogenital strand. "That some such rupture does occur is evidenced not only by the appearance of the false passage, but also by the pretty extensive extravasations of blood found both in and surrounding the track followed by the fœtus during its egress, *i.e.*, the median pseudo-vaginal passage" (p. 429). At all events, I am unable to conceive of the formation of such a cleft-like passage other than in association with the downward passage of the young during parturition. As to the formation of the common median vagina, the separateness of the median vaginal cul-de-sacs in specimen ix. suggests that the disappearance of their common partition wall posteriorly may likewise be due to the passage of the young into their narrow posterior ends, resulting in pressure on, and subsequent rupture of, the common wall, which is, no doubt, in a stretched and congested condition during the act of parturition. In my previous paper (**3**) I instituted a comparison between the median pseudo-vaginal passage in *Perameles* and the epithelially lined median vaginal passage in the Wallaroo (*M. robustus*), by way of which, as Stirling (**10**) has shown, the young Wallaroo reaches the exterior. In that comparison, misled by my misinterpretation of the median vaginæ as posterior prolongations of the uteri, I stated that the former passage had "no connection whatever" with the lateral vaginal canals, an erroneous statement which I trust the present paper sufficiently corrects. For it has been demonstrated that the median pseudo-vaginal passage is directly continuous at, and for some time after, parturition with the lumen of the median vagina, and that the latter is formed by the union posteriorly of the two median vaginal canals, which themselves arise developmentally as posteriorly directed cæcal diverticula, one from each Müllerian duct at the junction of its uterine and vaginal segments.

Now in young fœtal Macropods and other Marsupials, the median vaginal apparatus consists, as in virgin females of *Perameles*, of two separate cul-de-sacs lying imbedded in the tissue of the genital cord. But whereas in Macropods the two cul-de-sacs extend back in the tissue of the genital cord up to within a comparatively short distance from the anterior end of the sinus urogenitalis, and eventually coalesce to form a single blindly ending median vagina whose posterior end alone remains imbedded in the tissue of the genital cord; in *Perameles*, the vaginal cul-de-sacs remain relatively extremely small, do not undergo fusion until the first parturition, and even then the fusion is only partial, are entirely imbedded in the tissue of the genital cord and terminate far remote from the urogenital sinus.

In virgin females of *Macropus*, then, the median vaginal apparatus consists of a single long tube, which ends blindly in the tissue between the *posterior* ends of the lateral vaginal canals; while in virgins of *Perameles* the homologous apparatus consists of two separate cul-de-sacs, which end blindly in the tissue between the *anterior* portions of the lateral canals.

It is thus evident that the median vaginal apparatus remains, as compared with that of Macropods, in an extremely primitive condition, at a stage of development which is early passed through in the fœtal Macropod.

In view of the fact that both in *Perameles* and in certain Macropods [*cf.* especially Stirling (**10**)], the young reach the exterior by way of a direct median passage, involving in both cases the median vaginal apparatus, the question next arises, may not the mode of formation of the direct passage in *Perameles*, associated as it is with such an extremely primitive condition of the median vaginal apparatus, throw light on the parturition phenomena in those other Marsupials with a direct mode of birth, and in particular, may there not occur, in the parturition of Macropods, phenomena recalling the formation of the pseudo-vaginal passage in *Perameles?*

Now it has been shown by numerous independent investigators, from Home (**14**), who first described the condition, onwards [I need here only cite the careful work of Lister and Fletcher (**11**), and Fletcher (**12** and **13**), whose papers contain, in addition to their own extensive observations, valuable historical summaries of the earlier investigations in this field], that in many species of the family *Macropodidæ*, a direct post-partum communication exists between the median vagina and the urogenital sinus, that therefore the young reach the exterior in those forms in which such an opening exists by a direct median passage as in *Perameles*.

Only in two cases has the median vagina in Macropods been found to communicate with the urogenital sinus in virgin animals, namely, "by Lister in *H. ualabatus* and Brass in *H. bennettii*" (Fletcher, **13**, Part ii. p. 9), but such cases are to be regarded as very rare and exceptional variations.

In virgins, normally, as Fletcher's investigations (**13**) show, the median vagina ends blindly in the connective tissue between the posterior ends of the lateral vaginal canals and in comparatively close proximity to the urogenital sinus. Figures such as the classical figure of Owen of the genital organs of a pregnant *M. major* (**9**, Plate vi., fig. 7), and certain of those of Brass (**4**, notably fig. 2, Taf. ii., representing the vaginæ of a young *Trichosurus*, fig. i., Taf. iv. representing the genital organs of *Phascolomys*, and fig. i. Taf. iv. those of *M. major*), are, as Fletcher has already pointed out (**13**, Part i. p. 658), entirely misleading since they represent the median vagina as ending freely and without any connection with the connective tissue in which the posterior ends of the lateral vaginæ and urethra lie imbedded. This tissue, with its enclosed canals, lateral and median vaginæ and urethra, represents the persistent posterior portion of the genital cord, and just in this tissue, from analogy with *Perameles*, we should expect the formation of a pseudo-vaginal passage to take place if such occurs in Macropods.

Fletcher is the only observer who offers any observations on the mode of origin of the direct communication in these forms, and summarises his results in the following paragraph (**13**, Part ii. p. 10) :—"In virgin animals of *H. ruficollis*, *H. dorsalis*, *P. penicillata*, *O. robustus* and *O. rufus*, the direct communication did not exist, but in one specimen of *P. p* [*enicillata*] and one of *H. ualabatus*, the direct communication was in process of formation, but still incomplete; and these two specimens seem to show that the aperture of communication arises probably not by a mere rupture of the intervening portion of the wall of the urogenital canal, but by an involution of the latter canal growing backwards to meet the cavity of the median portion of the vagina when the latter has reached its maximum backward extension. My own observations show that it is possible for the direct communication to exist in virgins, while those of other observers show that this actually is the case; but more usually it would seem to be formed late in life, probably during pregnancy or at parturition." Brass (**4**, p. 27) also remarks : "es ist wohl die Ansicht ausgesprochen worden, dass dieser Durchbruch des Blindsackes gegen den Sin. urog. hin zur zeit der Schwangerschaft stattfände, um den Embryonen einen bequemeren Weg nach aussen zu verschaffen."

Although I have no direct observations of my own to offer on the formation of this direct communication in these forms, yet in view of the occurrences in *Perameles*, I feel unable to accept Fletcher's suggestion that the direct communication is ever completed independently of the median vagina, by an involution of the urogenital sinus. Convinced as I am, from the study of the condition in *Perameles*, that the formation of the direct passage involves solely the median vaginal apparatus and the connective tissue tract leading backwards therefrom, the completion of the passage by a definite independent involution of the urogenital sinus appears to me inexplicable. However, leaving this point aside, since it is only offered by Fletcher as a tentative suggestion based on appearances seen in only two specimens, we come to his important conclusion, founded on the examination of the genital organs of eighty females, that the direct opening in Macropods is "more usually . . . formed late in life, probably during pregnancy or at parturition," a conclusion identical with that arrived at, in my previous paper (**3**), for *Perameles*. In the present paper I have expressed the opinion that the pseudo-vaginal passage in *Perameles* is actually formed at the time of parturition, and I think that the facts herein set forth justify us in concluding that, as in *Perameles* so also in Macropods, the median passage is completed during parturition by actual rupture by the embryo of the tissue intervening between the posterior end of the median vagina and the sinus urogenitalis. But in those Macropods with a direct opening, owing to the close approximation of the median vagina to the urogenital sinus, the cleft in the connective tissue or pseudo-vaginal passage is either extremely short or, indeed, hardly present where the two cavities are only separated in the virgin by a thin septum. The consequence of this is that the ruptured epithelium of the median vagina and that of the urogenital sinus are able, in the healing process, to extend completely along the very short pseudo-vaginal passage and to become directly continuous with each other. Once formed, the opening of the median vagina into the sinus, in these Macropods, thus becomes a permanent one, while in *Perameles*, as has already been pointed out, owing to the great length of the pseudo-vaginal passage, the edges of the opening into the sinus can only unite with each other, and as a consequence the opening is obliterated and has to be temporarily reformed at each succeeding act of parturition.

Now there are forms even amongst Macropods, *e.g.*, *M. major*, in which, as Fletcher points out (**13**, Part ii. p. 10), "unless very exceptionally there is no direct communication even after young have been produced," in spite of the fact that the median vagina is well developed and extends down to within a short distance from the sinus. The distance, however, between the posterior end of the median vaginal cul-de-sac and the sinus urogenitalis, appears to be greater in virgins of *M. major* than in the virgins of species which later possess the direct post-partum communication. Fletcher says in his description of virginal genital organs of *M. major*, "from three specimens sections which were cut differ from those considered above, chiefly in the fact that the cul-de-sac came to an end sooner, and always before the urogenital canal appeared in section" (**13**, Part ii. p. 9). If, then, a pseudo-vaginal passage were developed in *M. major* during parturition, it would be of greater length than in those forms with a persistent direct opening, and the question thus arises whether, in view of the closure of the direct opening in *Perameles* after each parturition in association with a long pseudo-vaginal passage, a similar explanation may not account for the apparently anomalous condition in *M. major* and other forms in which the direct opening appears to be absent?

At all events the fact of the closure of the direct opening into the urogenital sinus in *Perameles* shows us that the mere absence of such is no certain and sufficient criterion on which to decide whether or not the young are born by a direct median passage.

Finally, as regards parturition, it seems to me that the foregoing discussion sufficiently upholds the conclusion that *Perameles*, in respect to the phenomena connected with that process, in no way stands alone amongst Marsupials as an aberrant and specialised type, but quite on the contrary, exhibits more primitive features in the mode of birth of the young than are shown by any other Marsupial hitherto described as possessing a direct median passage. That the direct passage in *Perameles* is in a much more primitive condition than that of Macropods, will, I think, be admitted without question. Indeed, the condition of the passage in *Perameles* can only, in my opinion, be regarded as the precursor of the Macropine one and as showing us in use to-day the earliest stage in the evolution of that direct median passage which reaches its highest development in the specialised

Macropodidæ. So far as our present knowledge extends, *Perameles* is the only Polyprotodont genus in which a direct median passage has yet been found. The condition of the genital organs in a pouch young of *Peragale lagotis*, however, suggests that such also occurs in this genus. Among Diprotodonts, the direct communication has been observed, according to Fletcher, in twelve species of the family Macropodidæ. That it also exists outside the limits of this family, I can affirm for *Tarsipes rostratus*, and Alix (2) states that "sur un Phascolome wombat le vagin médian communiquait avec le vestibule urogénital par un petit pertuis bien distinct." Although I find that this is not the case in *Phascolomys mitchelli*, yet I would not on that account venture to assert that the young are not born by a median passage. As regards other forms, there are some, *e.g.*, *Trichosurus vulpecula*, in which the young are almost certainly born through the lateral vaginal canals, here comparatively short and simple in their course, while with regard to the majority of forms, extended observations based on serial sections through the termination of the median vaginal apparatus are necessary before any definite statements can be made concerning them.

Such being the state of our knowledge, it would be hazardous to venture far into the uncertain field of speculation concerning the conditions which first led to the acquisition of the direct median passage for the birth of the young. That this median passage has not been twice independently acquired within the Marsupial class I am convinced, and its existence in *Perameles* in a condition so obviously unspecialised and in association with such a persistently embryonic condition of the genital organs, tends to suggest that its acquisition is of ancient date, and at the same time leads us to ask whether the acquirement of the median passage in the first instance may not be the direct outcome of some such peculiar disposition of the Müllerian ducts in the genital cord as occurs in the adult *Perameles* and in the pouch young of other Marsupials, a disposition without doubt to be associated with the mesial position of the ureters?

The very fact of the constant occurrence in *Perameles* of this mode of birth by a direct median passage, even formed as it is in by far the greater part of its extent by rupture of maternal tissue involving the loss of more or less blood at each act of parturition, shows that with all its apparent defects it has proved of such direct advantage as to have led to its adoption in preference to the route offered by the lateral vaginal canals. What this advantage is, is not far to seek when we contrast the two routes. By way of the median passage, the young reach the exterior by the shortest possible path; they simply pass back in a straight line, while to reach the exterior through the lateral vaginæ they must first pass back into one of the median vaginæ, then directly forwards through the anterior portion of one of the lateral canals into the corresponding vaginal cæcum and hence back again through the posterior portion of the lateral canal to the uro-genital sinus. Parturition then through this latter path must, we can easily imagine, have been not only a slow and laborious process, but one difficult of successful accomplishment and even fraught with danger to the lives of the young, cumbered as they are with attached allantoic stalks At all events, the acquirement of an entirely new passage is quite sufficient to show that the old route proved in some way to be unsatisfactory.

Now the origin of this new and direct passage in the first instance presupposes, it seems to me, the existence of the median vaginal cul-de-sacs. These may have originally arisen as out-bulgings mechanically produced by the young to facilitate their passage from the contracted neck of the uterus into the lateral vaginal canal, here bent outwards and forwards in association with the mesial position of the ureter. Whether or not this be the true explanation of the origin of the vaginal cul-de-sacs, if we grant their existence, then it seems probable that the median passage was discovered through what we can only describe as an accident, which, happening again and again, came eventually, owing to its value, to be adopted as a normal occurrence.

In the lowly *Perameles*, the old accidentally discovered passage has persisted, probably unmodified, in correlation with the retention by the genital organs as a whole of a persistently embryonic condition; while the specialised Macropods have gone on to exhaust the possibilities implied in the possession of a median vaginal apparatus and have evolved a direct median passage, eventually epithelially lined throughout its entire extent.

Conscious as I am that the last word has not yet been said on the evolution of the median passage in Marsupials, and that many points still stand in need of explanation, I put forward these few remarks and suggestions on the parturition phenomena in general and on the origin of the direct passage, in no dogmatic spirit, but in the hope that they may be the means of eventually leading us to a better understanding of this, certainly one of the most remarkable of all the adaptive modifications exhibited by the Marsupialia.

Concluding Remarks.

At the conclusion of the present series of papers, I hope, with a more complete knowledge of the development of the genital organs in *Perameles*, *Macropus*, and *Trichosurus*, to be in a position to enter into a more extended discussion of the morphology of the genital organs of *Perameles* than is possible in the present communication. It will here suffice to briefly direct attention to the more noteworthy features in which the organs of *Perameles* depart from the more usual Marsupial condition, and thereafter to shortly inquire what light the study of their development throws on the question of the primitiveness or otherwise of the urogenital organs in this genus of Marsupials.

If we contrast the urogenital organs of *Perameles* with those of other Marsupials, *e.g.*, *Macropus*, the following features stand out as worthy of remark :—

(1.) The absence of any sharply marked separation between the uterine and vaginal segments of the organs, the uterus being directly continued into the median vaginal cul-de-sac and its os being extremely ill-defined.

(2.) The small size and distinctness in the virgin, of the median vaginal cul-de-sacs, their termination at a relatively great distance from the urogenital sinus and their complete investment by the connective tissue of the urogenital strand.

(3.) The fact that the lateral vaginal canals (except their forward expansions—the vaginal cæca), are imbedded throughout their entire extent, together with the urethra, in an elongated mass of connective tissue—the urogenital strand.

(4.) The extremely short sinus urogenitalis, and the existence of a very distinct cloaca.

As regards (1) and (4) these features constitute, I think, obvious marks of lowly organisation, while as regards (3), I have already pointed out in the preceding pages that the median vaginal apparatus in *Perameles* remains at a stage which is early passed through in the fœtal Macropod, and which is without doubt extremely primitive. As concerns (3), the adult structural relations of the urogenital strand led me to believe that it represented the genital cord of the fœtus, and serial sections of a small pouch-young at once convinced me of the rightness of this belief. The urogenital strand of the adult is simply nothing else than the persistent genital cord, from the tissue of which the posterior ends of the uterine segments of the Müllerian ducts and the entire vaginal segments of the same never become free, except in so far as the forwardly projecting vaginal cæca may be said to have become free from the original tissue of the cord.

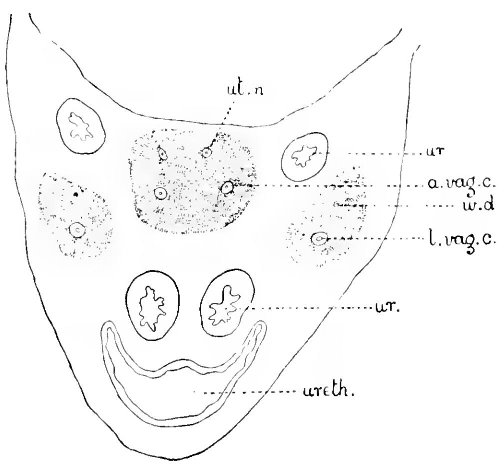

Fig. 2.

Text-figures 2 and 3 are outline drawings of sections through the genital cord of a pouch-specimen of *P. nasuta*, 34 mm. in greatest length. Fig. 2 represents a section through the anterior region of the cord, a little behind the openings of the ureters into the fundus of the bladder; while fig. 3 represents a section through the cord at a somewhat lower level. They may be compared, respectively, with figs. 5 and 8, Plates iii.-iv., representing sections through the corresponding regions of the genital organs in the adult, when it will at once be apparent that, so far as concerns the general disposition and course of the genital ducts, these remain in a condition which can only be described as persistently embryonic.

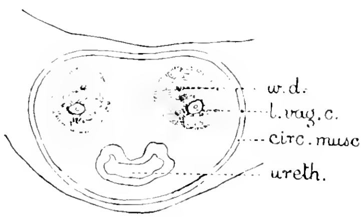

FIG. 3.

Now, in young fœtal Macropods, the genital ducts have essentially the same disposition as in the fœtal and adult *Perameles*, *i.e.*, the posterior portions of the uterine and the entire vaginal segments of the Müllerian duct and the urethra lie imbedded in a common mass of mesodermic tissue – the genital cord. In both, the uterine segments pass back side by side to open into small median vaginal cul-de-sacs, arising at the junction of the former with the vaginal sections of the Müllerian ducts. From the cul-de-sacs, the lateral vaginal canals continue directly forwards and outwards ventral to the uterine segments of the ducts (text-fig. 2, *a.vag.c.*), in order to sharply bend round anteriorly and to continue backwards. Just behind the bend the two lateral canals are widely separated from each other by the ureters. These pass in mesially to the vaginal canals to reach the base of the bladder, which is imbedded ventrally in the tissue of the genital cord. Behind this level, the two vaginal canals gradually approximate and finally (text-fig. 3) run back parallel with each other and with the Wolffian ducts (*w.d.*) and urethra (*ureth.*) to open into the short urogenital sinus. While, then, in *Perameles*, the genital ducts persistently retain their position in the genital cord, in Macropods they later become more or less free from the tissue of that cord.

I would lay special emphasis on the fact that the anteriorly directed vaginal portions of the Müllerian ducts remain permanently imbedded in the tissue of the genital cord, a structural condition never before described for any Marsupial, and confined, so far as our present knowledge goes, to the two allied genera, *Perameles* and *Peragale*, though there appears to be a close approximation to a similar condition in *Myrmecobius fasciatus*. In most other Marsupials, not only do these forwardly directed portions of the lateral vaginal canals become entirely free from the genital cord, but in many forms, *e.g.*, Macropods, their backwardly directed portions also become free from the cord over the greater portion of their extent, only their terminal segments retaining their original position in that cord. In concluding for the present this short discussion, I would remark that the facts here briefly set forth, in my opinion, show conclusively that the condition of the genital organs in Macropods—undoubtedly one of the most specialised families of living Marsupials—can in no sense be regarded as primitive, and that just in so far as the genital organs of *Perameles* depart from the prevalent Marsupial condition they in the same degree realise the more primitive type. Indeed, the urogenital organs of the Peramelidæ appear, so far as I am able to judge, to have retained a more archaic condition than those of any other hitherto described Australian Marsupial,* a conclusion which I believe gives very material support to that view which regards the existence of an allantoic placenta in the genus *Perameles* as an extremely primitive feature in its organisation.

The present work and that to be detailed in succeeding parts of this series of papers has been carried out with the aid of a

*The condition of the genital organs in the Didelphyidæ requires re-examination. In the figures both of Owen (**9**) and Brass (**4**) the tissue of the genital cord, which ought developmentally to be found extending between the small median vaginal cul-de-sacs and the sinus urogenitalis, is not shown, hence it is impossible to determine with certainty the relation of the lateral vaginal canals to that tissue, though the bent character of the canals suggests that they are free from it over the greater part of their extent as in Macropods.

grant from the Royal Society, the liberality of whose Committee I desire here to gratefully acknowledge. I am much indebted to my friends, Prof. J. T. Wilson and Mr. J. J. Fletcher, for kind advice, and I further desire to express my thanks to Mr. R. Grant, late of the Physiological Department, for invaluable help in the preparation of the photo-micrographs illustrating this paper and for much assistance in other ways.

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2.—Alix, P. H. E. "Sur les organes de la parturition chez les Marsupiaux." Bull. Soc. Zool. France, 1879. p. 118.

3.—Hill, J. P. "The Placentation of Perameles. (Contributions to the Embryology of the Marsupialia, I.)". Q.J.M.S. Vol. 40. 1897.

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10.—Stirling, E. C. "On some Points in the Anatomy of the Female Organs of Generation of the Kangaroo, &c." P.Z.S. 1889.

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14.—HOME, E. "Some Observations of the Mode of Generation of the Kanguroo, with a particular Description of the Organs themselves." Phil. Trans. 1795.

EXPLANATION OF PLATES.

Reference letters.

a. vag. c. Anterior forwardly directed portion of lateral vaginal canal. *bl.* Bladder. *bd. lig.* Broad ligament. *cl.* Cloaca. *c. m. v.* Common median vagina. *c.t.* Connective tissue between lateral vaginal canals. *fim.* Fimbriated opening of Fallopian tube. *f.t.* Fallopian tube. *l. vag. c.* Lateral vaginal canal. *m.v.c.* Median vaginal canal. *o.u.s.* Opening of urogenital sinus. *op.* Opening of anterior portion of lateral vaginal canal into vaginal cæcum. *ov.* Ovary. *pv. p.* Pseudo-vaginal passage. *rect.* Rectum. *u.s.* Urogenital strand. *ur.* Ureter. *ureth.* Urethra. *ut.* Body of uterus. *ut.p.f.* Utero-pelvic fold of broad ligament. *ut.n.* Uterine neck. *vag.c.* Vaginal cæca. *ves.v.* Vesical artery and vein.

N.B.—With the exception of figs. 1 and 2, the figures are reproductions from photo-micrographs of transverse sections.

Plate i.

Fig. 1.—Urogenital organs of *P. obesula*, seen from the dorsal aspect. The cloaca has been opened to show the opening of the urogenital sinus (*o.u.s.*), and the peritoneal pouches have been drawn forwards to expose the ovaries. (× 1.)

Fig. 2.—Urogenital organs of *P. obesula*. Dissection from dorsal aspect. *x*. Commencement of anterior forwardly directed portion of lateral vaginal canal. (× 1).

Figs. 3-8, Plates ii.-iv.—Trans. sections through the genital organs of virgin *P. nasuta*. For approximate positions of sections, see text-fig. 1, p. 52, and for description, see text, p. 53.

Fig. 9, Plate v.—Trans. section through the clitoris, showing the median septum (*m.s.*), the opening of the clitoris duct (*c.d.*) on one side, and the erectile tissue (*e.t.*)

Fig. 10, Plate v., and Figs. 11-12, Plate vi.—Trans. sections through median vaginal apparatus of *P. obesula* with two 17·5 mm. young.

Fig. 13, Plate vii., Figs. 14-15, Plate viii.—Trans. sections of *P. obesula* with two 22 mm. young. In 13, the section passes through the anterior portion of the common median vagina (*c.m.v.*); in 14, through the anterior region of the pseudo-vaginal passage, blocked up by three allantoic stalks (*all.s.*) ; and in 15, through the mid-region of the urogenital strand, with the cleft-like pseudo-vaginal passage (*pv.p*) containing detritus.

Fig. 16, Plate xii.—Trans. section. Just behind the posterior end of the common median vagina. *P. obesula* with four 3·7 cm. young.

Fig. 17, Plate xi.—Trans. section. Showing the remnants of allantoic stalks filling up the pseudo-vaginal passage and surrounded and invaded by connective tissue. *P. obesula* with 4 cm. young.

Fig. 18, Plate viii., and Figs. 19 and 20, Plate ix.—Trans. sections, *P. nasuta* (?) bred, showing in 18, the common median vagina (*c.m.v.*) in 19, a well marked example of a fibrosed allantoic stalk (*all.s.*) in the pseudo-vaginal passage, and in 20, the cleft-like passage containing remnants of stalks.

Fig. 21, Plate x.—Trans. section through the urogenital strand of *P. obesula* with blastodermic vesicle in uterus.

Fig. 22, Plate xii.—Trans. section, urogenital strand of *P. obesula* with two 12·5mm. young in uteri, showing the vascular character of the connective tissue (*c.t.*) between the lateral vaginal canals.

DESCRIPTIONS OF NEW AUSTRALIAN LEPIDOPTERA.

By Oswald B. Lower, F.E.S.

BOMBYCINA.

PSYCHIDÆ.

Oiketicus ulias, n.sp.

♂. 40 mm. Head, palpi, antennæ, legs, thorax and abdomen blackish-fuscous, antennal pectinations at greatest length 8, much shorter on apical half. Forewings elongate, costa gently arched, hindmargin extremely oblique, somewhat sinuate on lower third; dark fuscous, inclining to blackish; a large blackish somewhat cuneiform spot at end of cell; a moderate suffused elongate-ovate blackish patch above inner margin at $\frac{1}{3}$ from base; an indistinct patch of blackish beneath costa near base; hindmarginal area somewhat blackish: cilia blackish (imperfect). Hindwings short, hindmargin nearly straight, somewhat sinuate in middle; dark fuscous; cilia as in forewings.

Mackay, Queensland; two specimens.

Mr. Meyrick kindly identified this and several other of the species herein described, and in several instances suggested names which I have adopted.

ARCTIADÆ.

Emmiltis trissodesma, Lower.

(*Anestia trissodesma*, Lower, Proc. Linn. Soc. N.S.W., 1897, 12.)

Since describing the original specimen of this insect I have secured a fair series. The sexes of the species being different in appearance, besides being somewhat variable, I think it desirable to supplement the description. The groundcolour of the forewings varies in intensity of colouring; in some specimens it is almost white, but the markings are very constant. The hindwings of the ♂ vary from pale clear yellow to dull ochreous-orange, sometimes with an obscure fuscous line from middle of costa to middle of inner margin. In the type the hindwings were clear yellow.

♀. 14 mm. Head, thorax, antennæ, palpi and legs whitish. Abdomen whitish. Forewings as in ♂; white; markings ochreous-fuscous; a basal patch, outer edge limited by a nearly straight fine black line, from $\frac{1}{5}$ costa to $\frac{1}{4}$ inner margin; a moderate, straight, broad transverse band, from middle of costa to middle of inner margin, obscure on costa; a moderately broad irregularly edged band just before hindmargin, lower third constricted; an ill-defined pale ochreous hindmarginal band: cilia whitish, with a fine fuscous median line. Hindwings with hindmargin rounded; whitish; a moderately broad slightly curved fuscous fascia, from before middle of costa to before middle of inner margin; a similar parallel fascia just before hindmargin; a fine fuscous hindmarginal line; cilia as in forewings.

Broken Hill, N.S.W.; several specimens of the ♂; the ♀ is very scarce.

A curious character of this insect is the appearance when at rest, the head being appressed closely to the surface and the posterior legs raised so as to give a ʌ-shaped outline. Mr. Meyrick, to whom I am indebted for the correct location of this and several other of the species described in this paper, informs me that the genus has not previously been known to occur in Australia.

GEOMETRINA.

MONOCTENIADÆ.

Taxeotis phaeopa, n.sp.

♂♀. 20-25 mm. Head whitish, slightly ochreous-tinged, face grey. Thorax white. Abdomen greyish-ochreous. Palpi 2, ochreous-fuscous. Antennæ and legs fuscous, ciliations 1. Forewings elongate, triangular, hindmargin not sinuate, obliquely rounded beneath; pale grey-whitish, with faint ferruginous markings; a suffused spot on costa beyond $\frac{1}{4}$ to inner margin at $\frac{1}{3}$, more pronounced on costa; a transverse discal spot beyond and above middle; a cloudy spot on costa beyond $\frac{2}{3}$, emitting an irregular line to inner margin before anal angle, with two angulations outwards, one below costa and one in middle; a submarginal row of obscure spots; a hindmarginal row of small black dots: cilia ochreous-grey. Hindwings with hindmargin rounded; grey-whitish, somewhat fuscous-tinged; a faint fuscous discal dot; hindmarginal line and cilia as in forewings.

Broken Hill, N.S.W.; April to June, five specimens.

The only known species with a grey face.

SATRAPARCHIS (?) MACROCOSMA, n.sp.

♀. 62 mm. Head, palpi, antennæ, thorax and legs dark purplish-fuscous, palpi short, antennal pectinations 1; (terminal half broken). Abdomen yellow-ochreous. Forewings elongate-triangular, costa straight, hindmargin bowed; dark purplish-fuscous, transversely strigulated with blackish on basal half, where the groundcolour is lighter; an elongate strongly outwards-curved sphenoid white patch, anterior edge from about $\frac{2}{5}$ of costa to inner margin before anal angle; posterior edge obscurely defined and slightly oblique, from before $\frac{3}{5}$ of costa meeting anterior edge above inner margin; a sharply defined moderate white line, with a slight angulation beneath costa, from costa at $\frac{4}{5}$ to $\frac{1}{2}$ across wing, thence obscurely continued to above middle of sphenoid patch; groundcolour anterior to line much darker, beyond pale purplish-coppery. Hindwings with hindmargin slightly waved; bright yellow, with a broad black band along hindmargin, with a moderate sinuation in middle: cilia fuscous. Forewings beneath with markings of upper side reproduced; a yellow basal patch, outer edge from $\frac{1}{4}$ of costa to near middle of inner margin, with a quadrate protuberance below middle. Hindwings with markings reproduced as above; two pale purplish-coppery patches at apex and on costa at $\frac{3}{4}$.

Pentland Hills, near Bacchus Marsh, Victoria; one specimen, taken by Mr. E. E. Brittlebank; unfortunately without date of capture.

A very fine and distinct species, not truly referable to *Satraparchis*, but placed here provisionally in the absence of the ♂. The curious unipectinated antennæ of the ♀, and the short palpi are noticeable characters. Generally speaking this species partakes somewhat the appearance of *Epidesmia tricolor*, Westw. I have very little doubt but that a new genus will be required to receive it.

Monoctenia phyllomorpha, n.sp.

♂. 40 mm. Head, thorax, palpi and abdomen pale ochreous, palpi at base whitish, abdomen and thorax beneath white. Antennæ whitish, orange beneath, pectinations ochreous. Legs dull ochreous-orange, ochreous-whitish internally. Forewings elongate-triangular, apex acute, hindmargin slightly sinuate beneath apex, thence bowed, oblique; pale ochreous, becoming darker towards base; an obscure ferruginous spot above inner margin, at $\frac{2}{3}$ from base; a few obscure ferruginous spots from costa before apex; apex and hindmargin tinged with ferruginous: cilia ferruginous, darker at base. Hindwings with hindmargin nearly straight; colour as in forewings, but broadly suffused with whitish along costa; cilia as in forewings. Wings beneath pale ochreous, greenish-tinged. Forewings with two or three ferruginous dots reproduced from upper side; inner margin broadly whitish. Hindwings with a row of about six fuscous dots, from costa towards inner margin but not reaching it.

Newcastle, N.S. Wales; one specimen sent by Mr. G. Lyell, taken in May (*Coll. Lyell*).

Allied to *cycnoptera*, Lower, but very distinct from that species, or indeed any other known to me. The absence of any definite markings either above or below wings is an uncommon character in this genus.

AMELORA CRYPSIGRAMMA, n.sp.

♂. 30 mm. Head, palpi and thorax dark fuscous. Antennæ reddish, pectinations 5. Abdomen grey-whitish. Legs grey-whitish, anterior and middle pair infuscated. Forewings elongate-triangular, costa arched at base, thence nearly straight; hindmargin gently bowed, slightly sinuate beneath apex; dark fuscous, mixed with blackish; markings obscure; costa moderately edged throughout with blackish; a thick suffused irregular black streak from base at inner margin across wing to apex, becoming attenuated at apex; a thickly deeply dentate black line from beneath above streak at $\frac{2}{3}$ to middle of inner margin, edged posteriorly by white; hindmarginal area blackish; veins obscurely outlined with whitish. Hindwings with hindmargin rounded, hardly waved; dull whitish, sprinkled with fuscous, except towards base; a moderate blackish discal dot; cilia whitish.

Broken Hill, N.S.W.; one specimen, at light, in May.

In the neighbourhood of *idiomorpha*, Lower, but not very near it.

STIBAROMA STENODESMA, n.sp.

♀. 34 mm. Head, palpi, thorax, antennæ, legs and abdomen ashy-grey-whitish, abdomen becoming greyish posteriorly, posterior legs more whitish. Forewings elongate, moderate, dilated posteriorly, costa gently arched, hindmargin slightly waved, oblique; ashy-grey-whitish; markings black; a fine, short, inwards-curved line from near base of costa to base of inner margin; a fine line from $\frac{1}{3}$ costa to $\frac{1}{3}$ inner margin, moderately curved outwards and with a very slight projection inwards immediately above inner margin; a fine waved line from $\frac{2}{3}$ of costa to $\frac{3}{4}$ inner margin, with a moderate projection outwards above middle, curved inwards below this; a similarly formed very obscure line, indicating median shade, between first and last mentioned lines, nearer first on costa; a straight irregular band of ferruginous from beneath costa at $\frac{5}{6}$ to anal angle; veins on hindmarginal area outlined with black, more especially above and below middle; a fine waved black hindmarginal line: cilia grey-whitish, mixed with blackish at extremities of veins. Hindwings with hindmargin slightly waved; fuscous-grey; an obscure fuscous discal dot; a broad blackish hindmarginal band, somewhat suffused, constricted at anal angle; indications of a faint fuscous line at $\frac{3}{4}$ inner margin, not reaching costa; hindmarginal line and cilia as in forewings. Forewings beneath as above; costa dusted with white; a broad blackish hindmarginal band, containing a spot of groundcolour on costa at apex. Hindwings as in forewings, but spot of groundcolour obsolete.

Newcastle, N.S.W.; one specimen in May; (*Coll. Lyell*).

NOCTUINA.

NOCTUIDÆ.

THALPOCHARES LEUCODESMA, n.sp.

♀. 10 mm. Head, palpi and legs white. Thorax ochreous-fuscous, anteriorly white. Abdomen dull orange. Antennæ fuscous. Forewings elongate-triangular, hindmargin bowed, oblique; chestnut-brown, somewhat suffused with white on basal area; a slightly oblique broad whitish fascia, narrowed on costa, from middle of costa to middle of inner margin, anterior edge straight, posterior edge irregular, with a strong projection in middle; fascia edged on either side with darker groundcolour; an oblique darker chestnut streak from apex to projection; fascia suffused into groundcolour below this; a few fuscous dots along hindmargin: cilia whitish, slightly ochreous-tinged. Hindwings pale ochreous, infuscated round margins, especially at apex; cilia as in forewings.

Duaringa, Queensland; two specimens, taken in April and May.

EUSTROTIA CRYSTALLINA, n.sp.

♀. 40 mm. Head and thorax dull whitish, finely reticulated with blackish. Antennæ and palpi dull orange. Abdomen orange, fuscous-tinged at base. Legs whitish, anterior tibiæ and tarsi ochreous-orange, posterior and middle tibiæ and tarsi dull orange. Forewings elongate, moderate, slightly dilated posteriorly, costa nearly straight, hindmargin bowed, somewhat oblique; dull bluish-white, finely strigulated with fuscous; costal edge orange from base to very near apex; an outwardly oblique black streak on costa in middle; a similar but longer streak on costa at $\frac{5}{6}$, reaching about $\frac{1}{3}$ across wing; a third similar black streak on costa between first and second, groundcolour between first and second streak is, except on costa, dull fuscous-ferruginous, and is continued as broad fascia to inner margin before anal angle, narrowed on lower $\frac{1}{2}$; a narrow elongate streak along middle of hindmargin, anteriorly nearly reaching termination of second costal streak; a hindmarginal row of black dots: cilia fuscous, with a fine grey-whitish basal line. Hindwings white, with a yellowish hindmarginal band, becoming narrowed and lost on inner margin; veins somewhat outlined with yellow; six or seven black dots on upper half of hindmargin; cilia white, becoming yellowish on upper half of hindmargin.

Mackay and Cairns, Queensland; two specimens, in November.

PYRALIDINA.

BOTYDÆ.

Metallarcha leucodetis, n.sp.

♂♀. 14-20 mm. Head, thorax and abdomen snow-white, abdomen somewhat infuscated posteriorly, thorax beneath snow-white. Palpi and antennæ fuscous. Middle and posterior legs white; anterior pair fuscous. Forewings elongate-triangular, dilated posteriorly, costa straight, hindmargin oblique, gently bowed; snow-white; markings fuscous; a moderate streak along costa from base to beyond $\frac{3}{4}$, anteriorly attenuated, with a small obscure tooth in middle; from posterior extremity of this streak proceeds a thick direct irregular streak to $\frac{3}{4}$ across wing, becoming claviform on lower extremity and almost (in some specimens quite) reaching anal angle; a small suffused spot in inner margin at $\frac{2}{5}$; in some specimens more elongate and extended towards anal angle; a thick streak along hindmargin separated from claviform streak by its own width of groundcolour: cilia greyish, with fuscous subbasal and terminal lines. Hindwings dull greyish-ochreous; a fuscous mark in middle of wing; a broad dull fuscous band along anterior half of hindmargin broadest at apex, finely attenuated posteriorly; cilia whitish with a fuscous subbasal line.

Broken Hill, N.S.W.; four specimens, in November, generally at light.

Differs from the other described species by the white groundcolour.

SCOPARIA SCHIZODESMA, n.sp.

♂♀. 16-18 mm. Head and abdomen yellow. Palpi yellowish, base of second and subapical band of terminal joint fuscous. Antennæ, legs and thorax fuscous, thorax with a few yellowish, posterior legs yellowish. Forewings elongate-triangular, costa hardly arched, hindmargin oblique; whitish-ochreous, with fuscous markings; a fine costal line from base to near apex; a basal patch, its outer edge nearly straight, slightly outwardly oblique, from $\frac{1}{4}$ costa to beyond $\frac{1}{4}$ of inner margin; a moderate blotch-like fascia immediately beyond, not quite reaching costa, slightly broader on lower half, separated by a very distinct line of groundcolour, slightly curved below middle; an irregularly edged outwardly oblique moderate fascia, from costa at $\frac{3}{4}$, reaching half across the wing; a fine oblique line from extremity of this to inner margin at $\frac{3}{4}$; a small irregular patch at anal angle; a small triangular spot on costa at $\frac{5}{6}$; an elongate somewhat cuneiform spot from apex along hindmargin to anal angle, finely attenuated beneath; a few ochreous-whitish scales along hindmargin: cilia dark fuscous. Hindwings yellow; a narrow suffused fuscous hindmarginal fascia; cilia yellowish, at base fuscous.

Broken Hill, N.S.W.; six specimens, from August to January.

A very pretty species; easily known, as it is the only Scoparia with yellow hindwings.

Eclipsiodes crypsixantha, Meyr.

(Trans. Ent. Soc. Lond., 1884, p. 343.)

Recent captures of this species both at Broken Hill, N.S.W., and Parkside, South Australia, would indicate that it is subject to considerable variation especially as regards the groundcolour of the forewings. In Mr. Meyrick's original description he states that the forewings are "dull dark fuscous, sometimes with a few grey-whitish scales." I have eight specimens before me, four of which are superficially quite distinct by the groundcolour of the forewings, which varies from ashy-grey to white; one specimen is clay-coloured; the markings are, however, identical, but the abdomen in all the species is yellow, whereas in the typical specimens it is stated to be dark fuscous, margins of segments yellowish. The three well-marked varieties present themselves thus:—

Var. a. Forewings with three large white blotches, at base, middle and along hindmargin; groundcolour clay-coloured. Abdomen yellow. Parkside, South Australia, in October.

Var. β. Forewings uniform ashy-grey-whitish, markings distinct. Abdomen yellow. Broken Hill, N.S W., in August.

Var. γ. Forewings uniform clay-colour, markings distinct. Abdomen yellowish, infuscated posteriorly. Broken Hill, N.S.W., in August.

Specimens which I took at Duaringa and Brisbane, Queensland, are nearest to the typical form as regards the forewings, but the abdomen has only the two anterior segments fuscous, the rest of the body being yellowish.

TORTRICINA.

TORTRICIDÆ.

Tortrix eugramma, n.sp.

♂♀. 15-18 mm. Head fuscous-white, face whitish. Thorax, palpi and antennæ fuscous. Abdomen greyish-fuscous. Legs fuscous-whitish, posterior pair whitish. Forewings moderate, costa arched towards base, thence straight, hindmargin oblique, hardly rounded; dark fuscous, with silvery-white markings, well defined; a short somewhat wedge-shaped spot, from base below middle; a moderate thick outwardly oblique fascia from about $\frac{1}{3}$ to middle of wing, thence continued obliquely to apex of wing, sometimes broken at $\frac{3}{4}$ by a line of groundcolour; a dull moderate elongate spot just below costa in middle; a moderate streak along inner margin from base to middle, sometimes obsolete towards base: cilia fuscous, with a greyish basal line. Hindwings grey-whitish, spotted with fuscous, becoming lighter towards base; cilia as in forewings.

Brighton, Victoria; two specimens in January, somewhat worn: I have seen specimens from Sale, Victoria; taken in December by Mr. G. Lyell.

Distinct and easily recognised.

CAPUA MELICHROA, n.sp.

♂♀. 18-22 mm. Head, palpi, antennæ and thorax pale yellow. Abdomen grey-whitish, yellowish beneath. Anterior and middle legs yellowish, tarsi fuscous, coxæ shining whitish; posterior legs pale greyish. Forewings moderate, broad, dilated posteriorly, costa rather strongly arched, especially towards base, apex obtuse, hindmargin hardly oblique; pale yellow, finely strigulated with darker yellow; a minute purplish dot at base of inner margin; a second at $\frac{1}{3}$ of inner margin; a very irregular oblique purplish fascia, from before middle of costa to inner margin just before anal angle, more pronounced on margins, and somewhat flattened on inner margin; a similar fascia from costa at $\frac{5}{6}$ to below middle of hindmargin, more or less edged with darker purplish on upper half; a very fine indistinct purplish hindmarginal line, more conspicuous at apex: cilia pale yellow, with a greyish pencil of hairs at anal angle. Hindwings pale yellowish-ochreous; cilia yellowish.

Mackay, Queensland; in December; ten specimens beaten from *Lonicera* sp.

CAPUA OXYGONA, n sp.

♂♀. 18 mm. Head, thorax, and palpi pale ochreous, palpi infuscated laterally. Abdomen whitish. Antennæ fuscous, some what obscurely annulated with whitish. Legs whitish, anterior and middle tarsi fuscous, ringed with whitish. Forewings elongate, moderate, hardly dilated, costa hardly arched, apex round-pointed, hindmargin oblique; pale ochreous-whitish, becoming more ochreous on dorsal half; costa with a row of fine blackish equidistant dots throughout, anterior smaller; a moderate oblique fuscous fascia, darkest in middle, reaching $\frac{3}{4}$ across wing, from middle of costa towards anal angle; wing beneath this finely infuscated; a very fine fuscous hindmarginal line: cilia pale ochreous. Hindwings whitish, obscurely spotted with pale fuscous; cilia whitish.

Broken Hill, N.S.W.; two specimens in October.

CAPUA PLACODES, n.sp.

♂. 20 mm. Head, palpi and thorax blackish-fuscous. Antennæ greyish-fuscous. Abdomen and legs greyish; anterior legs blackish, tibiæ and tarsi ringed with whitish. Forewings moderate, hardly dilated, costa gently arched, hindmargin oblique; ochreous-fuscous; basal patch blackish; outer edge very irregular, from $\frac{1}{5}$ costa to $\frac{1}{6}$ inner margin, with an acute projection in middle; an outwardly oblique dark fuscous fascia, reaching half across wing, from before middle of costa to middle of disc; costa and inner margin spotted throughout with black; three teeth of groundcolour on costa, between middle and apex, each containing one or two minute spots of black; an elongate blackish spot on middle of hindmargin: cilia ochreous-fuscous, with a suffused blackish median line. Hindwings greyish, obscurely spotted with fuscous, more pronounced towards apex; cilia greyish, with a fuscous median line.

Broken Hill, N.S.W.; three specimens, taken at light, in November and December.

In the "*sordidatana*" group.

DIPTERINA (?) PHYLLODES, n.sp.

♂♀. 10-12 mm. Head, palpi and thorax olive-green, palpi whitish internally, second joint triangularly scaled, terminal joint short, $\frac{1}{3}$ of second. Antennæ ochreous. Abdomen fuscous. Legs fuscous-whitish, anterior coxæ white. Forewings rather short, somewhat dilated posteriorly, costa gently arched, apex round-pointed, hindmargin hardly oblique; olive-greenish, strigulated with darker greenish and fuscous; costal edge irregularly whitish throughout: costa obliquely strigulated with blackish; a broad ill-defined, oblique, blackish fascia from beyond middle of costa to inner margin before anal angle, outer edge more pronounced and with a longitudinal black streak in middle, fascia obsolete in some specimens; a rhomboid blackish spot on costa at apex, preceded by two fine short oblique lines of white, and edged beneath by a similar line; a small blackish quadrate spot on hindmargin above middle, edged above and below by a short line of whitish; a dark fuscous hindmarginal line, not reaching anal angle: cilia fuscous, with a whitish tooth at apex, and an obscure median line. Hindwings blackish, basal half much lighter; cilia dark fuscous, with a greyish basal line.

I hardly feel satisfied in placing this species in this genus, as it presents somewhat different characters from that of *Dipterina;* for instance, the palpi are longer and somewhat more porrected, and the neuration of the forewings is noticeable on account of the close approximation of veins, 3, 4 and 5, leaving 6 widely remote; vein 3, which is from angle of cell, is so curved as to approximate to 4 closely at base and on hindmargin.

Brisbane, Queensland; two specimens in December.

Arotrophora gonomela, n.sp.

♂♀. 20-23 mm. Head, thorax, antennæ and abdomen dark fuscous. Palpi moderate, fuscous dusted with whitish. Anterior legs dark fuscous, posterior and middle pair greyish, tibiæ with blackish rings. Forewings elongate, moderate, dilated posteriorly, costa nearly straight, apex rounded, hindmargin obliquely rounded; dark fuscous, with fine transverse darker strigulæ throughout; costa obscurely strigulated throughout with darker; a broad blackish fascia, anterior edge indicated by a fine inwards-curved waved blackish line, from about $\frac{1}{6}$ of costa to $\frac{1}{6}$ inner margin, posterior edge oblique, from costa in middle to inner margin beyond $\frac{1}{3}$, with a slight indentation just above inner margin, the colour of fascia more pronounced on lower $\frac{1}{2}$, the upper portion inclined to shade into groundcolour; a moderate, obscurely indicated fuscous patch beneath apex, irregularly edged by a fine dentate line, anterior edge curved so as to meet posterior line of fascia; two or three short, curved black lines around apex: cilia dark fuscous, mixed with ferruginous, and with a few whitish scales. Hindwings slightly sinuate beneath apex; light fuscous, becoming darker around hindmargin; cilia light fuscous, tips darker, and with a well-defined basal line.

Blackwood, South Australia; three specimens dislodged from *Banksia* sp., in September.

GRAPHOLITHIDÆ.

Laspeyresia lomacula, n.sp.

♂♀. 9-12 mm. Head and antennæ fuscous-whitish. Palpi whitish, terminal joint short, fuscous. Thorax dark fuscous. Abdomen fuscous. Legs grey-whitish; anterior and middle tibiæ and tarsi blackish, ringed with whitish. Forewings moderate, rather dilated, costa hardly arched, hindmargin hardly oblique, sinuate beneath apex; dark fuscous mixed with whitish; numerous very oblique black lines on costa, the majority reaching nearly half across wing, separated on costa by dull interspaces of dull metallic whitish; numerous outwardly oblique lines from inner margin, those on posterior half meeting costal lines; a quadrate blotch of white on inner margin, often obsolete, anterior edge from beyond $\frac{1}{3}$, very outwardly oblique, reaching more than $\frac{1}{2}$ across wing, posterior edge irregular, obscure, from about $\frac{2}{3}$; three outwardly oblique, dull leaden-metallic finely black-edged streaks, first from before $\frac{2}{3}$ of costa to anal angle; second parallel, from costa just beyond to middle of hindmargin, thence continued along hindmargin to anal angle; third very short, just before apex; between the first and second is a small leaden-metallic patch containing three sharply defined black streaks, upper the largest, the patch is edged posteriorly by a short line of silvery-whitish : cilia dark fuscous, with whitish basal line. Hindwings dark bronzy-fuscous; cilia fuscous, tips whitish with a dark fuscous subbasal line.

Broken Hill, N.S.W.; several specimens in October.

A neat little species, rather variable; the whitish blotch on inner margin is very often obscured by the groundcolour. It is nearest *iridescens*, Meyr.

TINEINA.

GELECHIADÆ.

Paltodora marmorea, n.sp.

♂. 8-10 mm. Head, thorax, antennæ and palpi whitish; second joint of palpi loosely haired beneath, fuscous beneath and at base internally, terminal joint with a fuscous subapical ring. Anterior and middle legs fuscous; anterior coxæ whitish; posterior legs whitish, suffusedly banded with fuscous. Abdomen greyish. Forewings elongate, narrow, pointed; white; two irregular oblique pale fuscous parallel fasciæ, first from costa near base to $\frac{1}{5}$ inner margin; second just beyond; both fasciæ with a few blackish spots on margins; a fine elongate blackish mark in middle of disc; a second in a direct line beyond; a pale fuscous patch on inner margin immediately below; costa from second fascia to about $\frac{5}{6}$, pale fuscous; apex fuscous-tinged, more pronounced at extreme apex : cilia greyish, becoming fuscous at apex and on costa. Hindwings with termen emarginate, strongly produced; grey-whitish; cilia nearly 3, grey-whitish.

Broken Hill, N S.W.; two specimens in October.

Gelechia perdita, n.sp.

♂♀. 12-14 mm. Head white. Palpi ochreous-white, terminal joint with blackish rings at and below apex; second joint roughened on apical half, somewhat grooved. Antennæ and thorax fuscous; antennæ more than $\frac{3}{4}$ of wing. Abdomen fuscous, mixed with silvery-grey and whitish; three basal segments orange-yellow. Legs fuscous-whitish; tarsi black, ringed with whitish; posterior legs whitish, slightly infuscated. Forewings elongate, moderate, costa gently arched, apex somewhat pointed, hindmargin extremely obliquely rounded; dark fuscous; a very indistinct fine blackish line along fold of wing; two obscure blackish dots in middle of disc, beyond $\frac{1}{3}$ from base; a few blackish spots at base: generally all these markings are obliterated by general groundcolour: cilia blackish-fuscous, terminal half more or less greyish. Hindwings with hindmargin slightly sinuate beneath apex; apex somewhat produced; dull greyish-fuscous, thinly scaled; a very fine, obscure, somewhat interrupted hindmarginal line; cilia fuscous with a greyish-ochreous basal line.

Broken Hill, N.S.W.; ten specimens during August.

GELECHIA PYCNODA, n.sp.

♂♀. 10-12 mm. Head, thorax, antennæ and palpi dull fuscous-reddish; antennæ whitish-tinged, basal joint whitish, terminal joint of palpi ochreous-tinged, with blackish basal and subapical rings: second joint internally ochreous-whitish, roughened on apical half, somewhat grooved. Legs fuscous-whitish, tarsi blackish, with whitish rings; posterior legs dull whitish. Abdomen dull leaden, three anterior segments dull greyish. Forewings shaped as in *perdita;* dull reddish-fuscous, irregularly strigulated with blackish; a fine, somewhat obscure, direct blackish line from base in middle to inner margin at anal angle; three obscure dark fuscous dots arranged in a longitudinal series in middle of wing, first near base, second just before middle, and third just before end of cell, somewhat all more or less merged into groundcolour: cilia greyish, basal half dark fuscous, mixed with some blackish scales. Hindwings with termen sinuate, apex somewhat produced; grey-whitish, thinly scaled; cilia grey, base ochreous-tinged.

Broken Hill, N.S.W.; ten specimens, taken from June to October.

Somewhat allied to *perdita*, but, apart from its more reddish colouring, it is distinguished from that species by the abdomen, &c.

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GELECHIA COSMODES, n.sp.

♂♀. 8-16 mm. Head, thorax, antennæ and abdomen blackish-fuscous; antennæ $\frac{3}{4}$ of wing, irregularly annulated with white, abdomen sometimes somewhat shining, face whitish Palpi blackish, second joint internally whitish and somewhat mixed with whitish externally in middle; terminal joint with three equidistant whitish rings. Legs dark fuscous, with whitish tarsal rings; posterior pair blackish, with tibiæ and tarsi irregularly ringed with whitish. Forewings as in *G. perdita*, but somewhat narrower; reddish-ferruginous, with black and golden-metallic markings; a small black basal patch, outer edge moderately straight, indented in middle, where there are a few golden-metallic scales; a narrow outwardly oblique golden-metallic fascia, from costa at $\frac{1}{4}$ to beyond inner margin at $\frac{1}{3}$, sometimes hardly reaching inner margin; an irregular black quadrate spot on costa immediately beyond, reaching more than half across wing; a second, similar to first, golden-metallic fascia, not so oblique as first, immediately beyond quadrate spot, sometimes broken, from middle of costa to middle of inner margin; a small roundish ochreous-white spot on costa at $\frac{3}{4}$, lower half reddish-tinged, reaching nearly half across wing; a golden-metallic patch of scales beneath, but slightly anterior; a blackish elongate spot on costa between second fascia and whitish spot; hindmarginal area beyond black: cilia blackish, becoming greyish on terminal half on middle of hindmargin. Hindwings with termen sinuate beneath apex, apex somewhat produced; pale fuscous; cilia greyish-fuscous.

Broken Hill, N.S.W.; taken occasionally at light, from September to November.

A very elegant little species, not approaching any other Australian species known to me.

GELECHIA LITHINA, n.sp.

♂♀. 9-12 mm. Head, palpi, antennæ and thorax dark fuscous, second joint of palpi moderately smooth, antennæ at base beneath whitish, tarsi ringed with whitish. Abdomen greyish-fuscous. Forewings elongate, moderate, costa gently arched, apex rounded, hindmargin obliquly rounded, narrower than hindwings; dark fuscous; three obscure equidistant blackish marks, placed longitudinally, slightly above middle of wing; an elongate blackish mark along fold at $\frac{1}{5}$ from base, followed by a similar less distinct mark above and before anal angle; costa more or less spotted throughout with blackish; a fine obscure blackish line around apex: cilia greyish, with a distinct median line of blackish scales, becoming obsolete towards anal angle. Hindwings with termen sinuate beneath apex, apex hardly pointed; greyish, thinly scaled; cilia greyish, with a fuscous tooth at apex.

Broken Hill, N.S.W.; five specimens bred during October and November, from spun-up shoots of *Dodonæa* sp. (Native Hop).

An obscure little species.

Gelechia desmatra, Lower.

(Trans. Roy. Soc. S.A. 1897, p. 56.)

Recent captures of this species prove it to be identical with *Gelechia zygosema*, Meyr., MSS.; Mr. Meyrick informs me, however, that his name has not been published, consequently the name *desmatra* must be adopted for the species. My type is evidently a faded specimen; in the description the colour is given as whitish, whereas it should be yellow, as the series before me are all of that colour. I exceedingly regret the confusion.

Gelechia decaspila, n sp.

♀. 12 mm. Head, thorax, antennæ and palpi pale ochreous. Abdomen and legs greyish-ochreous. Forewings elongate, moderate, costa gently arched, apex somewhat pointed, hindmargin very oblique; pale ochreous; markings black; a very small spot on costa at base; three small spots, first on costa beyond $\frac{1}{6}$; second in middle of wing, obliquely below and beyond; third obliquely below and beyond second, not very near inner margin; an elongate mark on costa before middle; a second, similar but more suffused and elongate, on costa at $\frac{3}{4}$; a small spot on inner margin at anal angle; an elongate mark immediately above this; a more or less suffused interrupted hindmarginal line: cilia pale ochreous-yellowish. Hindwings with hindmargin somewhat sinuate beneath apex; pale greyish, darker on margins; cilia grey-whitish, with a pale line at base.

Stawell, Victoria; three specimens in October.

PARATHETA CALYPTRA, n.sp.

♂♀. 9-12 mm. Head whitish. Thorax light fuscous, whitish on margins. Palpi light fuscous, terminal joint whitish, with fuscous subapical ring. Antennæ and legs fuscous, middle and posterior tibiæ mixed with whitish. Abdomen fuscous, with silvery-grey segmental margins. Forewings elongate-linear, apex pointed; whitish, tinged with fuscous; a fuscous spot at base of costa, somewhat extended to inner margin; an irregular fuscous triangular spot on inner margin, reaching half across wing; a fuscous quadrate spot on inner margin immediately beyond, groundcolour snow-white between; sometimes both spots are more or less continued transversely to costa, forming irregular fasciæ; a fuscous spot on costa at $\frac{5}{6}$, sometimes continued direct to anal angle; immediately followed on costa by a snow-white spot; a small dark fuscous spot at apex, sometimes irregularly continued to anal angle: cilia greyish, with an irregular row of blackish at base. Hindwings linear, apex pointed, narrower than forewings; pale greyish; cilia 3, pale greyish-ochreous.

Broken Hill, N.S.W.; common at light during October.

PARATHETA OCHROCOMA, n.sp.

♂♀. 11-14 mm. Head and thorax whitish. Palpi fuscous, second joint white at base and apex, terminal joint white with a fuscous subapical ring. Antennæ white, obscurely annulated with fuscous. Abdomen dark fuscous, with whitish segmental rings, anal tuft greyish-ochreous beneath. Legs fuscous, strongly sprinkled with white. Forewings shaped as in *calyptra;* dark ashy-grey-whitish; base of wing slightly whitish-tinged; an obscure, sometimes imperfect, narrow outwardly oblique fuscous fascia from inner margin beyond $\frac{1}{3}$ to costa at $\frac{1}{3}$, immediately preceded by a patch of its own width of snow-white, sometimes nearly merged into groundcolour, sometimes the white is edged on either side by an irregular dark fuscous fascia, which reaches half across wing; a dark fuscous spot at apex, sometimes continued obscurely along hindmargin to anal angle: cilia greyish-ochreous, with a few blackish scales at base, terminal edge lighter. Hindwings as in *calyptra*: fuscous; cilia light fuscous, with a well defined ochreous basal line throughout.

Broken Hill, N.S.W.; ten specimens during October and November.

Allied to the preceding; but easily distinguished from that species by the clearness of markings, &c.

PARATHETA LASIOMELA, n.sp.

♂♀. 11-14 mm. Head and thorax dark fuscous, face white, patagia whitish. Antennæ whitish, obscurely annulated with blackish. Abdomen blackish, white beneath, in some specimens with grey-whitish segmental rings above. Palpi fuscous, base of second joint whitish, terminal joint whitish with blackish subapical band. Legs fuscous, strongly sprinkled with white. Forewings shaped as in *P. calyptra:* dark fuscous, somewhat mixed with whitish; a narrow obscure whitish basal fascia, absent in some specimens; a second similar, hardly oblique fascia, from $\frac{1}{3}$ of inner margin to about $\frac{1}{3}$ of costa; a much broader rather obscure fuscous-whitish fascia-like patch, beyond and parallel, reaching margins; a small white tooth on costa before apex; some scattered white scales around hindmarginal area: cilia dark fuscous, mixed with two or three whitish teeth on upper half, becoming grey around anal angle. Hindwings formed as in *calyptra:* blackish-fuscous; cilia blackish, with greyish basal line.

Broken Hill, N.S.W.; five specimens in October.

Allied to the two preceding species, but immediately distinguished by its more blackish colouring throughout. It cannot be confused with the others.

XYLORYCTIDÆ.

Lichenaula drosias, n.sp.

♂♀. 20-22 mm. Head, palpi and thorax ashy-grey-whitish, thorax narrowly snow-white anteriorly, second joint of palpi with a suffused whitish apical ring, more whitish internally. Antennæ blackish, annulated with white. Anterior and middle legs fuscous; tarsi blackish, ringed with white; posterior legs whitish. Abdomen fuscous, beneath white, segmental margin grey-whitish. Forewings moderate, rather short, hardly dilated, costa hardly arched, except at base, hindmargin oblique; 7 to apex: white, very finely irrorated with black and grey scales, so as to appear ashy-grey-whitish; extreme costal edge whitish; a small blotch-like suffusion in disc at $\frac{2}{5}$ from base, more or less connected by a fine black line from base to middle; the blotch is immediately followed by a well marked spot of groundcolour; an obscure row of blackish spots along apical fifth of costa: cilia blackish, chequered with whitish and grey-whitish points; terminal edge black. Hindwings pale greyish-fuscous; cilia whitish, with pale fuscous basal and subterminal lines.

Broken Hill, N.S.W.; several specimens in October and November.

Xylorycta melanias, n.sp.

♂♀. 16-20 mm. Head, thorax, palpi and legs white, thorax streaked with blackish, second joint of palpi laterally fuscous, tibiæ and tarsi banded with blackish. Antennæ white, becoming fuscous towards apex, ciliations over 1. Abdomen greyish-ochreous, segmental margin whitish. Forewings elongate, moderate, costa gently arched, apex rounded, hindmargin obliquely rounded; snow-white, finely irrorated throughout with blackish; markings very obscure; a short black dash from near base in middle; a small black mark on costa, close to base; a suffused blackish mark on fold before middle; a small black spot at end of cell; an irregular row of black spots along hindmargin: cilia white, mixed with blackish. Hindwings pale fuscous-whitish, darker round margins; cilia white mixed with fuscous.

Broken Hill, N.S.W.; ten specimens during October and November.

A very variable species; the description is drawn from a well marked specimen; in some specimens the markings are scarcely traceable owing to the groundcolour. The species, when at rest, is an admirable imitation of birds' droppings.

Scieropepla megadelpha, n.sp.

♂♀. 18-24 mm. Head and thorax shining snow-white. Antennæ and palpi fuscous, palpi internally and base of second joint whitish. Anterior and middle legs fuscous; coxæ shining snow-white; posterior legs whitish. Abdomen yellowish. Forewings elongate, moderate, costa gently arched, apex round-pointed, hindmargin very obliquely rounded, 7 and 8 long-stalked, 7 to costa; shining snow-white; a fine fuscous line along costa from middle to apex, attenuated anteriorly; a moderate fuscous streak along inner margin, from near base to hindmargin, posteriorly attenuated: cilia shining snow-white. Hindwings pale whitish-ochreous; cilia as in forewings.

Broken Hill, N.S.W.; twelve specimens, mostly taken at electric light, from August to November.

This species furnishes another instance of remarkable mimicry; in general appearance it resembles *Chalarotona craspedota*, Meyr., so closely that one could easily be persuaded into considering it that species, but the neuration affords a safe distinguishing test. I have examined no fewer than nine specimens, in which each and every one was structurally identical with the genus *Scieropepla*, Meyr. A species named by Dr. Turner (*Annals Queensland Museum*, No. 4, 1897) as *Lichenaula dissimilis* must be (according to description) very similar in appearance, but the termination of vein 7, which is hindmarginal, and the larger size should be sufficient characters to distinguish it from the two species previously mentioned.

Procometis heterogama, n.sp.

♂. 20 mm.: ♀. 30-32 mm. Head in ♂ whitish, in ♀ fuscous. Thorax fuscous, patagia whitish. Antennæ white, annulated with black. Palpi fuscous, internally white, second joint externally whitish at base. Legs whitish, sprinkled with fuscous; anterior pair more fuscous-tinged. Abdomen fuscous, segmental margins silvery-grey. Forewings elongate, moderate, costa gently arched, hindmargin obliquely rounded; ashy-grey in ♀, strongly suffused with white in ♂, so as to become almost wholly whitish. a moderate snow-white streak along costa, from very near base to apex, finely attenuated at extremities; extreme costal edge from base to $\frac{1}{8}$, fuscous; a suffused spot of fuscous on inner margin at $\frac{1}{4}$; a second in middle of wing; a third somewhat larger, slightly below and beyond second; costal streak edged more or less throughout with a fine fuscous line; a fine fuscous hindmarginal line: in ♀ all these markings are obscured by general ground-colour, but sometimes there are a few indications of accumulations of fuscous scales along veins and hindmargin: cilia in ♀ dark fuscous; in ♂ greyish-ochreous, mixed with fuscous. Hindwings in ♂ greyish-ochreous, fuscous-tinged round margins; in ♀ dark fuscous; cilia ochreous-grey-whitish, with a fine fuscous basal line; in ♀ greyish-fuscous, with a very distinct dark fuscous line close to base.

Broken Hill, N.S.W.; nine specimens during October, usually taken at light.

Although the sexes of this species differ somewhat in size and appearance, it is an easily recognised species, varying very little. It recalls *Scieropepla argoloma*, Lower, in general appearance.

A curious deformity is noticeable in one of my specimens, wherein the neuration of the forewings consists of nine veins instead of eight, the extra one being formed by the very short stalking vein 7.

Agriophara hyalinota, n.sp.

♂♀. 36-40 mm. Head, palpi, antennæ and thorax pale ashy-grey, palpi white externally. Abdomen greyish-ochreous. Legs whitish mixed with fuscous, coxæ snow-white. Forewings elongate-ovate, costa gently arched, apex rounded, hindmargin strongly rounded, oblique; pale ashy-grey; extreme costal edge ochreous-whitish; a suffused fuscous spot at $\frac{1}{3}$ of inner margin; a large blackish dot at end of cell; an irregular fuscous dot in disc, at $\frac{1}{3}$ from base; a row of rather ill-defined fuscous spots, from beneath costa in middle, curved round apex, along hindmargin to anal angle: cilia pale ashy-grey-whitish. Hindwings pale ochreous in ♂; greyish-ochreous in ♀, somewhat infuscated around apex and hindmargin; cilia pale ochreous-whitish, with a pale fuscous median line.

Parkside, South Australia; Duaringa, Queensland; two specimens, ♂ and ♀, in December.

Intermediate in form between *gravis*, Meyr., and *cinderella*, Newman, differing from both principally by the hindwings.

ŒCOPHORIDÆ.

Eulechria nepheloma, n.sp.

♂♀. 15-18 mm. Head and thorax whitish, thorax sometimes infuscated. Palpi, antennæ and legs fuscous. Abdomen ochreous. Forewings elongate, moderate, somewhat narrowed, costa gently arched, apex round-pointed, hindmargin oblique; greyish-fuscous, sparsely mixed with whitish and blackish scales; a moderate whitish costal streak, from base to middle, finely attenuated posteriorly; extreme costal edge fuscous on anterior half: cilia fuscous, greyish at tips. Hindwings fuscous; cilia as in forewings.

Broken Hill, N.S.W.; five specimens in October.

Eulechria autophylla, n.sp.

♂♀. 28-30 mm. Head, palpi, antennæ and thorax ashy-grey-fuscous, antennal ciliations 1. Abdomen greyish-ochreous. Legs greyish-ochreous, anterior pair infuscated. Forewings elongate, moderate, costa gently arched, apex round-pointed, hindmargin obliquely rounded; dark ashy-grey-whitish; markings obscure; a fine blackish line along lower edge of anterior half of cell; a similar streak along posterior half of upper portion of cell; a few obscure blackish streaks towards hindmargin; a few blackish scales along inner margin towards base; sometimes a fuscous dot at $\frac{1}{3}$ from base in middle; a second immediately below and beyond; a third above cell at about $\frac{1}{2}$, and one or two somewhat confluent, at end of cell: cilia ashy-grey. Hindwings greyish, lighter towards base; cilia ochreous-grey.

Broken Hill, N.S.W.; three specimens at light.

In the "*sicella*" group.

Eulechria actias, n.sp.

♂. 12-14 mm. Head and palpi whitish. Antennæ fuscous, annulated with white. Legs fuscous, posterior pair ochreous-whitish Abdomen dark fuscous. Forewings elongate, moderate, rather short, costa greatly arched, apex rounded, hindmargin obliquely rounded; whitish, margins strongly irrorated with dark fuscous; hindmarginal area beyond cell more densely irrorated; a minute black dot at $\frac{1}{3}$, in middle; a second, much larger, beyond; two confluent spots at end of cell: cilia greyish, with a median fuscous parting line. Hindwings dark fuscous; cilia fuscous, ochreous-tinged at base.

Broken Hill, N.S.W.; six specimens in April and October.

Philœopola inferna, n.sp.

♂♀. 18-20 mm. Head, thorax, antennæ, legs and palpi dark fuscous, antennæ with a few hairs at base, ciliations $\frac{1}{2}$, palpi with a distinct tip of yellow at apex of terminal joint, apex of second joint obscurely whitish; posterior legs greyish, with obscure fuscous tarsal rings. Forewings elongate, moderate, costa gently arched, hindmargin obliquely rounded; blackish-fuscous, with very faint indications of a few black dots in disc: cilia dark fuscous, tips greyish. Hindwings greyish, fuscous-tinged, darkest at apex; cilia greyish, basal third ochreous-tinged.

Broken Hill, N.S.W.; several specimens during March and April; usually taken at light.

Although obscure-looking this species is easily recognised by the yellow tip of the second joint of the palpi, which is a distinctive character.

NEPHOGENES ZALIAS, n.sp.

♂♀. 10-12 mm. Head whitish. Thorax fuscous-whitish, patagia white. Abdomen dark fuscous. Antennæ and palpi fuscous-whitish, terminal joint of palpi white. Legs fuscous, posterior pair grey-whitish. Forewings elongate, moderate, narrow, costa gently arched, apex round-pointed, hindmargin very oblique; whitish, somewhat infuscated; a black dot beyond $\frac{1}{3}$ in middle; a second, larger, beyond and immediately below; two confluent spots at end of cell; a few blackish spots and scales around hindmargin: cilia ashy-grey-whitish. Hindwings light fuscous; cilia greyish, with an obscure fuscous line near base.

A small and obscure species, not very near any other.

Broken Hill, N.S.W.; five specimens in October.

NEPHOGENES OLYMPIAS, n.sp.

♂♀. 22-24 mm. Head, palpi, antennæ and thorax ashy-grey-whitish; base of antennæ, and palpi internally white. Abdomen ochreous, segmental margins dull silvery-whitish. Legs fuscous-whitish, posterior pair whitish. Forewings elongate, moderate, costa gently arched, hindmargin oblique; pale ashy-grey-whitish; extreme costal edge whitish, from $\frac{1}{3}$ to apex; an obscure suffused fuscous spot at end of cell, obscurely edged above with whitish; groundcolour towards apex more fuscous-tinged: cilia whitish, mixed with blackish and whitish points. Hindwings greyish; cilia greyish, ochreous at base; tips fuscous-tinged.

Broken Hill, N.S.W.; three specimens in October.

NEPHOGENES SILIGNIAS, n.sp.

♂♀. 16-19 mm. Head white. Thorax dark fuscous, patagia white, collar whitish. Antennæ dark fuscons, obscurely annulated with white. Palpi and legs dark fuscous, posterior legs ochreous. Abdomen greyish-ochreous, anal tuft yellowish. Forewings elongate, moderate, costa gently arched, apex rounded, hindmargin oblique; ashy-fuscous, suffusedly irrorated with white; a more or less suffused dark fuscous costal streak, somewhat obscure in some specimens, from base to $\frac{3}{4}$; three equidistant blackish spots on middle of lower extremity of streak; a larger somewhat elongate spot, immediately beneath first of the three spots; two minute spots at end of cell, somewhat crescentic; an obscure outwards-curved row of black scales, from costa before apex to anal angle, indented beneath costa; a very obscure row of blackish hindmarginal dots: cilia ashy-grey-whitish, with a fuscous median line. Hindwings greyish-ochreous; cilia ochreous.

Broken Hill, N.S.W.; several specimens in October and November, mostly at light.

Nephogenes melanthes, n.sp.

♂. 16 mm. Head whitish. Thorax fuscous, patagia whitish. Antennæ and palpi fuscous-whitish, palpi internally and on sides white. Legs fuscous, posterior pair yellowish. Abdomen greyish, segmental margins ochreous-grey. Forewings elongate, moderate, costa gently arched, apex rounded, termen oblique; fuscous, suffusedly mixed with whitish in disc, markings of wing darker fuscous: cilia greyish, with some dark fuscous scales at base. Hindwings pale yellow, somewhat infuscated; cilia yellowish, terminal half greyish.

Broken Hill, N.S.W.; common during October and November.

Allied to the preceding, but easily distinguished from that and the other grey species by the yellow hindwings.

Philobota habrodes, n.sp.

♂♀. 12-17 mm. Head pale reddish. Palpi fuscous, internally and at base externally dull fleshy-pink, collar narrowly white. Thorax brownish, patagia white posteriorly. Abdomen fuscous. Antennæ fuscous, obscurely annulated with whitish. Legs fuscous, middle and posterior pair mixed with whitish; hairs of posterior tibiæ mixed with dull reddish. Forewings rather narrow, costa gently arched, apex round-pointed, hindmargin obliquely rounded; fuscous; a short white fascia from base of wing to middle of inner margin at $\frac{1}{8}$, obscure in some specimens;

a moderate fleshy-red longitudinal streak from base along fold to apex, becoming whitish at apex, interrupted just before middle by a spot of dark fuscous, and very broadly above anal angle; a dark fuscous spot anterior to and above first spot, posteriorly followed by an elongate streak of fleshy-pink to end of cell, where it meets another fuscous spot; a more or less obscure fuscous spot immediately beyond; all markings somewhat obscured by general groundcolour: cilia fuscous, mixed with dark reddish and with a tooth of whitish at apex. Hindwings bright orange, becoming broadly fuscous round apex, and narrowly along hind-margin; veins sometimes outlined with fuscous; sometimes the whole of wing is obscured with fuscous.

Broken Hill, N.S.W.; seventeen specimens during April.

Pleurota pyrosema, n.sp.

♂♀. 28 mm. Head, palpi and thorax greyish, base of second joint of palpi blackish externally. Abdomen greyish-ochreous. Antennæ greyish, ciliations 1, becoming shorter towards apex. Legs greyish-fuscous, posterior tibiæ thinly banded with yellowish. Forewings elongate, moderate, rather broad, costa gently arched, hindmargin obliquely rounded: dark fuscous, finely dusted with black; an orange-red spot at end of cell; a hindmarginal row of black dots, continued round apex to costa: cilia dark fuscous, becoming greyish on terminal third. Hindwings greyish-fuscous: cilia greyish-fuscous, becoming fuscous-tinged at base.

Broken Hill, N.S.W.; three specimens in May.

Easily known by its large size and reddish discal spot.

Peltophora eugramma, Lower.

(Trans. Roy. Soc. S.A. 1894, p. 99.)

I have seen a specimen of this species wherein the whole of the apical area of forewings from the curved fascia at $\frac{5}{6}$ is dark fuscous, excepting a few elongate streaks of groundcolour near hindmargin. The hindwings are somewhat paler than the type.

Cæsyra pelodesma, n.sp.

♂♀. 15-18 mm. Head and palpi whitish-ochreous, palpi beneath, especially base of second joint, fuscous-tinged. Antennæ fuscous. Abdomen pale ochreous-whitish. Thorax purplish-coppery, anteriorly ochreous-whitish. Legs fuscous, posterior pair yellowish. Forewings elongate, moderate, costa moderately arched, apex round-pointed, hindmargin obliquely rounded; pale yellow; costal edge fuscous at base; a nearly straight irregularly edged coppery-fuscous fascia, from $\frac{3}{5}$ costa to just before anal angle, narrowest above and slightly constricted beneath costa: cilia dull fuscous, tips darker; sometimes an ochreous median line. Hindwings with hindmargin slightly sinuate beneath apex; pale ochreous, sometimes slightly infuscated; cilia pale ochreous.

Broken Hill, N.S.W.; several specimens, from August to October.

Not unlike *Brachynemata cingulata*, Meyr., at first sight.

Cæsyra xanthocoma, n.sp.

♂♀. 16-18 mm. Head and thorax grey-whitish, patagia ochreous-whitish. Palpi dark fuscous, dusted with white. Antennæ fuscous. Legs and abdomen blackish; hairs of posterior legs ochreous. Forewings elongate, moderate, costa hardly arched, apex round-pointed, hindmargin oblique; pale whitish-ochreous, more ochreous on margins: cilia pale ochreous. Hindwings fuscous; cilia yellowish, becoming darker at base.

Broken Hill, N.S.W.; four specimens, in October.

Ocystola holodryas, n.sp.

♀. 12-15 mm. Head dull ochreous. Palpi, thorax and legs fuscous, palpi internally paler, terminal $\frac{1}{2}$ of second; posterior legs greyish. Abdomen greyish-fuscous. Forewings elongate, moderate, costa nearly straight, apex hardly pointed, hindmargin oblique; dull ochreous-fuscous, with some fuscous scales which coalesce to form an irregular spot at end of cell; a second but smaller one at $\frac{1}{3}$ from base, and indications of a third below and beyond second:

cilia pinkish-coppery, becoming fuscous at tips and around anal angle. Hindwings greyish-fuscous; cilia fuscous with an ochreous basal line.

Broken Hill, N.S.W.; three specimens in October.

Borkhausenia maculifera, n.sp.

♂♀. 16-18 mm. Head, palpi and thorax pale ochreous, second joint of palpi with a few fuscous scales externally. Antennæ fuscous, ciliations 1. Abdomen ochreous, segmental margins silvery-grey. Legs fuscous, posterior pair ochreous, somewhat mixed with fuscous. Forewings elongate, moderate, costa gently arched, hindmargin very obliquely rounded, 2 from before angle of cell, 3 and 4 remote at base, 7 and 8 stalked, 7 to costa; pale ochreous; costa narrowly blackish at base; an obscure fuscous spot on fold at $\frac{1}{3}$; a second obliquely above and beyond, and a third more distinct at end of cell; a few ill-defined fuscous scales around apex and along hindmargin : cilia greyish-ochreous, with a few fuscous scales. Hindwings with 3 and 4 from a point; grey; cilia pale greyish-ochreous.

Broken Hill, N.S.W.; five specimens in October and November.

Macrobathra metallica, n.sp.

♂♀. 8-10 mm. Head, thorax and abdomen dark fuscous, more or less sprinkled with metallic scales, patagia dull brassy-metallic. Palpi whitish, terminal joint more or less infuscated. Legs fuscous-whitish, anterior pair more fuscous. Antennæ fuscous, obscurely annulated with whitish. Forewings narrow, elongate-lanceolate ; dark fuscous ; three ochreous fasciæ, somewhat irregular, edged with blackish and more or less obscured; first outwardly oblique, from $\frac{1}{3}$ costa towards inner margin, but hardly reaching it, sometimes broken in middle, edged anteriorly with a fine line of darker fuscous; second from middle of costa, reaching half across wing, edged anteriorly on lower edge with a small blackish spot; third from just before apex, somewhat cuneiform, and projecting outwards below middle, very obscurely continued to inner margin : cilia greyish, suffusedly mixed with blackish round apex. Hindwings grey-whitish, somewhat shining, slightly infuscated at apex; cilia as in forewings.

Broken Hill, N.S.W.; three specimens during October.

Macrobathra phernæa, n.sp.

♂. 10 mm. Head and palpi ochreous-white, terminal joint of palpi infuscated. Thorax and antennæ dark fuscous. Abdomen greyish. Legs fuscous mixed with whitish, posterior pair whitish-ochreous. Forewings narrow, elongate-lanceolate; dark fuscous, with ochreous-whitish markings; a moderate nearly straight fascia, from $\frac{1}{5}$ costa to $\frac{1}{5}$ inner margin; a triangular spot on costa in middle, reaching nearly half across wing; a moderate inwardly oblique fascia, from costa before apex to anal angle, sometimes separated by groundcolour in middle; an obscure streak along inner margin along median third, connected with first fascia, often obsolete: cilia greyish-fuscous, with some black scales at base. Hindwings greyish, thinly scaled; cilia pale greyish-fuscous.

Broken Hill, N.S.W.; four specimens in October.

Macrobathra syncoma, n.sp.

♂♀. 10-12 mm. Head and thorax dark fuscous; face whitish. Palpi whitish; terminal joint fuscous. Antennæ fuscous, becoming whitish on median third. Abdomen greyish. Legs fuscous, irregularly banded with whitish. Forewings rather narrow, elongate-lanceolate; dark fuscous; a narrow ochreous-whitish fascia from costa at $\frac{1}{3}$ to inner margin at $\frac{1}{3}$, sometimes hardly reaching inner margin; a broader, slightly oblique, ochreous-white fascia, from costa at $\frac{5}{6}$ to inner margin before anal angle; a few whitish scales in disc between fasciæ, sometimes absent: cilia greyish-fuscous. Hindwings pale fuscous; cilia greyish-fuscous, mixed with ochreous on basal half.

Broken Hill, N.S.W.; three specimens in October.

ELACHISTIDÆ.

Batrachedra hologramma, n.sp.

♂♀. 8-10 mm. Head whitish. Thorax and antennæ fuscous-whitish. Abdomen fuscous, becoming grey on posterior segments.

Palpi fuscous, second joint with whitish apical ring, apex of terminal joint white. Legs fuscous, middle and posterior pair whitish. Forewings elongate, narrow, pointed; white; four (sometimes five) fine equidistant black longitudinal lines from base to hindmargin, sometimes the lower two terminate abruptly before hindmargin: cilia greyish, with some black and white streaks at apex. Hindwings lanceolate-linear, about half as broad as forewings; grey; cilia as in forewings, suffusedly ochreous on basal half.

Broken Hill, N.S.W.; six specimens in October.

Batrachedra capnospila, n.sp.

♂♀. 11-13 mm. Head, palpi and thorax ochreous, second joint of palpi with suffused whitish apical band. Antennæ fuscous. Legs fuscous, sprinkled with whitish. Abdomen fuscous, dusted with whitish, anal tuft ochreous. Forewings elongate, pointed; a broad blackish dorsal stripe from base and continued to $\frac{2}{3}$, attenuated posteriorly, edged above throughout by a line of ochreous-white, becoming much dilated posteriorly; some scattered black scales above anal angle and along hindmargin, sometimes absent: cilia fuscous, tinged with ochreous at apex. Hindwings lanceolate-linear; light fuscous; cilia $3\frac{1}{2}$, ochreous; terminal $\frac{2}{3}$ pale fuscous.

Broken Hill, N.S.W.: three specimens in October.

Æoloscelis orthochroa, n.sp.

♂♀. 11-14 mm. Head, palpi, thorax and legs whitish, head ochreous on crown, palpi with a few scattered fuscous-ferruginous scales internally at base of second joint, a few near apex of terminal joint, anterior legs infuscate except coxæ. Antennæ fuscous, obscurely annulated with whitish, basal joint fuscous. Abdomen ochreous-greyish. Forewings narrow, pointed; shining white; a minute blackish spot at base of costa; a fuscous basal fascia, outer edge strongly marked in middle and on inner margin by a few blackish scales; an oblique ferruginous fascia from $\frac{1}{3}$ costa to middle of inner margin, sometimes aborted and not reaching either margin, but well marked in middle; a ferruginous patch above and before anal angle: cilia whitish, becoming ochreous at apex. Hindwings elongate-lanceolate; shining grey-whitish; cilia 3, colour as in forewings.

Broken Hill, N.S.W.; four specimens in October.

PYRODERCES SENTICA, n.sp.

♂♀. 10-12 mm. Head, palpi and thorax whitish, thorax posteriorly dark fuscous, palpi laterally fuscous. Antennæ dark fuscous, somewhat suffused with whitish beneath. Legs fuscous, posterior pair whitish. Abdomen dark fuscous. Forewings lanceolate; ochreous-whitish; markings fuscous; a short moderate streak along inner margin, from base to $\frac{1}{5}$; a moderate streak along costa, from base to $\frac{1}{3}$; a somewhat suffused streak, from $\frac{1}{4}$ inner margin, thence continued very obliquely to costa at $\frac{3}{4}$, with two suffused projections posteriorly, one just above inner margin, and one beneath costa; hindmargin more or less sprinkled with blackish scales; a fuscous spot at apex: cilia ochreous-fuscous. Hindwings narrow, lanceolate; light fuscous; cilia 4; ochreous.

Broken Hill, N.S.W.; three specimens at light, in October.

In markings not unlike some forms of *Stathmopoda.*

LIMNÆCIA EUGRAMMA, n.sp.

♂. 20 mm Head, palpi and antennæ ochreous-white, base of second joint of palpi fuscous externally. Thorax dark fuscous, patagia ochreous-whitish. Abdomen dull orange. Legs dull whitish-ochreous, more or less banded with fuscous. Forewings elongate, moderate; dark fuscous, with ochreous-whitish markings; a small spot on base of inner margin, not reaching costa; a rather broad nearly straight transverse fascia, anterior edge straight, posterior edge indented in middle, from $\frac{1}{3}$ of costa to $\frac{1}{3}$ inner margin; a similar fascia, from $\frac{2}{3}$ of costa to $\frac{2}{3}$ inner margin, lower extremity constricted and not quite reaching inner margin, anterior edge indented in middle, posterior edge straight; a third similar fascia, from costa before apex to anal angle, constricted in middle and tapering on lower half, sometimes bisected in middle by groundcolour: cilia fuscous, somewhat ochreous at base of third fascia. Hindwings dull bronzy-fuscous; cilia fuscous, becoming ochreous at base, except towards apex.

Broken Hill, N.S.W.; three specimens in November.

PLUTELLIDÆ.

HOMADAULA LASIOCHROA, n.sp.

♂♀. 10-12 mm. Head, thorax, abdomen, antennæ and palpi snow-white, palpi with a small black spot at base of second and terminal joints. Legs white, anterior and middle pairs strongly mixed with blackish, posterior pair more whitish, all tarsi blackish ringed with white. Forewings rather short, somewhat dilated posteriorly, costa gently arched, hindmargin obliquely rounded; snow-white, strongly spotted throughout with black, except basal third of costa; a well-marked elongate blackish blotch, just before middle, nearer to inner margin than to costa; a blackish spot in middle of disc at $\frac{5}{6}$ from base; costa and inner margin spotted with black, except basal third of costa: cilia whitish, fuscous-tinged on terminal half, and darker round apex. Hindwings shining greyish-fuscous, becoming whitish towards base, apex fuscous; cilia shining white, costal cilia fuscous.

Broken Hill, N.S.W.; three specimens in October, and one in January.

EUPSELIA IRIDIZONA, n.sp.

♂. 10 mm. Head and thorax yellowish, thorax somewhat mixed with fuscous. Antennæ, abdomen and palpi fuscous. (Legs broken). Forewings elongate, moderate, slightly dilated, costa gently arched, apex round-pointed, hindmargin oblique; yellow; a broad purplish-fuscous hindmarginal patch occupying posterior third of wing, anterior edge hardly straight, sinuate beneath costa, thence very slightly curved outwards to inner margin; near anterior edge of patch are two transverse lines of reddish-purple, not reaching either margin; a few black scales around anal angle: cilia fuscous. Hindwings and cilia dark fuscous, somewhat bronzy-tinged.

Stawell, Victoria; one specimen in December. I have seen a second taken at Ballan, Victoria.

Nearest *satrapella*, Meyr.

TINEIDÆ.

BLABOPHANES (?) CHRYSOGRAMMA, n.sp.

♀. 25 mm. Head orange. Antennæ, palpi and thorax bronzy-fuscous, palpi internally ochreous, thorax anteriorly whitish and with a spot of whitish on patagia. Abdomen and legs ochreous-yellowish, anterior and middle pair infuscated. Forewings elongate, moderate, costa arched, apex rounded, hindmargin obliquely rounded; bronze-brown, finely and irregularly irrorated with white, and with bright yellow markings; a moderate thick outwardly oblique fascia from close to base of inner margin to $\frac{1}{6}$ costa, not quite reaching either margin, broadest beneath; a flattened elongate spot on inner margin at about $\frac{1}{3}$, just beyond first fascia; a moderately broad fascia, from costa at about $\frac{2}{3}$ to inner margin before anal angle, strongly angulated inwards in middle; an irregular whitish-ochreous patch, occupying apical portion of wing, and extending to half of hindmargin, with a somewhat suffused reniform spot of groundcolour in middle: cilia ochreous-white, with bronzy fuscous bars at apex and anal angle. Hindwings shining golden-bronzy; cilia ochreous-yellow, with a fuscous basal line, obsolete towards base.

Brisbane, Queensland; two specimens in December.

FUNGI FROM KERGUELEN ISLAND.

By D. McAlpine.

(Communicated by J. H. Maiden, F.L.S.)

(Plate xiii., figs. 1-8.)

Mr. Robert Hall, of Melbourne, paid a visit to this Island in December, 1897, and was there from December 27th, 1897, to February 18th, 1898, or a little over seven weeks altogether.

He sailed from Port Philip in the brig "Edward," commanded by Captain Steensohn, with a crew of 14 men on board. As the guest of Mr. Hans Gundersen, the owner, he had every facility for making the most of his trip as naturalist. While his principal object was to study the oceanic avifauna and collect ornithological specimens, he also made a general collection of natural history objects, which will, I understand, be properly described. The fungi collected by him were placed in my hands for determination by Mr. Luehmann, F.L.S., Curator of the National Herbarium, and I consider them of sufficient interest and novelty to be put on record.

Kerguelen Island, also known as Desolation Island and Antarctic Iceland, lies in the South Indian Ocean, midway between the Cape of Good Hope and Australia. Its long is between 68° 42′ and 70° 35′ E., and its lat. 48° 39′ and 49° 44′ S. It is about 90 miles long by 50 wide, and is composed principally of volcanic rock. The flora of such an oceanic island has a peculiar interest of its own in relation to geographical distribution, and even the fungi have to be taken into account in this connection.

Previous Collections of Fungi.—Five scientific expeditions have visited the Island within comparatively recent times—the

"Antarctic" under Sir James Ross (1840), the "Challenger" under Sir George Nares (1874), and three "Transit of Venus" Expeditions (1874-75),—and it is to them we owe our present scanty knowledge of the fungi of this island. In the Botany of the American Transit Expedition,* no fungi are recorded, and I have not seen the Report of the German Expedition to which Drs. Naumann and Huesker were attached as naturalists, but a list of all obtained by the others is given in the Transactions of the Royal Society, Vol. 168 (1879). Saccardo's "Sylloge Fungorum" has, however, been consulted, and probably all the known species are there recorded. Nine species have been described, distributed among seven genera.

Mr. Hall's Collection.—There are ten species of fungi represented altogether, exclusive of bacteria, distributed among as many genera, and all of them are determinable from the fairly good state of preservation in which they reached my hands. It is very creditable indeed to Mr. Hall that, after such distinguished naturalists as Sir Joseph Hooker, Moseley and Eaton had visited the island, he should have succeeded, not only in collecting several species unobserved by them, but in securing more species than the total number previously known.

It will be seen, on next page, that 5 are among the 9 previously recorded, and the remaining 5 are new to the island, two of them (*Panaeolus Hallii* and *Fusarium rhodellum*) being new to science. Of the 5 newly recorded, two of them at least are so cosmopolitan that they have probably been introduced by the sealers who occasionally visit the island, so that there are 3 to be added to the fungus-flora as indigenous species. The total number, therefore, of the fungi at present known is 14, of which three are very probably introductions.

In isolated islands, such as Kerguelen, it has been observed that the species are generally well defined, and that the genera are small, seldom containing more than two or three species. In the present collection each genus has only one species, and in

* Smithsonian Miscellaneous Collections, Vol. xii. Art. ii. 1878.

the general collection there are never more than two species to a genus.

The following table will show at a glance the fungi formerly recorded and those added to the list by Mr. Hall :—

Fungi already recorded and those recently collected at Kerguelen Island, principally between 27th December, 1897, and 30th January, 1898, by Mr. Robert Hall :—

Fungi already recorded.	Hall's Collection.
1. *Galera kerguelensis*, Berk.	
2. *G. hypnorum*, Batsch.	1. *Galera hypnorum*, Batsch.
3. *Tubaria furfuracea*, Pers.	
4. *Naucoria glebarum*, Berk.	2. *Naucoria glebarum*, Berk.
5. *Agaricus campestris*, L.	
6. *Coprinus atramentarius*, Fr.	
7. *C. tomentosus*, Fr.	3. *Coprinus tomentosus* Fr.
8. *Lachnea (Peziza) kerguelensis*, Berk.	4. *Lachnea kerguelensis*, Berk.
9. *Cladosporium herbarum*, Link.	5. *Cladosporium herbarum*, Link.
	6. *Panaeolus Hallii*, n.sp.
	7. *Aspergillus glaucus*, Link.
	8. *Penicillium glaucum*, Link.
	9. *Fusarium rhodellum*, n.sp.
	10. *Alternaria tenuis*, Nees.
	11. Bacteria.

Galera hypnorum, Batsch.

(Plate XIII., fig. 1.)

Among moss. Gregarious. Spores elliptical, yellowish, $9\frac{1}{2}$-11 $\times$ $5\frac{1}{2}$-6 μ.

Geog. Dist.—Europe, Asia, America, Australia, Beeren I., Jan Mayen I., Kerguelen I.

It differs from *G. kerguelensis*, Berk., in the stem being nearly $1\frac{1}{2}$ in. high, in the principal gills though distant being more numerous than 12, and in the pileus being rather membranaceous.

Naucoria glebarum, Berk.

(Plate XIII., fig. 2.)

Gregarious. On damp ground among moss. Spores orange-yellow, elliptical to roughly ovate, $13\text{-}15 \times 7\frac{1}{2}\text{-}8\frac{1}{2}\ \mu$.

Geog. Dist.—Falkland Is., Kerguelen I.

Coprinus tomentosus, Fr.

On damp ground among grass (Royal Sound. 27-xii.-97 to 20-i.-98). Gregarious. Pileus about $\frac{5}{8}$ in. high. Gills free, about $\frac{1}{8}$ in. broad. Stem up to $2\frac{1}{2}$ in. long. Spores black, elliptical, $13\text{-}15 \times 8\frac{1}{2}\text{-}9\frac{1}{2}\ \mu$.

Geog. Dist.—Europe, Asia (Ceylon), Australia, Kerguelen I.

Lachnea kerguelensis, Berk.

(Plate XIII., figs. 3-4.)

Gregarious, fleshy, sessile, at first cup-shaped, becoming expanded and gradually tapering towards base, $\frac{3}{16}$ inch across when dry, but about $\frac{1}{4}$ inch when fresh. Disc deep brick-red or clear light carmine, becoming lake when dry, blackening towards margin. Externally orange-yellow, densely clothed with short, brownish, flaccid hairs, which are yellowish to yellowish-brown by transmitted light; septate, acute at apex, narrowing towards base, up to 350 μ long and 24 μ broad. Asci cylindrical, rounded or flattened at apex, often bulging slightly at spore and contracted between. Spores elliptical to ellipsoid, smooth, obliquely uniseriate or partially straight, continuous, hyaline, 1-3-guttulate. $20\text{-}20\frac{1}{2} \times 16\text{-}17\ \mu$. Greenish-yellow when treated with Potassium-iodide-iodine. Paraphyses filiform, septate, apex clavate and 7 μ broad, rest about 3 μ broad, slightly longer than asci, contents coloured similarly to that of spores by Potassium-iodide-iodine.

On the ground and on dead portions of *Azorella*. Greenland Harbour. Between 27th and 30th January, 1898.

Geog. Dist.—New Zealand and Kerguelen I.

Mr. Hall states that he was struck with the bright appearance of this fungus, like so many brick-red cups, and generally 8 or 10 together.

PANAEOLUS HALLII, n.sp.

(Plate XIII., figs. 5*a*, 5*b*, 6.)

Minute, about $\frac{7}{16}$ in. high. Pileus conical, buff-coloured, mealy, about $\frac{1}{4}$ in. high and $\frac{1}{8}$ in. across, with flattened apical disc somewhat darker coloured. Gills adnexed, greyish and mottled with black spores. Stem similarly coloured to pileus, mealy, hollow, tapering to a point at apex, slightly swollen and darker at base. Spores black, yellowish-brown by transmitted light, elliptical to oval, thick-walled, $11\text{-}15 \times 9\text{-}11\ \mu$.

On damp ground among moss. About 28th January, 1898. South Head of Royal Sound.

Only a few specimens were met with, and they were not gregarious, but they might easily be overlooked on account of their small size. The mealy covering was very uniform over the whole.

On the decaying wood of the Kerguelen Island Cabbage (*Pringlea antiscorbutica*, Brown), which was considerably bored by the larvæ of the Cabbage Fly, I found four species of saprophytic fungi :—

1. ASPERGILLUS GLAUCUS, Link, generally overspreads the wood, forming masses of its glaucous heads of conidia. This species has not hitherto been recorded here, but in Hooker's "Flora Antarctica," *Eurotium herbariorum*, Link, of which *Aspergillus* is the conidial condition, is recorded on biscuit on board the "Erebus," Jan. 3rd, 1841. In this way the fungus may have been introduced, and it was the greenish hue of the wood which attracted Mr. Hall's attention and induced him to collect it.

2. Penicillium glaucum, Link, also occurs on the same piece of wood, at first forming a dense white stratum, then its sage-green conidia.

3. Intermixed with the *Aspergillus* are salmon-pink patches found to be due to a species of *Fusarium*.

Fusarium rhodellum, n.sp.

(Plate xiii., fig. 7.)

Forming an effused, salmon-pink, flocculent layer. Hyphæ hyaline, septate, branched, slender, densely interwoven, about 4 μ broad and conidiophores only 2 μ. Conidia at tips of branches, hyaline, slightly curved and pointed at both ends, sometimes straight and fusiform, uni-septate when fully developed, 11-13 × 2 μ, but may be only $7\frac{1}{2}$-$9\frac{1}{2}$ μ long when aseptate. Stained very pale yellow by Potassium-iodide-iodine.

It differs from *F. brassicæ*, Thuem., in the absence of wart-like brown sporodochia and the conidia not being bi-septate; from *F. roseum*, Link, in the conidia not being 3-septate.

4. A sooty-black mould was also developed on the same piece of wood among the others.

Alternaria tenuis, Nees.

(Plate xiii., fig. 8.)

Hyphæ pale fuliginous, short, septate, branched, average 4 μ broad. Conidia in chains, dark brown to dark olive, elongated, clavate, up to 6-septate and sparingly longitudinally septate, constricted at septa, some Helminthosporium-like, 24-37 × 9-11 μ.

It differs from *A. brassicæ*, Sacc., in the hyphæ being narrow and multi-septate and the conidia less than half the size. The conidia were sometimes firmly attached in chains, and three might frequently be seen tossing about in a current under the microscope without separating.

On leaf of *Pringlea antiscorbutica*. Black-looking spots with slightly raised margins, round to oval, and marked with concentric zones, up to $\frac{1}{2}$ inch diam.

The leaf was yellow, the only one on this particular cabbage, and probably connected in some way with the spots.

Nests of Bacteria were plentifully found, but no other form of fungus-fructification.

I submitted the leaf to Dr. Cherry, and his report is as follows:

Pathological Laboratory,
University of Melbourne,
22nd August, 1898.

Scrapings from the surface of the specimen of Kerguelen Island cabbage contain bodies which appear, from their morphological characters and staining reactions with the aniline dyes, to be micro-organisms. They are of two forms, cocci generally about 2 μ in diameter, and bacilli 6 μ long and 2 μ in diameter. No growth has been obtained by inoculations on gelatine and potato kept for two months at from 8° to 15° C. These bodies occur both on the black spots and on the normal surface of the leaf.

T. Cherry, M.D.

Cladosporium herbarum, Link, was found on the same leaf. Eaton also found the same fungus on dead stems.

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The works relating to Kerguelen Island Fungi are not numerous, and their titles may be given here in full:—

1.—Hooker, J. D. The Botany of the Antarctic Voyage of H.M. Discovery Ships "Erebus" and "Terror," in they ears 1839-1843, under the Command of Captain Sir James Ross.

Part i. Flora Antarcticæ, 1845-1847 (Fungi, by Rev. J. M. Berkeley).

2.—————. Botany of Kerguelen Island. *Phil. Trans. Roy. Soc.* Vol. 168, 1879. (Collections made during the Transit of Venus Expeditions, 1874-75, and Fungi named by Rev. J. M. Berkeley).

3.—Report of the Scientific Results of the Voyage of H.M.S. "Challenger" during 1875-76. Botany. Vol. i. (Fungi enumerated as in *Phil. Trans.* Vol. 168).

4.—Die Forschungsreise S.M.S. "Gazelle" in den Jahren 1874, bis 1876, unter Kommando des Kapitän zur See Freiherrn von Schleinitz, herausgegeben von dem Hydrographischen Amt des Reichs-Marine-Amt. Berlin, 1890.

Band. iv. Botanik, herausgegeben von A. Engler. Pilze, Baron von Thuemen.

5.—Saccardo, P. A. Sylloge Fungorum. Vol. xii. Pt. i, Fasc. 2, 1897.

EXPLANATION OF FIGURES.

Plate XIII.

Galera hypnorum.

Fig. 1.—Spores (× 1000).

Naucoria glebarum.

Fig. 2.—Spores (× 1000).

Lachnea kerguelensis.

Fig. 3.—Ascus with spores (× 270).
Fig. 4.—Apex of paraphysis (× 1000).

Panaeolus hallii.

Fig. 5.—Specimen and section (nat. size).
Fig. 6.—Spores (× 1000).

Fusarium rhodellum.

Fig. 7.—Conidia (× 1000).

Alternaria tenuis.

Fig. 8.—Conidia (× 1000).

THREE ADDITIONS TO THE FUNGI OF NEW SOUTH WALES.

By D. McAlpine.

(Communicated by R. T. Baker, F.L.S.)

(Plate XIII., figs. 9-13.)

The three species of Fungi here recorded are new for New South Wales. Two of them have hitherto been found in Victoria, and one of these is also a Brazilian form. The species of *Stilbum* found upon dead insects are few in number, only four being given in Saccardo's Universal Index of Fungi, 1897, and their distribution is very varied—one belonging to N. America, another to the Tropics, a third to France, and a fourth to Australia.

The species of *Stilbum* found on dead wood among moss had no reproductive bodies, but it is otherwise fully described in the hope that it may yet be found in the reproductive stage.

Isaria cicadæ, Miq.—Cicada Club.

(Plate XIII., fig. 9.)

Stroma projecting forward from dorsal surface of head at joint between antennæ, slender, chocolate-brown, fully $2\frac{1}{2}$ in. long and 1 line thick, slightly twisted, with minute stump alongside stem at base and forking at apex, each fork about $\frac{1}{2}$ inch long and terminating bluntly; hard and compact, with interior white tissue and brown bark-like outer portion. Conidia borne at apex of slender filaments, hyaline, cylindrical, obtuse at both ends, $8\text{-}9 \times 3\frac{1}{2}\text{-}4\ \mu$.

On *Cicada*. Orange, New South Wales (R. T. Baker), and previously recorded from Victoria.

References.—Miquel, Ann. Sci. Nat. p. 378 (1838); Saccardo, Syll. Fung. Vol. iv. p. 595 (1886); Cooke, Veg. Wasps and Plant Worms, p. 284 (1892); and Handb. Austr. Fungi, p. 383 (1892).

This species was first found on the larva of a Cicada in Brazil, and Miquel considers that it developed after death and not on the living insect. It is described by Cooke as cylindrical, tough, branched in the upper portion and producing cylindrical obtuse conidia.

STILBUM FORMICARUM, Cooke & Mass.—**Ant Stilbum.**

(Plate XIII., figs. 10-12.)

Stems (7) black, slightly flexuous, hair-like, smooth, up to 5-6 mm. long, slightly thickened at base. Capitulum obovate to elliptic, rosy to rose-pink, about 250 μ long. Conidia hyaline, elliptic-ovate, $5\frac{1}{2}$-7 × 2-$2\frac{1}{2}$ μ.

On dead Ants among moss. Ballina, New South Wales (Rev. W. W. Watts).

Seven stems arose from various parts of the ant's body—two from the lower surface of the head and five from the sides of the body. They vary considerably in size from 1 mm., and gradually become a little more slender towards the head. The hyphæ of the stem are clear brown externally and hyaline internally, and composed of elongated, septate, firmly united filaments.

This species was first described by Cooke & Massee on a dead ant, from Cheltenham, Victoria, in Grevillea, Vol. xviii., 8 (1889), so that it is new for New South Wales.

STILBUM sp.

(Plate XIII., fig. 13.)

Stem black, hair-like, becoming pallid towards head, long (up to 9 in.). Capitulum oval, black, but ruddy-brown by transmitted light, 320 × 170μ. Conidia . . . .

On dead pieces of wood (entangled in moss), August. Ballina, New South Wales (Rev. W. W. Watts).

The hair-like stems are mostly barren, and although several were met with, only one terminated in a head. The outer layer is composed of dark brown, almost black, elongated, narrow, transversely septate filaments enclosing more delicate, hyaline, slender, septate hyphæ. It seems to resemble a *Stilbum*, but the absence of reproductive bodies leaves it in doubt.

EXPLANATION OF FIGURES.

Plate XIII.

Isaria cicadæ, Miq.

Fig. 9.—Conidia (× 1000).

Stilbum formicarum, Cooke & Mass.

Fig. 10.—Portion of stem with head (× 52).
Fig. 11.—External portion of stem (× 1000).
Fig. 12.—Conidia (× 1000).

Stilbum sp.

Fig. 13.—Head at end of black hair-like thread (× 52).

DESCRIPTION OF *AGROMYZA PHASEOLI*, A NEW SPECIES OF LEAF-MINING FLY.

By D. W. Coquillett.

(Communicated, with a Note thereon, by W. W. Froggatt, F.L.S.)

Agromyza phaseoli, n.sp.

Black, including the halteres. Front on the sides opaque, the triangle highly polished, almost reaching the lower end of the front. Body strongly tinged with blue, polished, not light coloured pruinose on any of its parts; thorax bearing two pairs of dorso-central macrochaetæ, destitute of acrostichals. Wings hyaline, costa strongly thickened beyond the apex of the first vein, small crossvein distinctly beyond the middle of the discal cell, hind crossvein at three-fourths of its length beyond the small, apex of third vein midway between the apices of the second and fourth veins. None of the tibiæ nor of the tarsal joints noticeably dilated or swollen. Length, 1·5 mm.

Hab.—Gosford District; N.S.W.; described from five specimens received from W. W. Froggatt, Sydney, Australia, under the name of French bean fly pest.

Among an exchange collection of economic entomological specimens sent to Dr. Howard, Chief of the Entomological Division of the Department of Agriculture, Washington, U.S.A., I forwarded some specimens of an undetermined leaf-mining dipteron, which last year proved a most destructive pest to people growing French beans in the Gosford district, N.S.W.

In company with the Secretary of the Agricultural and Horticultural Association of Gosford, I visited the infested gardens early in April. Four or five gardens about Erina and Wamberal were so badly attacked that all the plants were destroyed before they commenced to bear. I carefully examined about five acres where every bean stalk was more or less infested. The flies deposited their eggs on the outer surface of the main stem, just about the ground. The maggots, on hatching out, burrowed under the epidermis, some working upwards towards the foliage and others under ground towards the roots. As many as thirty or forty pupæ and larvæ could be obtained from a large plant when the skin was all discoloured, split, and rusty red, the plant soon dying from the injuries. This pest had not been noticed before by any of the gardeners, though several of them have been growing French beans on the same land for the last five years.—W.W.F.

A NEW GENUS AND SPECIES OF SAWFLY.

By Walter W. Froggatt, F.L.S.

(Plate xiv.)

Phylacteophaga, n.g.

Antennæ 8-jointed, those of the male produced into projecting horns on the outer extremity in the middle of 4th-7th joints. Head narrow, eyes large, ocelli in centre of the forehead. Legs long and slender, all bearing spines, those on the hind tibiæ large and straight: claws bifid. Wings: forewings with thick costal nervure and large rounded stigma, the costal nervure extending beyond the tip of the radial cell, but not forming an appendicular cell; marginal nervure turning upward: the first of the four cubital cells small, second and third angular, longer than broad, with the transverse cubital nervures marked with foveæ in the middle; third discordal cell petiolate; no lanceolate cell: hindwings with costal nervure straight; radial cell petiolate at the tip, median cell large, transverse, cubital nervures showing foveæ in centre; first cubital cell small, cubital and discoidal nervure not reaching the outer margin of the wing. Body long and slender, the saw of the female projecting beyond the abdomen. Larva flattened, slender, with six thoracic legs.

This genus belongs to the Subfamily *Pterygophorinæ*, "the members of which have no lanceolate cell in the forewings, and the accessory nervure of the hindwings is wanting, the latter have only one middle cellule, and the anterior are appendiculated" (Ashmead). The genus *Pterygophorus* is typical of the group, and to it the genus now proposed is allied in the general form of the wings, but the latter has the scutellum posteriorly rounded. The larva, both in form and habits, is very different from any member of the group known to me.

PHYLACTEOPHAGA EUCALYPTI, n.sp.

Eggs inserted singly, generally one on either side of the mid-rib of a leaf towards the tip, seldom more than two upon a leaf.

Larva 5 lines in length, long, slender, and flattened on the dorsal surface. Head small, testaceous, lobed on either side, with the mouth parts fringed with fine hairs. Thoracic and two apical abdominal segments bright golden yellow, median ones pale yellow; thoracic segments of uniform size, rounded on the outer margins, each bearing a pair of short stout semitransparent legs; abdominal segments of uniform size, rounded on the margins, the terminal one rounded at the apex.

The young larvæ feed upon the tissue between the cuticle, forming an irregular brown blotch of about $1\frac{1}{2}$ inches in diameter. When full grown they spin a thin silken web, forming an oblong cocoon measuring 5 lines in length and 3 in breadth, in the centre of the gnawed area, which stands out on either surface of the leaf like a small blister.

Pupa.—$3\frac{1}{2}$ lines in length, slender in form; eyes black and projecting; ocelli standing out very distinctly on the summit of the head; head, thorax, and the tip of the abdomen reddish-orange, the tip of the latter bifid; wing-covers small, dark brown.

When leaves containing the pupæ are touched the enclosed insect has a peculiar habit of arching the back and rapping the head and tip of the abdomen against the walls of the cell as if to frighten away intruders.

The change from larva to pupa takes several days before completion, but the latter only remains about a week in the pupal stage before it emerges as an imago.

♂ *Imago.*—Length 3 lines. Head reddish-brown; antennæ, eyes, a patch enclosing the ocelli, and thorax black; fore and mid-legs dull yellow; with the basal portion of the thighs black in the second pair; hind legs black, with the apex of the thighs light brown. Wings hyaline, nervures pale at the base, darker towards extremities; stigma black.

Head truncate in front, slightly lobed and swelling out below the base of the antennæ, wider than the thorax, nearly twice as wide as long, swelling out behind the eyes, and deeply arcuate at the junction with the prothorax; eyes large, hemispherical, very finely faceted; ocelli ochreous, shining, large; hind pair in a line with the centre of the eyes, the frontal one in the centre behind the base of the antennæ, enclosed in an irregular heart-shaped black patch occupying the centre of the forehead; antennæ 8-jointed, 1st short, cylindrical, reddish-brown at base; 2nd smaller, bead-shaped; 3rd thrice the length of the first two combined, rounded at the base, slightly curved at the base, swelling out at the apex and truncate; 4th slender at the base, swelling out to the apex, which is slightly produced into a knob on the outer margin; 5th, 6th, 7th segments of about equal length, slender at the base and swelling out into a funnel-like tip, which forms a finger-like projection on the outer edge; 8th segment slender, oblong, oval, longest and rounded at the tip.

Thorax smooth, shining, rounded in front, and widest at base of the fore-wings; a short thorn-like projection on either side of the mesothorax, the apex truncate; scutellum smooth, large, angled on either side in front, rounded behind. Metathorax cylindrical, tapering towards the abdominal segments. Legs long, slender, the tibiæ of each pair armed with a pair of apical spines on the inner margin, those of the fore and middle pair short and curved inwards; tibiæ of hind legs armed with a small spine about one-third from the apex, and two large stout spines at the apex; 1st joint of the tarsi longer than the rest combined; 2nd and 3rd of the same length; 4th smaller and rounded; tarsal claws stout, turned downwards, bifid.

Wings: forewings more than twice as long as broad, costal nervure stout; stigma large, elongate; radial cell large, costal nervure produced beyond the outer margin; the first of the four cubital cells rounded above; 2nd cubital cell constricted at base, 3rd longer than broad, the transverse cubital nervures showing fovea in the centre; median cell long and slender, clouded at apex; 1st discoidal cell narrower at the base, broadest in a line with the apex of median, produced into a narrow angular point under the lower margin of the first cubital cell; 2nd discoidal cell angular, receiving the sub-discoidal cell in the centre of the apical margin; anal cell large, swelling out at apex: hindwings with costal nervure straight, narrow; sub-costal nervure extending beyond the front of the radial cell; median cell long, broad at the apex; 1st cubital cell broadest at the base; both the transverse cubital nervures showing fovea in the centre; neither the cubital or discoidal nervure coming to the outer edge of the wing; the posterior margin very much thickened from the base half way round the basal lobe.

Abdomen slender, cylindrical, tapering to the apex, truncate at the tip.

♀ *Imago.*—Four lines in length, larger than the male, with the whole of the head and thorax, except the apical edge of the metathorax, bright reddish-brown, ocelli black; antennæ without prongs, somewhat longer, 3rd joint longest, slender at the base, swelling out at the apex; 4th-7th decreasing slightly in length, but increasing in width towards the tip; 8th larger, and truncated on the outer edge.

Abdomen broadest at the base, tapering to the tips. somewhat flattened on the dorsal surface; anal segment cone-shaped, truncated at the tip, with the protruding tip of the saw showing from above in some specimens; viewed from beneath the saw is very distinctly produced.

Hab.—Melbourne, Victoria; larvæ feeding on the foliage of *Eucalyptus globulus* (Coll. Mr. Chas. French).

This handsome insect was sent to me by Mr. French, who stated that it was doing a great deal of damage to the foliage of the Blue Gum. At my request he sent me an ample collection of freshly gathered leaves, containing specimens in all stages of growth, except the eggs and very young larvæ. When the sawflies emerged they were very active, running about the jar, and trying to make their way out: when touched they made a buzzing sound like many of the Pergas. The protective rattle of the chrysalid when the leaves were picked up or handled is very remarkable.

EXPLANATION OF PLATE.

Phylacteophaga eucalypti.

Fig. 1.—Forewing.
Fig. 2.—Hindwing.
Fig. 3.—Antenna of ♀.
Fig. 4.—Antenna of ♂.
Fig. 5.—Foreleg.
Fig. 6.—Tarsi of hindleg.
Fig. 7.—Saw of ♀.
Fig. 8.—Larva (enlarged).
Fig. 9.—Gnawed leaf of *Eucalyptus globulus*, with pupal chambers.

NOTES AND EXHIBITS.

Mr. Rainbow exhibited on behalf of Mr. E. G. W. Palmer, a living specimen of the spider *Lycosa godeffroyi*, L. Koch, from Lawson. The specimen, a female, was covered with the recently hatched out young. The spiderlings are always so carried by the female during infancy, but when old enough to forage for themselves, distribute by the process of ballooning. The egg-bag or cushion is always carried by these spiders attached to the spinnerets.

Mr. Deane exhibited the following plants of interest, which he had collected a week previously in the neighbourhood of Byrock:—*Eucalyptus terminalis*, F.v.M., *Owenia acidula*, F.v.M., *Acacia aneura*, F.v.M.; *Loranthus Exocarpi*, Behr., on Belah (*Casuarina* and other species), *L. linophyllus*, Fenzl., also on Belah; *L. pendulus*, Sieb., on Mulga (*Acacia aneura*, F.v.M.); and *L. linearifolius*, Hook., on *Capparis*. Mr. Deane offered some remarks on the value of Mulga as a forage plant in a season of drought like the present, and he contrasted the rational mode of cutting it for stock with that too commonly followed. In the United States, Cape Colony and elsewhere, vigorous efforts were being made to acclimatise Australian salt-bushes, Eucalypts, and other useful plants, whereas in their native country the tendency seemed to be towards their extermination rather than their conservation.

Mr. Maiden exhibited some well-grown pot plants in flower from the Botanic Gardens, including two indigenous species of *Glossostigma*, a North Australian Pitcher-plant (*Nepenthes Kennedyi*, F.v.M.), and *Incarvillea Koopmannii*, Lauche. Also photographs of the inflorescence of the palm *Hedyscepe Canterburiana*, F.v.M., introduced from Lord Howe Island, which had recently flowered in the Gardens.

Mr. Baker exhibited the Fungi described in Mr. McAlpine's second paper. Also, on behalf of the Rev. W. W. Watts, of Ballina, examples of six Australian Mosses recently described by Professor Brotherus, of Helsingfors, with the following Notes on the same by Mr. Watts.

Dr. V. F. Brotherus, in his "Some New Species of Australian Mosses. Part iv.," recently published in Helsingfors, has described six new species found by me in this Colony, as follows :—

Leucobryum strictifolium, Broth., was found in Queensland by Mr. Bailey, before my specimens were sent to Dr. Brotherus; and the eminent specialist had already named it as a new species. It had, however, been disallowed by that greatest living authority, the venerable Dr. Carl Müller, and my specimens were determined by Dr. Brotherus as *Leucobryum brachyphyllum*, Hampe, the common Leucobryum of New South Wales. The specimens in my possession, however, seemed to me so distinct, especially in their climbing, straggling habit, that I ventured to ask Dr. Brotherus to re-examine them. This he did, with the result that he was convinced that his original determination of Mr. Bailey's specimens was correct. The moss is a very striking one, and most distinct in its habit, sometimes almost covering the trunk of a large tree, and, unlike *L. brachyphyllum*, which grows mostly in dense patches and fruits very freely, *L. strictifolium*, Broth., branches loosely in all directions and is seldom found in fruit. It is distinguished easily from *L. brachyphyllum* by its straight leaves being disposed in five rows. It is fairly frequent on the Richmond River, and I have good specimens from Tuckombil (Hunter's Scrub) and from Wollongbar, near the Experimental Farm.

Dicranella Wattsii, Broth., was found in good quantity near Brooklet, Richmond River. It is very distinctive in the arcuate form of its capsule.

Campylopus Novæ-Valesiæ, Broth., was found by me in the scrub, off Bulli Pass, but, unfortunately, in only a very small quantity and without fruit. But Dr. Brotherus states that it is easily distinguished from its ally, *C. torquatus*, Mitt., by its more robust growth, and by its comal leaves being falcate and entire.

Macromitrium Wattsii, Broth., is a most interesting moss. My first specimen was found on the rocks by the seaside at Wollongong. But I have since found it in considerable quantities on the north coast, though never far from the sea. Its favourite habitat is the rocks of the sea cliff, but it is plentiful on trees (mostly Sheoaks) near the Pilot Station, Ballina. The Macromitria are very difficult of determination, but this species is easily recognised after having been once seen. From its ally, *M. aurescens*, Hampe, it differs in its smooth capsule and hairless calyptra.

M. ligulaefolium, Broth., I found in a gully at Roseville, near Sydney, growing on rocks. Dr. Brotherus states that it is very readily distinguished by its capsule being destitute of a peristome. It is a beautiful species.

Funaria squarrifolia, Broth., was found by me, first, close to Ballina, growing on the ground in shady places, afterwards at German Creek in similar positions. It is very closely allied to *F. Smithhurstii*, Geh., but is distinguished by its higher growth, by its stem being loosely leaved from the base upwards, and by its leaves being reflexo-patulate.

In addition to the above six species, it may be mentioned that, in letters to me, Dr. Brotherus names two other new species, which, however, have not yet been described, one of them being a very minute and beautiful *Fissidens* found under damp rocks at Woollahra, Sydney.

I am also convinced that several species found by me on the Richmond River have never before been recorded for this Colony. *Funaria Smithhurstii*, Geh., is one of these. The fact that no continuous and complete record of New South Wales Mosses has been kept makes it difficult, however, to say exactly what is new for the Colony and what is not. But, undoubtedly, several species found by me on the Richmond and Brunswick Rivers have only been recorded previously for Queensland.

It is the intention of Mr. T. Whitelegge and myself to publish, as soon as practicable, a list of New South Wales Mosses up to date, as complete as we can possibly make it.

Our list, arranged according to the most recent and most widely accepted classification, is now in the hands of Dr. Brotherus for revision and suggestion.

I may add that it will give me great pleasure to receive from any part of the Colony specimens of the local mosses, with necessary notes as to habitat and date of collection.

WEDNESDAY, APRIL 26TH, 1899.

The Ordinary Monthly Meeting of the Society was held at the Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesday evening, April 26th, 1899.

The Hon. James Norton, LL.D., M.L.C., President, in the Chair.

The President made the following announcements:—

1. Under the provisions of Rule xxv., the Council had elected Dr. J. C. Cox, F.L.S., Prof. David, B.A., F.G.S., Mr. Henry Deane, M.A., F.L.S., and Professor J. T. Wilson, M.B., Ch.M., to be VICE-PRESIDENTS; and Mr. Prosper N. Trebeck, J.P., to be HON. TREASURER for the current year.

2. At a Special General Meeting, held on the 19th inst., it was unanimously resolved to adopt the recommendation of the Council that, for the remainder of the current year, the payment of Entrance Fees as provided for by Rule vi., should be suspended.

3. A Special General Meeting will be held on May 31st, at 8 o'clock, to take precedence of the Monthly Meeting of the same date. Business: to confirm the action of the Special General Meeting held on the 19th April.

The President called attention to certain documents forwarded by the Rev. W. W. Watts, of Ballina, giving particulars of a movement to secure the reservation of a portion of the Big Scrub on the Richmond River, known as Marshall's Falls, and some of the adjacent forest as a National Park. Every effort to preserve even limited areas of the characteristic vegetation in as nearly as possible the natural state should, in the interest of future generations, recommend itself to naturalists. This is especially the case with the vegetation of the subtropical Northern River Districts, upon which settlement is making such serious inroads. An influential memorial on the subject has been prepared, and submitted to the Minister for Lands for consideration by the Government. On behalf of the Society the President felt justified in expressing the hope that the issue would be crowned with success.

DONATIONS.

Department of Agriculture, Brisbane—Queensland Agricultural Journal. Vol. iv. Part 4 (April, 1899). *From the Secretary of Agriculture.*

Australian Museum, Sydney—Records. Vol. iii. No. 5 (April, 1899). *From the Trustees.*

Department of Mines and Agriculture, Sydney—Agricultural Gazette of New South Wales. Vol. x. Part 4 (April, 1899): Memoirs of the Geological Survey of New South Wales. Ethnological Series. No. 1. Aboriginal Carvings of Port Jackson and Broken Bay. By W. D. Campbell, A.K.C., F.G.S., &c. (4to., 1899). *From the Hon. the Minister for Mines and Agriculture.*

Public Library of New South Wales—Report of the Trustees for 1898. *From the Trustees.*

The Surveyor, Sydney. Vol. xii. No. 4 (April, 1899). *From the Editor.*

Australasian Journal of Pharmacy, Melbourne. Vol. xiv. No. 160 (April, 1899). *From the Editor.*

Field Naturalists' Club of Victoria—Victorian Naturalist. Vol. xv. No. 12 (April, 1899). *From the Club.*

Gordon Technical College, Geelong—The Wombat. Vol. iv. No. 2 (Feb., 1899). *From the College.*

Zoological and Acclimatisation Society of Victoria—Thirty-fifth Annual Report, for the Year 1898. *From the Society.*

Department of Mines, Hobart—Mineral Resources of Tasmania (Nov., 1894): Mineral Industry of Tasmania, 1897: Progress of the Mineral Industry of Tasmania for the Quarters ending Dec., 1897; March, June, Sept. and Dec., 1898. *From the Secretary for Mines.*

Geological Survey, Perth—Geological Map of Northampton: Geological Map of the Collie Goldfield (1898). *From the Government Geologist.*

Auckland Institute and Museum—Annual Report for 1898-99. *From the Institute.*

American Geographical Society, New York—Bulletin. Vol. xxxi. No. 1 (1899). *From the Society.*

American Museum of Natural History, New York—Bulletin. Vol. xii. Arts. i.-ii. (pp. 1-17: March, 1899). *From the Museum.*

The American Naturalist (Cambridge). Vol. xxxiii. No. 387 (March, 1899). *From the Editor.*

U.S. Department of Agriculture, Washington: Division of Biological Survey—Bulletin. Nos. 9-11 (1898): Division of Entomology—Bibliography of the more important Contributions to American Economic Entomology. Part vi. (8vo. 1898): Farmers' Bulletin, No. 68 (1898). *From the Secretary of Agriculture.*

Museo Nacional de Costa Rica—Informe del primer Semestre de 1898 à 1899. *From the Museum.*

Bristol Museum—Report of the Museum Committee for the two Years from 1st October, 1896, to 30th September, 1898. *From the Museum.*

Royal Gardens, Kew—Hooker's Icones Plantarum. Fourth Series. Vol. vi. Part iv. (March, 1899). *From the Bentham Trustees.*

Royal Society of London—Proceedings. Vol. lxiv. Nos. 408-409 (Feb.-March, 1899). *From the Society.*

Scottish Microscopical Society, Edinburgh — Proceedings. Vol. ii. No. iii. (1897-98). *From the Society.*

Zoological Society of London—Abstract 21st Feb., and 7th March, 1899. *From the Society.*

Société Géologique de Belgique—Annales. Tome xxiv. 3e Liv. (1899); Tome xxv. 2e Liv. (1899); Tome xxvi. 1re Liv. (1899). *From the Society.*

Société des Sciences des Arts et des Lettres du Hainaut—Mémoires et Publications. ve Série. Tome x. (1898). *From the Society.*

Société Royale Linnéenne de Bruxelles—Bulletin. 24me Année. Nos. 3-5 (Dec., 1898-March, 1899). *From the Society.*

Naturhistoriske Forening i Kjöbenhavn — Videnskabelige Meddelelser for Aaret 1898. *From the Society.*

Royal University of Upsala—Universitets Arsskrift, 1897. Medicin 1 : 1898, Program 1 : Three Dissertations by J. A. Z. Brundin, A. Cleve and E. Jäderholm (1898). *From the University.*

Perak Government Gazette. Vol. xii. Nos. 5-8 (Feb.-March, 1899). *From the Government Secretary.*

Journal de Conchyliologie, Paris. Vol. xlvi. No. 3 (1898). *From the Editor.*

Medicinisch-Naturwissenschaftliche Gesellschaft zu Jena—Jenaische Zeitschrift. xxxii. Band. Heft iii.-iv. (1898); xxxiii. Band. Heft i. (1899). *From the Society.*

Naturwissenschaftlicher Verein in Hamburg—Verhandlungen. 3 Folge. vi. (1898). *From the Society.*

Zoologischer Anzeiger. xxii. Band. Nos. 580-582 (Feb.-March, 1899). *From the Editor.*

Société Hollandaise des Sciences à Harlem—Archives Néerlandaises. Série ii. Tome ii. 4e Liv. (1899). *From the Society.*

Koninklijke Natuurkundige Vereeniging in Nederl.-Indië—Natuurkundig Tijdschrift. Deel. lviii. (1898). *From the Society.*

NOTES FROM THE BOTANIC GARDENS, SYDNEY.

No. 4.

By J. H. Maiden and E. Betche.

PITTOSPOREÆ.

Citriobatus lancifolia, F. M. Bailey (*Bot. Bull.* No. vii. p. 60, 1893). New for N.S. Wales.

Lismore (W. Bäuerlen, March, 1891 and 1893, in fruit; September, 1894, in flower). Previously recorded by Bailey from Killarney and Warwick, Queensland. According to Mr. Bäuerlen, the small tree attains a height of 25ft. in the Lismore scrub. Specimens received from Mr. R. T. Baker, Curator, Technological Museum.

MALVACEÆ.

Abutilon Mitchelli, Benth.—New for N.S. Wales.

Mt. Browne (P. Corbett, November, 1898). Previously recorded from Queensland and South Australia.

Flowers yellow, larger than described in Bentham's *Flora Australiensis*, the petals attaining fully $\frac{3}{4}$ inch in length.

LEGUMINOSÆ.

Gastrolobium Boormani, n.sp.

An erect shrub, 6 to 10 ft. high, with hirsute young branches. Leaves in irregular whorls of three, or alternate, ovate-cordate, about 4 to 6 lines long, tapering into a slender pungent point, glabrous above, sprinkled with a few hairs underneath, the fine reticulation prominent on both sides. Stipules spinescent, divaricate, about half as long as the leaves. Flowers axillary, solitary or more rarely in pairs or in a raceme reduced to two flowers, on slender peduncles shorter than the leaves, with one or two small narrow bracteoles inserted about 1 line below the calyx. Calyx about $1\frac{1}{2}$ lines long, sparingly hairy as well as the peduncles, the lobes rather longer than the tube, the two upper ones united higher up. Petals all yellow, on short claws, the standard broad, about half as long again as the calyx, longer than the lower petals, the keel obtuse, about as long as the wings. Ovarium pubescent, shortly stipitate, the ovules two in all ovaria examined. Pod narrow-ovate, nearly glabrous, pointed by the persistent base of the style. Ripe seeds smooth and shining, not strophiolate.

Top of Jilliby Jilliby Ranges, near Wyong (J. L. Boorman, November, 1897, December, 1898, January, 1899).

The hitherto single representative of the genus *Gastrolobium* in N.S. Wales (*G. grandiflorum*, F.v.M.) is a desert plant, and differs widely from our coast plant, which is more nearly allied to the W. Australian *G. spinosum*, Benth., though bearing no close relation to any described species. In general appearance it more resembles *Daviesia squarrosa*, Sm., and *Pultenæa ternata*, F v.M., but the shape of the pods removes it from the genus *Daviesia*, and the absence of the characteristic bracteoles from *Pultenæa*. The inflorescence seems at first sight to remove it also from the genus *Gastrolobium*, but the single flowers show a distinct tendency to a racemose inflorescence and may be considered as reduced racemes All the numerous specimens brought by Mr. Boorman from the locality where it abounds are shy-flowering, with only a few scattered flowers in the axils.

PULTENÆA CAMPBELLI, n.sp.

A small shrub, about 2ft. high, with erect scarcely spreading slightly pubescent branches. Leaves very shortly petiolate, erect or not much spreading, linear to linear-lanceolate, with incurved margins, about 4 to 5 lines long, finely pointed but not pungent, equally green on both sides; stipules linear-subulate, appressed, brown, small and deciduous. Flowers few in small terminal heads, with scarcely any bracts. Bracteoles adnate to the base of the calyx, scarcely longer than the calyx-tube, linear-subulate, with two broader and shorter stipules, all three brown and slightly hairy. Calyx with broad-lanceolate very acute lobes with fringed margins, otherwise glabrous, the lobes longer than the tubes, the two upper ones united at the base. Standard, keel and wings of equal length, about half as long again as the calyx-lobes, bright yellow, the keel of a duller shade. Ovarium glabrous, except a few long hairs on the top; style long and subulate. Fruit not seen.

Grave-yard Creek, near Walcha (J. F. Campbell, October, 1898).

The affinities are with *P. glabra*, Benth., from which it is distinguished by the slight hairiness, the smaller leaves, stipules and flowers, and chiefly by the shape and small size of the bracteoles. The bracteoles with their adnate stipules have the appearance of a 3-fid bracteole, but the stipule-like character of the side lobes can be recognised from analogy with several other species of *Pultenæa*, especially *P. plumosa*, Sieb., in which it is very apparent; in *P. dentata*, Labill., (which derives its specific name from the bracteoles) the bracteoles and stipules are still more closely united so as to give the appearance of a dentate bracteole.

Acacia harpophylla, F.v.M.

Coolabah, Great Western Line (R. N. Peacock, 1898).

This species has been recorded in N.S. Wales from the Brigalow Creek near Narrabri, Moree, Warrah and Scone.

Acacia glaucescens, Willd.

Belowra, Tuross River, N.S. Wales (J. S. Allan, 1898).

The most southerly locality hitherto recorded for this species.

HALORAGEÆ.

Myriophyllum pedunculatum, Hook. f.—New for N.S. Wales

Mt. Kosciusko, circa 7000ft. Lining the bottoms of shallow ponds near the head of the Snowy River. The plant has a red cast and gives the surface of the ground a red appearance. Previously recorded from the Australian Alps in Victoria, Tasmania also, and Western Australia.

The flowers in our specimens are not pedunculate.

MYRTACEÆ.

RHODAMNIA TRINERVIA, Blume, var. GLABRA, n.var.

Richmond River (in fruit; W. Bäuerlen, April, 1891); Mullumbimby (in flower; W. Bäuerlen, December, 1895); Burringbar (E. Betche, April, 1896). (Mr. Bäuerlen's specimens were received from Mr. R. T. Baker, Curator, Technological Museum).

Chiefly distinguished by the absence of all hairs. Shrub 5 to 10 feet high (as far as seen); the two side-nerves of the leaves are less prominent than in the typical form and closer to the margin.

UMBELLIFERÆ.

AZORELLA MUELLERI, Benth.—New for N.S. Wales.

Mt. Kosciusko, 5500 ft. to summit (J. H. Maiden, January, 1898); tree-line to 7000 ft. (J. H. Maiden and W. Forsyth, January, 1899). Previously recorded from the summits of the Munyong Mountains, Victoria.

Bentham has a note, "This species in many respects approaches *Hydrocotyle* in character as well as in habit." Most persons would, we imagine, collect it for a *Hydrocotyle*.

OREOMYRRHIS ANDICOLA, Endl.

Mt. Kosciusko, on the very summit, and at various elevations. Specimens which differ from the typical form chiefly in the short fruiting pedicels which (B.Fl. iii. 377) are described as "longer than the bracts."

CRANTZIA LINEATA, Nutt.

Apsley River, near Walcha (E. Betche, December, 1898).

The leaves are described in the *Flora Australiensis* as "from under one inch to two or three inches long or even more." The species is quite amphibious on the Apsley River, growing in mudbanks with short leaves, or floating with leaves generally six inches to one foot long, attaining 18 inches in extreme cases.

COMPOSITÆ.

Olearia alpicola, F.v.M., var. aglossa, n.var.

Jindabyne (W. Bäuerlen, January, 1890); Sawpit Creek, Mt. Kosciusko (J. H. Maiden, January, 1898, and 1899).

Differs from the broad-leaved form of *Olearia alpicola* in the absence of the ray-flowers, in the fewer flowers in the heads (5 to 7 in the heads examined) and in the pinkish tint of the pappus-bristles. Specimens of *O. alpicola* from the Cobberas Mountains in Victoria, collected by F. v. Mueller, as well as specimens from Woolls' Herbarium without locality, agree precisely with the rayless Mt. Kosciusko form, except in the presence of the ray-flowers.

Leptorrhynchus squamatus, Less.

Mt. Twynam, Mt. Kosciusko (J. H. Maiden and W. Forsyth, January, 1899).

A comparatively broad-leaved form, uniformly hairy on both sides of the leaf. The peduncle short or absent.

Abrotanella nivigena, F.v.M.—New for N.S. Wales.

Mt. Kosciusko, tree-line to summit (J. H. Maiden and W. Forsyth, January, 1899). Previously recorded from the summits of the Munyong Mountains, Victoria.

Helipterum corymbiflorum, Schlect., var. ? microglossa, F.v.M. in *B.Fl.* iii. 647.

We proposed (P.L.S.N.S.W., May, 1897) to raise this variety to the rank of a species, under the name of *H. microglossum*. On examination of additional material and as a result of a visit by one of us to the National Herbarium, Melbourne, where a large series of specimens was examined, we have arrived at the conclusion that the new species is untenable, although extreme forms of *H. corymbiflorum* and its variety are very dissimilar in appearance.

Since then Prof. Tate has shown (*Proc. Roy. Soc. S.A.* xxii. 121) that he had raised the variety *microglossum* to the rank of a species so far back as 1883.

Botanists have therefore a choice of designations for the plant, but we are of opinion that the Melbourne Herbarium dwarf forms with shorter rays and narrow flower heads distinctly show a connection between *H. corymbiflorum* and *H. microglossum.*

GNAPHALIUM JAPONICUM, Thunb., var. RADICANS, F.v.M., MS.

Mt. Kosciusko, tree-line to 7000 ft. (J. H. Maiden and W. Forsyth, January, 1899).

This alpine variety bears the unpublished manuscript name of F. v. Mueller, given to specimens collected by him nearly half a century ago on the Munyong Mountains, Victoria.

SCROPHULARINEÆ.

GLOSSOSTIGMA SPATHULATUM, Arn.—New for N. S. Wales.

Common on the banks of the Apsley River near Walcha (E. Betche, December, 1898 . Dispersed over tropical Asia and Africa. In Australia previously recorded from Queensland.

The colour of the flower seems to vary greatly. Bentham describes it in the *Flora Australiensis* as blue; in the figure of an Indian specimen in Hook., *Bot. Misc.* ii. suppt. 4, the colour is white and pinkish with a pink style, while our Apsley River specimens are of a pure white. *Glossostigma spathulatum* grows on the Apsley River in company with the pretty blue *G. elatinoides*, Benth., and both are remarkable for the sensitiveness of the tongue-shaped style. The upper part of the style is curved over the stamens, and at the lightest touch moves slowly back to the upper lip, uncovering the stamens. Students interested in this pretty contrivance to insure cross-fertilization will find a full account in "Notes on the Fertilization of Glossostigma" by J. F. Cheeseman in *Trans. New Zealand Inst.* 1877, p. 353.

LIMOSELLA AQUATICA, Linn., var. with terete leaves.

Banks of the Apsley River, closely associated with *Glossostigma spathulatum,* Arn., (E. Betche, December, 1898).

Though this almost cosmopolitan plant varies greatly in the breadth of the leaves and the leaves of the common Australian form are narrower than in the European and Asiatic specimens, we have never met before with quite terete leaves.

LABIATÆ.

Plectranthus congestus, R.Br.—New for N.S. Wales.

Mt. Nullum (about 800 ft. high) near Murwillumbah, Tweed River (Dr. G. A. Goldsmid, February, 1899). Previously recorded from Queensland.

MONIMIACEÆ.

Piptocalyx Moorei, Oliv.

Dividing Range, between Sandy Flat and Mount Spiraby, Tenterfield district (J. H. Maiden, December, 1898).

This rare and interesting plant (figured in 1895 in Hooker's *Icones Plantarum*, pl. 2367) has been previously recorded only from the Kempsey district on the Hastings River, and from Wollombi and Guy Fawkes on the Armidale road.

LAURINEÆ.

Endiandra globosa, n.sp.

A tall straight-stemmed tree, glabrous in all its parts, except minute hairs on the inflorescence. Leaves ovate-elliptical, acuminate but obtuse, 5 to $5\frac{1}{2}$ inches long and 2 to nearly 3 inches broad, finely reticulate and equally green on both sides, narrowed into a short petiole. Panicles in the few specimens seen much less than half as long as the leaves. Calyx- (or perianth-) tube small, the limb very open, consisting generally of six broad segments. Stamens: three fertile ones alternating with three short thick rudimentary ones, and a large scale-like gland on each side of the fertile stamens. Ripe fruits perfectly globular, two inches in diameter, resting on a short thick pedicel, with a thin pericarp and a hard woody endocarp.

Near Murwillumbah, Tweed River, N.S.W. (Dr. J. A. Goldsmid, December, 1898).

The large fruits, of the shape and size of a small billiard ball, are frequently picked up in the dense brush forests of the Richmond and Tweed Rivers, and have been known to us for many years, but on account of the large size of the tree and the difficulty of collecting in dense brushes we have not hitherto been able to procure correctly matched flowering specimens till we succeeded in interesting Dr. Goldsmid, a resident of Murwillumbah, in the subject.

In affinity it is nearest to *E. Sieberi*, Nees, from which it is scarcely distinguished in the flowers; but its habit, foliage and fruit are so different that we cannot consider it a variety of that species.*

PROTEACEÆ.

Isopogon Dawsoni, R. T. Baker.

Nepean River (W. Forsyth, September, 1898).

Originally found by Mr. Baker in the Murrumbo Ranges, Goulburn River, in 1893, and described by him in the Proc. of this Society in March, 1895. We hereby record a new locality for this rare plant.

Persoonia chamæpeuce, Lhotsky.

Apsley Falls, near Walcha (E. Betche, December, 1898).

Sunny Corner and Mudgee have been recorded hitherto as the most northern localities.

Macadamia ternifolia, F.v.M., var. integrifolia.

Described by us in the Proc. of this Society in November, 1896, as *M. integrifolia*, n.sp., but since we have had, through Mr. Luehmann's kindness, the opportunity of comparing the rich material accumulated in the Melbourne Herbarium, and have

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* Since this paper was in type we have been favoured by Mr. R. T. Baker with good flowering specimens collected by Mr. W. Bäuerlen, near Murwillumbah, in October, 1892. It is described as a "Tree of 25 ft." on the label.—23. vi. 99.

found all degrees of transition between the two extreme forms, we have been forced to the conclusion that it can only be a variety, and is merely another instance of the great variability of the Proteaceous trees from which the Order derives its name.

SANTALACEÆ.

Exocarpus nana, Hook. f.—New for N.S. Wales.

Bullrock Mt. (W. Bäuerlen, 1890); Pretty Point, Mt. Kosciusko (J. H. Maiden and W. Forsyth, January, 1899).

A wiry plant a few inches high, forming a tangled mass encircling a rock in boggy ground.

This plant has been confused with *E. humifusa*, R.Br. In our plant the scale-like leaves are all opposite or nearly so, and not alternate as in *E. humifusa*. *E. nana* is recorded from Victoria ("Summit of Cobberas Mountains at an elevation of 6000 ft.") while the true *E. humifusa*, R Br., is only recorded from Tasmania.

GRAMINEÆ.

Eremochloa muricata, Hackel, in De Candolle's Prodomus, *Monogr. Andropog.* p. 262 (1889)—Byron Bay (W. Forsyth, October, 1898).

Synonymy according to Hackel, *Aegilops muricata*, Retz., *Rottboellia muricata*, Retz., *Ischaemum pectinatum*, Trin., *Andropogon pectinatus*, Steud.

Recorded previously from the northern coast district of N.S. Wales (extending to the Tableland), as *Ischaemum pectinatum*, Trin. The grass described in the *Flora Australiensis* as *Rottboellia muricata*, Retz., is, according to Hackel, the var. *commutata* of *Rottboellia ophiuroides*, Benth., and not the true *Rottboellia muricata* of Retzius, which is synonymous with *Eremochloa muricata*.

Hackel separates *Eremochloa*, Büse, from *Ischaemum*, Linn., chiefly by the following characters—

Ischaemum.—Pedicellate spikelets developed, flower-bearing. Sessile spikelets awned or with the flowering glume at least mucronate-pointed.

Eremochloa.—Pedicellate spikelets very rudimentary, sessile spikes awnless; first outer glume pectinate-fringed at least at the base. Spike solitary.

We feel fully justified in departing from the nomenclature of Bentham and F. v. Mueller (*B. Fl.* vii., 521) and introducing the genus *Eremochloa* into the Flora of N.S. Wales. Recent monographical works of eminent specialists like Prof. Hackel are not to be ignored, and the genus has already been recognised by J. D. Hooker in the *Flora of British India* (Vol. vii. p. 180, Gramineæ).

AGROSTIS (DEYEUXIA) DENSA, F.v.M.—New for N.S. Wales.

Mt. Kosciusko, 6000 ft. (R. Helms, February, 1893); Pretty Point, Mt. Kosciusko, 5500 ft.

Mr. Helms' specimens are broad-leaved and have the awn attached somewhat above the middle of the glume, while in the recently collected specimens from Pretty Point the leaves are narrower and the awn is attached a little below the middle. In spite of the difference in the attachment of the awn we must consider the two forms identical with Bentham's *Deyeuxia densa*, in which the awn is described as attached "about the middle."

In nearly all our Mt. Kosciusko *Agrostis* we find the attachment and length of the awn, and even the comparative length of the flowering glume, unreliable characters subject to great variations. Amongst the grasses recently collected on Mt. Kosciusko by Maiden and Forsyth we find *A. Muelleri*, Benth., in three distinct forms: the typical awnless form, another form with a very short awn or small point attached near the top, and a third form with an awn at least twice as long as the flowering glume attached near the middle. In all other respects the three forms are quite identical. *A. nivalis*, F.v.M., has also been collected in two forms, the one identical with the Victorian type specimen from Mt. Buller, the other with the flowering glume considerably shorter than the outer glumes.

Mr. L. Rodway has made a similar observation in Tasmanian species of *Agrostis;* he writes in a private letter (with regard to *A. quadriseta*): "The typical form has the awn inserted below the middle, but in Tasmanian forms at least this is totally unreliable."

DEYEUXIA BREVIGLUMIS, Benth.

On banks of creeks near Mt. Spiraby, eastern side of Dividing Range near Tenterfield (J. H. Maiden, December, 1898). In similar situations at Jindabyne and Sawpit Creek, Mt. Kosciusko (J. H. Maiden and W. Forsyth, January, 1899). These localities are given as this grass has rarely been recorded.

It forms patches of turf three to six inches long or, under the protection of clumps of *Juncus*, &c., it elongates considerably, forming a thin, weak-growing grass of great length (one of us has measured specimens 3 ft. long !)

Mr. J. G. Luehmann has since informed us that it was collected at Braidwood by Bäuerlen, and that he also has received it from Walcha, N.S.W.

FILICES.

PTERIS FALCATA, R. Br., var. NANA, Bailey, *Synops. of Q. Fl.* p. 669.

On rocks near the Apsley and Tia Falls (E. Betche, December, 1898).

According to Mr. Bailey this form is common in every scrub in Queensland, but it has not been previously recorded from N.S. Wales.

CONTRIBUTION TO AUSTRALIAN ICHTHYOLOGY.

By J. Douglas Ogilby.

In the paper here submitted to the Society descriptions of the following new genera and species of Australian fishes are given:—(Plotosidæ) *Euristhmus*, g.n., and *Ostophycephalus duriceps*, g. and sp.nn.; (Galaxiidæ) *Galaxias occidentalis*, sp.n.; (Serranidæ) *Bostockia* (g. redescr.) *hemigramma*, sp.n.; *Epinephelides leai*, g. and sp.nn.; (Theraponidæ) *Therapon humeralis*, sp.n.; and (Cepolidæ) *Cepola australis*, sp.n. The following species, which have been insufficiently diagnosed, are also redescribed:—(Monocentridæ) *Monocentris gloria-maris*; (Cheilodipteridæ) *Apogon rüppellii*; (Serranidæ) *Edelia vittata*; and (Scaridæ) *Pseudoscarus gymnognathos*. Notes on *Callanthias platei* are also given; and the suggestion is here thrown out that *Callanthias* (type—*peloritanus*), *Anogramma* (type—*allporti*), and *Gramma* (type—*loreto*) should be set apart as a subfamily (*Callanthiinæ*) of the Serranidæ. The families Monocentridæ and Cepolidæ are also diagnosed in this paper.

Most of the new species are from West Australia, and were kindly collected and given to me by Mr. Lea, now Government Entomologist of Tasmania, but at that time holding a similar position to the West Australian Government.

Two important species were obtained in Port Jackson, and in this case the honour of adding two new famllies to the Australian fauna is due to Mr. Brodie, who has kindly submitted to me for identification *Gonorhynchus greyi* and *Cepola australis*.

PLOTOSIDÆ.

Euristhmus, gen.nov.

Body elongate; tail more than twice as long as the head and trunk. Skin smooth. Head tetragonal, much wider than deep, with small, wart-like papillæ. Mouth moderate; lips thick and papillose, the upper without posterior filament; no mental lobe. Premaxillary teeth conical, in two small patches, the outer series enlarged; mandibular teeth forming an interrupted crescentic band, pluriserial, the outer row enlarged and bluntly conical, the rest granular; vomerine teeth granular and unequal. Anterior nostril on the outer edge of the lip, simple. Barbels moderate. Eyes small, sublateral, without free lid. Gill-membranes separate, broadly attached to the isthmus; gill-openings moderate; seven or eight branchiostegals; gill-rakers in small number; axillary pore present. First dorsal fin originating behind the base of the pectoral; second dorsal longer than the anal; ventrals rounded, with 12 or 13 rays, inserted behind the origin of the soft dorsal; pectoral rounded, with 8 or 9 soft rays; caudal pointed.

Etymology:—*εὐρύς*, wide; *ἰσθμός*, isthmus.

Type:—*Plotosus elongatus*, Castelnau.

Distribution:—Northern and eastern coasts of Australia.

To this genus also belongs *Cnidoglanis lepturus*, Günther.

Ostophycephalus, gen.nov.

Body moderately elongate; tail more than twice as long as head and trunk. Skin smooth. Head trigonal, much wider than deep, feebly vermiculated, with a few scattered papillæ. Lips rather thin, the upper without posterior filament; mental lobe small. Premaxillary teeth conical, in two small patches, subequal; mandibular teeth forming an interrupted crescentic band, pluriserial, the outer series enlarged and conical, the inner granular; vomerine teeth granular and irregular. Anterior nostril on the outer edge of the lip, simple. Barbels short. Eyes small, lateral, without free lid. Gill-membranes separate, broadly attached to the isthmus; gill-openings moderate; eight branchiostegals; pseudobranchiæ present; gill-rakers in small number; axillary pore well developed. First dorsal fin originating above the base of the pectoral; second dorsal longer than the anal; ventral rounded, with 11 rays, inserted behind the origin of the second dorsal; pectoral with 8 soft rays; caudal rounded.

Etymology:—ὀστοφυής bony; κεφαλή, head.

Type:—*Ostophycephalus duriceps*, Ogilby.

Distribution:—St. Vincent's Gulf, South Australia. The species described by Günther in the Challenger Reports (i. Shore Fishes, p. 49) as *Cnidoglanis nudiceps* possibly belongs to this genus.

OSTOPHYCEPHALUS DURICEPS, sp.nov.

B. viii. 1 D. i 5. 2 D. + C. + A. 227 (111 + 10 + 106).

Depth of body 11 (?), length of head $4\frac{7}{10}$ in the total length; width of head $\frac{2}{3}$ of its length, which is $\frac{2}{5}$ of the distance between the tip of the snout and the vent; upper profile of head gently rounded and but little oblique. Eye with wholly adnate lid, its diameter $8\frac{2}{5}$ in the length of the head and $3\frac{3}{4}$ in that of the snout, which is sharply pointed, but weakly declivous at the extremity, and $1\frac{1}{3}$ times as long as wide; lower lip feebly plicated, the mental lobe small and divided. Interorbital region slightly concave, its width $\frac{3}{4}$ of that of the mouth and $3\frac{3}{4}$ in the length of the head. Premaxillary teeth in two small patches, consisting of three teeth each; mandibular teeth in a wide, crescentic, divided band, each half of which is twice as long as broad; a pair of enlarged conical teeth on each side of the symphysis; vomerine patch large, forming an equilateral triangle. Barbels very short and slender, the nasal $\frac{1}{6}$ of the head and reaching little more than half way to the eye; maxillary barbel even shorter than the nasal; postmental barbel inserted well inside and behind the angle of the mouth, reaching in a direct line midway to the gill-opening, and $\frac{2}{9}$ of the head; mental barbel $\frac{1}{3}$ longer than the postmental. Greatest width of the isthmus but little less than the interorbital width. Gill-rakers 2 + 6, the longest $\frac{2}{5}$ of the diameter of the eye. Skin of head above finely vermiculated, below closely studded with minute pores. Axillary pore large. Distance of first dorsal from tip of snout $4\frac{1}{2}$ in the total length; dorsal spine moderate, serrated in front, barbed behind, its length $\frac{1}{3}$ of that of the head, and much less than the rays, which do not reach to the origin of the second dorsal; second dorsal originating slightly in advance of the base of the ventral: distance of anal fin from tip of mandible $2\frac{3}{5}$ in the total length: ventral rounded, with 11 rays, its length $3\frac{1}{4}$ in the head: pectoral with 8 soft rays, the spine serrated on the outer border, its length $2\frac{1}{2}$ in that of the head and $\frac{9}{10}$ of the soft rays, which do not reach to the base of the ventral: caudal small and rounded, $\frac{1}{4}$ of the head. Blue-grey, darkest above, the upper surface of the head nearly black.

Etymology:—*durus*, hard; *ceps*, head.

Type in the South Australian Museum, Adelaide.

Distribution:—St. Vincent's Gulf, South Australia. The unique example from which the above description was drawn up appears to have been washed ashore and partially sun-dried; it measures 383 millimeters. I have, however, seen a specimen of *Plotosus* equally constricted in the abdominal region, the evident cause being the presence of a large number of free-swimming copepods (*Lerneolophus* sp.) attached to the inside of the mouth and throat. The condition of the species described above may therefore have been due to disease.

GALAXIIDÆ.

GALAXIAS OCCIDENTALIS, sp.nov.

B. vii. D. 8-9. A. 13-14.

Body moderately stout and compressed, its depth 5 to $5\frac{1}{3}$ in the total length, its width $1\frac{1}{2}$ to $1\frac{2}{3}$ in its depth. Length of head $4\frac{4}{5}$ to 5 in the total length; width of head equal to its depth and $1\frac{3}{4}$ to 2 in its length. Interorbital region flat, its width $2\frac{2}{3}$ to $2\frac{4}{5}$ in the head. Diameter of eye 4 to $4\frac{1}{2}$ in the head and $1\frac{1}{5}$ to $1\frac{1}{3}$ in the snout. Lower jaw the longer. Maxillary extending to or a little beyond the vertical from the anterior border of the eye, its length $2\frac{2}{5}$ to $2\frac{2}{3}$ in the head. Gill-rakers 3 + 10, short. Dorsal and anal fins rounded; the space between the origin of the dorsal and the base of caudal $2\frac{2}{3}$ to $2\frac{4}{5}$ in its distance from the extremity of the snout, its length 1 to $1\frac{1}{4}$ in its height, $1\frac{2}{5}$ to $1\frac{1}{2}$ in the length of the anal, and $1\frac{2}{5}$ to $1\frac{2}{3}$ in the distance between its origin and the anal: anal commencing opposite to or a little behind the origin of the dorsal, its base as long as or a little longer than its distance from the caudal; longest rays when laid back not reaching beyond the short posterior rays: ventral with seven rays, inserted a little nearer to the tip of the mandible than to the base of the caudal, its length $1\frac{3}{4}$ to $1\frac{4}{5}$ in the head and $2\frac{1}{5}$ to $2\frac{1}{2}$ in the space between its origin and the anal, which is as long as or slightly less than its distance from the base of the pectoral; pectoral with 14 rays, as long as or a little longer than the ventral, and less than half the distance between its base and that fin: caudal emarginate, 6 to $6\frac{1}{2}$ in the total length; least depth of caudal peduncle 2 to $2\frac{1}{4}$ in its length behind the dorsal, which is $1\frac{1}{5}$ to $1\frac{1}{3}$ in the head. Vertebræ 57 (37 + 20). Dull yellow, everywhere closely powdered with minute dusky dots; body with twelve to fourteen golden, blue-edged transverse bands, which are more crowded on the tail, and do not extend to the dorsal and abdominal profiles: fins immaculate. Young examples are dark brown with bluish transverse bands.

E t y m o l o g y :—*occidentalis*, western; this being the first species recorded from west of the Murray watershed.

Type in my possession.

Length of largest specimen 105 millimeters.

D i s t r i b u t i o n :—Streams south of Perth.

This handsome species belongs to the group of which *Mesites attenuatus*, Jenyns, is the type and which differs from the typical *Galaxias* (type *alepidotus*) in its slender, subterete or slightly compressed body, small head which is as wide or a little wider than deep, small mouth, fewer (six or seven) branchiostegals, small fins, and emarginate caudal. This group might in future be known as *Austrocobitis*, that name being substituted for *Mesites*, Jenyns,* preoccupied by Schönherr in 1838 for a genus of coleopterous insects.

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* Voy. Beagle, Fish. iii. p. 118, 1842.

MONOCENTRIDÆ.

Body ovate, strongly compressed. Head large, with conspicuous muciferous cavities, the snout blunt and gibbous, projecting somewhat beyond the mouth. Mouth wide with oblique cleft, the lower jaw included, broad and truncated in front, with an oval, glandular, luminous disc behind the angle. Premaxillaries protractile, uniting to form a deep symphysial cavity, at the bottom of which is a similar disc, and constituting the entire dentigerous portion of the upper jaw; maxillary narrow, sigmoidal, hidden in front and behind by the shields of the orbital ring, provided with a large supplemental bone. Teeth minute, closely set, tubercular, covering the jaws, palatines, pterygoids, and branchial arches; present or absent on the vomer; tongue toothless or with scattered patches of teeth. Nasal openings large and patent, separated from one another by a narrow naked isthmus, which is curved forward across but is not connected with the deeper curtain which partially divides the nostril from the wide and deep preorbital cavity; both nostril and cavity are separated from the eye by a membranous curtain, which is partially protected along its outer margin by a small pyriform dermal shield; the two preorbital cavities are separated above by a wide bony bridge but are continuous within, so that there is an unobstructed view through the snout; each is provided with a luminous disc near its upper and outer edge. Eye large, situated in the anterior half of the head. Bones of the head rugose but not spiniferous, forming a network, the smooth membranous interspaces profusely punctured by small open pores; suborbital ring narrow, in part aborted; opercle with a strong curved keel traversing its upper moiety, but without prominent spine. Gill-openings wide; gill-membranes separate, free from the isthmus; gills four; the membrane behind the fourth closed; eight branchiostegals; pseudobranchiæ present; gill-rakers short and stout, densely spinulose. Two separate dorsal fins, the first composed of a few strong, rough, more or less isolated spines, which are alternately inclined to left and right; soft dorsal with eleven or twelve articulated rays; anal short with ten to twelve rays; ventral inserted below the base of the pectoral, with an enormously developed spine and two to four rudimentary rays; the spine provided with a locking apparatus, by means of which it can be immovably fixed at right angles to the axis of the body; when laid back it fits into a smooth groove outside of the abdominal scutes; pectoral moderate, asymmetrical, with thirteen to fifteen rays, the upper the longest; caudal emarginate and rather small; all the soft rays strongly spinulose. Scales large, coarse, and but little imbricated, each with a strong, median carina, bearing near its centre a stout backwards directed spine, from the base of which radiate spinulose striæ; abdomen protected by a series of largely developed scutes; soft dorsal and anal fins depressible within a scaly groove. Air-bladder large. Pyloric appendages in small number.

Inhabitants of the Western Pacific and Indian Oceans, residing possibly at considerable depths but visiting the neighbourhood of the shore at stated seasons.

Referring to the Japanese species, *Monocentris japonicus*, Schlegel writes:* "Common in Japan, and found in great numbers in winter and spring in the Bay of Nagasaki; its flesh is much relished by the inhabitants of the empire, and they usually eat it raw."

In comparing our Australian fish with the typical form, several points immediately claim our attention:—

Primarily all the authors whom I am in a position to consult —Cuvier and Valenciennes, Schlegel, and Günther—agree in denying to *M. japonicus* the presence of vomerine teeth; in fact, the authors of the "Histoire Naturelle" go out of their way to remark that the absence of these teeth is "chose singulière."

The dental diagnosis is thus given by Günther, "villiform teeth in the jaws and on the palatine bones, none on the vomer."† This brief announcement conveys at best but a hazy idea of the

* Fauna Japonica, Pisces, p. 50.

† Catalogue of Fishes, i. p. 9.

dentition of our fish, in which the teeth would more correctly be termed tubercular, and form in fact a smooth pad-like surface, which entirely covers the jaws, both outside and inside, palatines, pterygoids, and branchial arches, and partially the vomer and tongue.

There is no reference in any of the authors above mentioned to the curious bifurcation of the dentary nor to the luminous mandibulary disc, the presence of which is, however, the obvious cause of the departure from its ordinary form which has taken place in that bone, since the supplementary external limb has been manifestly provided for the protection of the sensitive light glands, the teeth with which it is armed being of little or no use in such a position. The presence of luminous glandular discs, as such, is not in fact referred to anywhere, though Cuvier and Valenciennes, in their excellent account of the Japanese fish, speak of these discs as colour-markings, not recognising their true character. In addition to these mandibulary discs, there are, as mentioned in the diagnosis of the family, three other discs, namely, the maxillary disc, situated at the bottom of the symphysial cavity, and the two preorbital discs, covering the postero-superior angle of the largely developed cranial canal, which uninterruptedly pierces the rostral framework from side to side in front of the eyes. There is no apparent necessity for this latter pair of luminous discs, unless they are provided for the purpose of disseminating light immediately in advance of the visual organs; but with the three remaining discs the case, as it appears to me, is very different, for I think we may fairly conclude that these luminous glands serve as traps to entice their prey within reach; some such provision would, in fact, be necessary to a species which, having regard to the small size of the fins and the comparative inflexibility of the dermal incasement, must needs be possessed of but feeble swimming powers, and the position of the maxillary and mandibulary discs fully supports the legitimacy of this deduction. For, while the glow of the maxillary organ, set as it is in the recess of a cup-shaped cavity, would only be visible to a creature stationed or passing directly in front of the fish, the luminosity of the mandibulary organs would, when the mouth was open, be patent to any animal approaching from the side or behind, and would thus prove a valuable adjunct to the symphysial disc of the upper jaw; while the mere act of closing the mouth would shut off the light whenever its presence was liable to prove a source of danger.

Again, the author of the ichthyological portion of Lydekker's "Royal Natural History" writes of *Monocentris japonicus* as having the scales "articulated together so as to form a solid armature." Whatever may be the case with regard to the Japanese fish I do not know, not having a specimen for examination, but it is certain that no such articulated coat of mail exists in the Australian species; on the contrary, the scales are normally developed, though greatly thickened and embossed, and, far from forming a "solid armature," are only partially imbricated, especially on the tail, so that the naked skin is plainly visible through the interstices, as is observable with many snakes.

If the statement as to the articulation of the scales is correct, and if the luminous organs, which are so conspicuous in the Australian form, are wanting in the Japanese, there can be no doubt that our fish must be relegated to a different genus; but in the absence of special information on these points, I am not prepared to go so far, and shall, therefore, for the present, consider De Vis' *Cleidopus* as a subgenus of *Monocentris*, restricting the latter name to those species in which the vomer is toothless.

In the "Study of Fishes," Günther announces that *Monocentris* is found at Mauritius, but as I have failed to find any earlier or fuller record of such occurrence, I am unable to decide whether the Mauritian fish belongs, as would seem more probable, to our type or to that of the North Pacific.

Monocentris.

Monocentris, Bloch and Schneider, Syst. Ichth. p. 100, 1801.
Lepisacanthus, Lacépède, Hist. Nat. Poiss. iii. p. 321, 1802.
Cleidopus, De Vis, Proc. Linn. Soc. N.S. Wales, vii. 1882, p. 367.

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* Royal Natural History, v. p. 354. The statement is not, so far as I am aware, confirmed by other authors.

Characters included in those of the family.

Μόνος, single; κεντρίς, a thorn (Ælian).

Type, *Monocentris carinata*, Bloch and Schneider = *Gasterosteus japonicus*, Houttuyn.

Coasts of Japan, Eastern Australia, and Mauritius; approaching the shore during the colder months.

MONOCENTRIS GLORIA-MARIS.

Monocentris japonicus (not Houttuyn), Macleay, Proc. Linn. Soc. N.S. Wales, v. 1881, p. 510.

Cleidopus gloria-maris, De Vis, Proc. Linn. Soc. N.S. Wales, vii. 1882, p. 368.

D. v-vii. 12. A. 11-12. Sc. 2/14-15/4-5.

Depth of body $1\frac{2}{5}$ to $1\frac{3}{4}$, length of head $2\frac{1}{2}$ to $2\frac{3}{4}$ in the total length; width of interorbital region 2 to $2\frac{1}{3}$, diameter of eye 3 to $3\frac{1}{5}$ in the length of the head; snout short and rounded, its height as great as or greater than its length, which is $\frac{3}{5}$ to $\frac{3}{4}$ of the diameter of the eye; upper profile of head behind the gibbosity slightly concave. Maxillary extending to the vertical from the posterior border of the eye or not quite so far, its length 2 to $2\frac{1}{4}$ in that of the head, its greatest width $4\frac{3}{4}$ to $5\frac{1}{4}$ in its length. 12 gill-rakers on the lower branch of the anterior arch, the longest about $\frac{2}{5}$ of the diameter of the eye. Dorsal fin originating above or very slightly behind the base of the pectoral; second spine longest, $1\frac{1}{3}$ to $1\frac{1}{2}$ in the length of the head and a little longer than the third; first spine intermediate in length between the third and fourth; fifth spine short; these five are always present and united by membrane at the base; one or two small spines present or absent between the two dorsals; outer border of soft dorsal rounded, the middle rays about as long as the first spine: anal originating below the middle of the soft dorsal, the anterior rays the longest, 2 to $2\frac{2}{5}$ in the length of the head: ventral with three or four rudimentary rays and an enormously developed spine, which is almost as long as the head and extends to, or nearly to, the end of the fourth abdominal scute; the free portion of the spine is longitudinally fluted: pectoral with 14 or 15 rays, $1\frac{2}{5}$ to $1\frac{1}{2}$ in the length of the head: caudal fin about $\frac{1}{5}$ of the total length; the peduncle rather weak, its depth equal to or less than the diameter of the eye. Abdominal scutes five, the second the longest, as long as the terminal pair and about $\frac{2}{5}$ of the length of the ventral spine; soft dorsal and anal sheaths composed of three pairs of scales, each of which is armed with a strong denticulated spine and an outer serrated edge; expanded portion of the maxillary closely studded with short, stout, conical spines, that part which impinges upon the orbit being smooth or nearly so; opercle with spinulose striæ radiating from the base of the keel; remaining bones of the head irregularly spinulose and pitted. Whitish with a golden gloss anteriorly, the black skin visible between the scales, especially on the tail; lips and chin black, the naked space between the mandibles with numerous broad, fleshy, white tentacles; luminous discs yellow; bony portion of maxilla and the skin behind and beneath it white; tips of the larger gill-rakers dull blue.

Etymology:—*gloria*, glory; *maris*, of the sea.

Type examined, in the Queensland Museum.

Length to 225 millimeters.

Eastern coast of Australia, south to Port Jackson.

The "Knight-fish," so called because of the coat of mail by which it is protected, occurs sporadically on our coast, usually among the detritus washed up on the beach during stormy weather. It may not, however, be so uncommon as would appear from the small number of specimens to be found in our museums, for, being plainly a fish which haunts rocky localities, it would necessarily be out of reach of our net fishermen, while its sluggish habits and dependence on the efficacy of its luminous traps to lure its prey within its reach—a mode of angling which of course necessitates absolute quietude in the angler—takes it equally out of the scope of the line fisher's art, unless he should chance to drop the bait literally into its mouth.

In addition to the type specimen, I have been able to examine four others, three of which are in the Australian Museum and were obtained from Port Jackson (2) and Port Stephens, while the fourth was kindly lent me by Mr. A. Finckh, of the Technological Museum.

CHEILODIPTERIDÆ.

Apogon rüppellii.

Apogon rüppellii, Günther, Catal. Fish. i. p. 236, 1859; Port Darwin.

D. vii, i 9. A. ii 9-10. Sc. 2/25-26/6.

Depth of body $2\frac{1}{5}$ to $2\frac{2}{3}$, length of head $2\frac{2}{3}$ to $2\frac{3}{4}$ in the total length. Dorsal profile strongly, abdominal moderately arched; upper profile of head slightly rounded. Snout $\frac{5}{7}$ to $\frac{2}{3}$ of the diameter of the eye, which is $2\frac{3}{4}$ to 3 in the length of the head. Interorbital region flat, its width $3\frac{1}{2}$ to $3\frac{2}{3}$ in the head. Maxillary concave posteriorly, extending to the vertical from the middle of the eye, its length $\frac{1}{2}$ of that of the head, its width at the distal extremity $2\frac{1}{5}$ to $2\frac{3}{5}$ in the diameter of the eye. Outer edge of preopercle serrated, most strongly at the broadly rounded angle; inner ridge with a few serræ at the angle. Cheek with a single series of tube-bearing scales. Gill-rakers 4 + 12, the longest $\frac{1}{2}$ of the eye. Dorsal fin originating above the base of the pectoral, its distance from the tip of the snout $\frac{5}{7}$ to $\frac{1}{2}$ of that from the base of the caudal; third and fourth spines equal or the fourth a little the longer, $\frac{2}{3}$ to $\frac{4}{7}$ of the head and $\frac{5}{6}$ to $\frac{3}{4}$ of the longest soft rays; spine of second dorsal as long as or a little shorter than that of first; length of second dorsal $\frac{3}{5}$ of its height and less than that of the anal: second anal spine about as long as the fifth dorsal, $\frac{3}{5}$ to $\frac{4}{7}$ of the rays, which are subequal to those of the dorsal: ventrals pointed, $\frac{4}{5}$ to $\frac{5}{7}$ of the head, and reaching beyond the origin of the anal: pectoral with 14 rays, reaching to the vertical from the 13th or 14th scale of the lateral line, $\frac{4}{5}$ to $\frac{3}{4}$ of the head: caudal rounded, $3\frac{1}{4}$ in the total length; least depth of caudal peduncle $\frac{3}{4}$ to $\frac{3}{5}$ of its length and $2\frac{1}{5}$ to $2\frac{3}{5}$ in the depth of the body. Vertebræ reddish; a series of nine to eleven black spots along the lateral line; a similar spot at the base of the last dorsal and anal rays, and two or three on the upper edge of the peduncle; border of some of the anterior scales above the lateral line black; an oblique bar from the eye to the angle of the preopercle, consisting of numerous small pearly black-edged spots: fins yellowish, the first dorsal apparently with dusky tip.

Etymology:—Named for Dr. Rüppell, author of several works on the fishes of the Red Sea.

Type in the South Kensington Museum.

Total length 110 millimeters.

Distribution:—West coast of Australia. Günther's type came from Port Darwin. There are two specimens in Mr. Lea's collections, one, the larger, from Pelsart Island, and a second (50 millimeters) from the neighbourhood of Perth.

SERRANIDÆ.

Bostockia.

Bostockia, Castelnau, Proc. Zool. & Acclim. Soc. Vict. ii. 1873, p. 126 *(porosa)*.

Body oblong, compressed. Scales moderate, adherent, cycloid, concentrically striated. Lateral line complete or incomplete, the tube straight, each extending over at least two scales (in *hemigramma*). Head large, partially naked; snout broad and depressed; muciferous system largely developed. Mouth with rather wide, oblique cleft, the chin slightly protruding. Premaxillaries but little protractile; maxillary exposed, naked, with supplemental bone. Jaws, vomer, and palatines with bands of villiform teeth; pterygoids and tongue smooth; lower pharyngeal bones narrow, the teeth acute and conical. Nostrils distant, the anterior on the border of the lip, tubular. Eyes moderate, high, sublateral. Preopercle with a double ridge, the outer serrated; opercle with a single spine, the lobe well developed. Gill-openings wide; gill-membranes separate, free from the isthmus; six branchiostegals; pseudobranchiæ rudimentary; gill-rakers short and claviform or tubercular, few in number. One dorsal fin, with vii-viii 15-17 rays, the soft portion longer than the spinous; anal shorter than the dorsal, with iii 10-11 rays; ventrals small, inserted a little behind the pectorals, close together, with a strong spine and five soft rays; pectorals moderate, rounded, with 12 or 13 rays, the middle the longest; caudal rounded or obtusely pointed. Vertebræ 33 (in *hemigramma*).

Etymology:—Named for the Rev. — Bostock, who made considerable collections in West Australia from twenty-five to thirty years ago.

Type:—*Bostockia porosa*, Castelnau.

Distribution:—Fresh waters of West Australia.

The genus *Bostockia* was proposed by Castelnau in 1873 for the reception of a fish found "in the small watercourses of the interior of Western Australia." Since that time the genus has not been again recorded until now. Castelnau has erred strangely in the position to which he has assigned his new genus. He remarks:—"This genus of *Percidæ* appears nearly allied to *Glaucosoma*"; the latter, however, belongs to the *Lutianidæ*, while *Bostockia* is a true serranid and should, I think, be placed near *Macquaria*.

The most obvious difference between the present species and *Bostockia porosa* lies in the formation of the lateral line, which in *B. hemigramma* ceases at or before the vertical from the origin of the anal fin, while in the typical form, according to its describer, "the lateral line follows regularly the profile of the back to the base of the caudal." Were it not that in almost every other structural character my fish resembles that of Castelnau, this difference might be taken as constituting a claim to generic validity, but instances of a similar variation of construction are not wanting in other percoidean genera, such as *Enneacanthus*, *Apomotis* and *Ambassis*, though I am unaware of any such in a typical serranid.

The two species may be synoptically arranged as below:—

Lateral line complete; inner ridge of preopercle serrated anteriorly; caudal fin rounded ... ... *porosa*.

Lateral line incomplete; inner ridge of preopercle everywhere entire; caudal fin obtusely pointed ... *hemigramma*.

Bostockia hemigramma, sp.nov.

D. vii-viii 15-17. A. iii 10-11. Sc. 43-47/24. L.l. 8-15.

Depth of body 3 to $3\frac{2}{5}$, length of head $2\frac{3}{4}$ to $3\frac{1}{5}$ in the total length. Dorsal profile much more strongly arched than the abdominal; upper profile of head concave before the eyes in the adult, nearly linear in the young. Diameter of eye $4\frac{2}{5}$ to $4\frac{2}{3}$ in the length of the head and equal to or a little less than that of the snout. Interorbital region gently rounded, its width $4\frac{2}{3}$ to $5\frac{1}{2}$ in the head. Maxillary extending to the vertical from the middle or posterior border of the pupil, its length $2\frac{1}{5}$ to $2\frac{1}{2}$ in the head, its width at the distal extremity $\frac{2}{3}$ to $\frac{1}{2}$ of the diameter of the eye. Outer border of preopercle with 4 to 6 strong, hidden, antrorse spines on the lower limb and angle; inner ridge entire. Gill-rakers 4 + 7, mostly tubercular. Dorsal originating behind the base of the pectoral; spines strong, the first minute and often imperceptible, increasing in length to the fourth, which is $\frac{2}{5}$ to $\frac{1}{4}$ of the head and $\frac{5}{6}$ to $\frac{5}{8}$ of the longest soft rays, which are in the latter half of the fin: second anal spine longer and stronger than the third, $\frac{1}{3}$ to $\frac{1}{5}$ of the head and $\frac{2}{3}$ to $\frac{4}{9}$ of the longest soft rays:* ventral rounded, $\frac{1}{2}$ to $\frac{3}{7}$ of the head and $\frac{5}{7}$ to $\frac{1}{2}$ of the space between its origin and the vent: pectoral $\frac{2}{3}$ to $\frac{5}{8}$ of the head: caudal subcuneate, $3\frac{3}{5}$ to 4 in the total length; least depth of caudal peduncle equal to or a little shorter than its length and $\frac{1}{2}$ to $\frac{3}{7}$ of the depth of the body. A large open pore below the chin and another at the origin of the lateral line. 24 series of scales in a transverse line between the first soft dorsal ray and the anal. Lateral line tubes very variable, never extending beyond the vertical from the origin of the anal. Vertebræ 12 + 21. Tawny-yellow, more or less obscured by dark brown: fins yellow, the soft

* The dorsal and anal spines are proportionately much longer in young than in large examples.

dorsal and anal with a median dusky band, the caudal spotted with brown.

Etymology:—ἥμι, half; γραμμή line.

Total length to 115 millimeters.

Type in the author's possession.

Distribution—Coastal streams south of Perth, West Australia.

Epinephelides, gen.nov.

Body oblong, compressed. Scales small, adherent, ctenoid, roughened along the outer border, the exposed surface coarsely striated except a small oval basal patch. Lateral line continuous, the tubes bifurcate on the curved portion, simple on the straight, extending to the posterior border of the scale. Head large, scaly, except the snout, maxillary, and mandible. Mouth with wide, oblique cleft; lower jaw prominent. Premaxillaries protractile; maxillary exposed, ridged anteriorly, without supplemental bone. Jaws with a band of villiform teeth, the inner of which are depressible and hinged; a pair of large curved canines in front of each jaw, and a second pair on each side of the lower jaw; villiform teeth on the vomer and palatines; pterygoids and tongue smooth. Nostrils approximate, the anterior small and round, the posterior a subvertical, oval slit. Eyes large, lateral, high. Preopercle serrated behind, the lower limb with large antrorse spines; opercle with three spines; subopercle serrated. Gill-openings wide; gill-membranes separate, free from the isthmus; seven branchiostegals; pseudobranchiæ present; gill-rakers moderate, cultriform, in small numbers. All the fins with scaly bases; dorsal fin with x 20 rays, the soft portion somewhat longer than the spinous; anal short, with ii 8 rays; ventrals inserted below the base of the pectorals, close together, with a strong spine and five soft rays; pectoral large, obtusely pointed, with 15 rays, the middle the longest, none of them dilated; caudal emarginate. Posterior processes of the premaxillaries extending to the frontal; cranium smooth and convex behind the orbits; supraoccipital and parietal bones very short, with strong crests.

Etymology:—*Epinephelus*, an allied genus; εἶδος, resembling.

Type:—*Epinephelides leai.*

Distribution:—West Australia.

This genus differs from *Gilbertia* in the striated scales, prominent lower jaw, three-spined opercle, number of anal spines, non-dilatation of the lower pectoral rays, emarginate caudal, and backward extension of the posterior process of the premaxillaries.

The first soft ray of the anal fin is simple and spine-like, much shorter than the second, being in fact scarcely or not longer than the enormously developed second spine, and though it is conspicuously articulated throughout two-thirds of its length, it is quite possible that this may be an accidental variation peculiar to the individual and not constant, in which case the anal spines would be of the normal number, three. It is on this account that I have not laid much stress on this character, preferring to wait until other examples are available for comparison.

I am not fully satisfied as to the advisability of associating *Plectropoma semicinctum*, Cuvier and Valenciennes,* and *P. annulatum*, Günther,† with *P. nigrorubrum*, C.V.,‡ as it appears to me that the strongly marked lateral line with its differently constructed tubes, is worthy of more consideration than has so far been given to it. Fortunately there is no need to seek for a new generic designation, since the two former would still remain under the name *Gilbertia*,§ of which *P. semicinctum* is the type, while the latter is the sole representative of *Hypoplectrodes*,‖ Gill, defined by Poey in 1871.¶

EPINEPHELIDES LEAI, sp.nov.

D. x. 20. A. ii. 8. Sc. 6/76/29. L.l. 64.

Depth of body $2\frac{7}{8}$, length of head $2\frac{2}{3}$ in the total length. Dorsal profile of body more strongly arched than the abdominal;

* Hist. Nat. Poiss. ix. p. 442, 1833.

† Catal. Fish. i. p. 158, 1859, Port Jackson.

‡ L.c. ii. p. 402, 1828.

§ Jordan and Eigenmann, Bull. U.S. Fish. Comm. viii. 1890, p. 346.

‖ Proc. Ac. Nat. Sc. Philad. 1862, p. 236.

¶ Ann. N. York Lyc. Nat. Hist. x. p. 45, 1871.

upper profile of head rounded. Diameter of eye $4\frac{1}{4}$ in the length of the head and as long as the snout. Interorbital region flat, its width $7\frac{4}{5}$ in the head; supraciliary ridges rather feeble. Maxillary extending to the vertical from the middle of the eye, its length from the tip of the snout $\frac{1}{2}$ of the head, its width at the distal extremity $\frac{3}{5}$ of the diameter of the eye. Anterior canines strong and hooked, those of the upper jaw the longest; lower jaw with a pair on each side; vomerine teeth in an obtusangular band, the outer slightly enlarged; pectoral band biserial. Preopercle finely and evenly serrated on its vertical limb, the lower with two or three strong antrorse spines; middle opercular spine the strongest, nearer to the lower than to the upper; lower spine not further back than the upper; subopercle with three or four small denticulations inferiorly. Gill-rakers 6 + 7, those on the upper branch rudimentary; the longest $\frac{1}{2}$ of the diameter of the eye. Dorsal fin originating above the outer border of the opercle and terminating well behind the anal; spines moderate, the tenth as long as the third, the fifth the longest, $2\frac{4}{5}$ in the head and $\frac{4}{5}$ of the longest soft rays: second anal spine stronger and longer than the longest dorsal spine, $2\frac{2}{5}$ in the head and $\frac{2}{3}$ of the second and longest soft ray: ventral spine strong and curved, not quite so long as the second anal, its length $\frac{2}{3}$ of the outer ray, which is $1\frac{2}{3}$ of the head and nearly reaches to the vent: pectoral with 15 rays, $1\frac{1}{5}$ in the head: caudal emarginate, the outer rays $\frac{1}{4}$, the middle $\frac{2}{9}$ of the total length; caudal peduncle deeper than long, its least depth $2\frac{2}{5}$ in the depth of the body. Scales of opercle nearly as large as those of the body; on the rest of the head much smaller. Lateral line well marked, the anterior tubes bifurcate, the posterior simple and straight Dark reddish-brown, the sides of the head and the pectoral region lighter: fins purplish-black, the bases of the dorsal, caudal, and anal orange-red.

Etymology:—Named for Arthur Mills Lea, Government Entomologist of Western Australia, who has kindly interested himself, in the face of manifold difficulties of transit, &c., in collecting fishes for the use of the work on the "Fishes of Australasia."

Type in my possession.

Distribution:—Pelsart Island, Houtman Abrolhos Group.

At the first glance this fish bears such a superficial resemblance to the *Epinephelus* type that one would naturally put it down as such, but a closer examination at once reveals its proximity to the *Gilbertia-Colpognathus* type.

In many of its characters this fish bears an extraordinarily close resemblance to the *Serranus armatus* of Castelnau* described originally from the Swan River, West Australia,† even the coloration being practically the same, but it differs in having but one anterior canine to each ramus of the jaws, two on each side of the lower jaw, palatine teeth few in a narrow band, strong antrorse teeth on the lower limb of the preopercle, three spines on the opercle, second anal spine much the strongest, and fifteen-rayed pectoral.

The unique example collected by Mr. Lea measures 122 millimeters.

CALLANTHIINÆ.

During the month of November, 1897, I obtained in the Sydney Market a specimen of *Callanthias*, which I at once recognised as being distinct from the Tasmanian *C. allporti*, but being at the time engaged in the study of our silurids, I neglected to describe the species. Subsequently the "Thetis" expedition obtained six examples "off North Head, 36 miles north of Port Jackson, in 32 to 45‡ fathoms" as recorded by Mr. Waite, under the name of *Callanthias allporti* in the Government "Report upon trawling operations off the coast of New South Wales . . . carried on by H.M.C.S. 'Thetis,' 1898." On talking over the matter with

* Res. Fish. Austr. p. 7, 1875.

† By a printer's error this species is said to come from the "Suran River" in the second edition of the British Museum Catalogue of Fishes, i. p. 309. On the preceding page of the same magnificent work another error has crept in, the pagination of *Gilbertia annulata* in Günther's Catalogue being given as 415 instead of 158.

‡ 48 doubtless by a printer's error; see page 9, fifteenth haul.

Mr. Waite, it was agreed that in his enlarged report the species should be described as *Callanthias australis*, but before this could be carried into effect I received from Dr. Franz Steindachner a pamphlet containing, among other matter, the description of a *Callanthias* from Juan Fernandez, to which the name *C. platei* was given, and which does not appear to be specifically distinguishable from our fish. In fact, the only appreciable differences lie in the larger head and eye, somewhat shorter maxillary, and some slight variation in the fin and scale formula in our species, which may be synoptically arranged as follows :—

a. Head a little more than 4 to $4\frac{2}{5}$ in total length; diameter of eye a little more than 3 to nearly $3\frac{1}{2}$ in the head; maxillary extending to below the middle of the eye in the adult, not so far in the young. D. xi 11-12. P. 20. Sc. $2\frac{1}{2}$-3/42-45/17 ... ... *platei.*

aa. Head $3\frac{3}{4}$ to $3\frac{7}{8}$ in total length; diameter of eye $2\frac{3}{5}$ to 3 in the head; maxillary not extending beyond anterior border of pupil at any age. D. xi 10-11. P. 21-22. Sc. 2/42-43/15 ... ... *platei australis.*

There is but little difference in the size of the examples examined by Dr. Steindachner and myself, so that one would hardly expect to find such a constant variation in the proportionate measurements as has been pointed out above; it is, therefore, proposed to differentiate our form subspecifically as *Callanthias platei australis.* Dr. Steindachner's specimens measured from 157 to 240 millimeters, mine from 178 to 220. In freshly caught examples there are some slight differences in coloration; for instance, referring to *C. platei*, Dr. Plate writes, "the dorsal and anal fins are dark red" ; in the Australian fish these fins are grey or greyish-pink, with a narrow but conspicuous violet marginal band; of the caudal fin Dr. Plate remarks, "sometimes the red, sometimes the violet predominates," while in our form the following pattern is very constant: "base and a broad submarginal band above and below golden, the middle rays yellowish-grey with violet tips, the rest of the fin violet;" in the Juan

Fernandez fish the iris is blackish, in ours golden, clouded with brown and bordered above with violet; nor is any mention made by Dr. Plate of the conspicuous orange spot behind the base of the pectoral fin. In their habits, also, the two forms appear to show considerable variation, for while the New South Wales fish is only taken at the bottom on rocky ground by persons engaged in fishing for schnapper, *(Pagrosomus auratus)* as in the case of two examples which I have had the privilege of critically examining, or by the trawl net in similar localities, as was the experience of the "Thetis" staff,* Dr. Plate writes of the eastern Pacific form that it arrives at the island at rare and irregular intervals in vast shoals consisting of many hundreds of individuals, and states that he has seen such swarms of fishes that they seemed to form a solid mass beneath the surface of the water, showing like golden spots in the remoter distance. Enough has, I think, been said to justify the subspecific separation of the two forms. The range of *Callanthias platei* and its subspecies may be given as throughout the South Pacific from the east coast of Australia to Juan Fernandez, and it may therefore be expected to be found eventually in the New Zealand seas.

This fish is the second species of true *Callanthias* as yet described, for, as I shall endeavour to show below, the Tasmanian fish commonly known as *Callanthias allporti* must be removed from that genus From the eastern Atlantic and Mediterranean *C. peloritanus* our species may be distinguished as follows :—

a. Depth of body equal to length of head, $3\frac{1}{3}$ to $3\frac{2}{3}$ in total length; eye twice the length of snout, $2\frac{1}{2}$ to $2\frac{2}{3}$ in the head ; maxillary extending to below the middle of the eye, its distal width $\frac{1}{4}$ of the eye ; lateral line 22-25, ending below last dorsal ray ... ... *peloritanus.*

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* "The necessity for raising the net was brought about by the fact of the trawl showing indications of having met with some obstruction. When hauled up it was shown that the cod-end of the net was torn slightly and that the foot-line was broken at the specially weakened part." And again, "They were probably netted among rocks, as obstructions were met with which rendered the raising of the trawl a necessity." (Waite, l.c. pp. 9 and 31).

aa. Depth of body much greater than length of head, $2\frac{9}{10}$ to $3\frac{1}{3}$ in total length; eye $1\frac{1}{3}$ to $1\frac{1}{2}$ times length of snout, $2\frac{2}{3}$ to $3\frac{1}{2}$ in the head; maxillary extending to below the middle of the eye or not so far, its distal width $\frac{4}{9}$ to $\frac{3}{8}$ of the eye; lateral line 38-40, ending close in front of the caudal ... ... *platei.*

I have mentioned above that I find it necessary to separate the Tasmanian *C. allporti* from the true *Callanthias* as here restricted, placing it in a monotypic genus for which the name *Anogramma* is proposed, and I further submit that these two genera along with *Gramma*, Poey, might conveniently be associated in a subfamily *Callanthiinæ*, of equal value to and intermediate between the *Anthiinæ* on the one hand and the *Plesiopinæ* on the other. The subfamily and the genera may be briefly tabulated thus :—

CALLANTHIINÆ :—Lateral line single, incomplete or interrupted high; a conspicuous scaly process between the ventral fins.

a. Vomerine teeth weak or absent; lateral line incomplete; maxillary scaly.

CALLANTHIAS (κάλλος, beautiful; *Anthias*), Lowe, Proc. Zool. Soc. London, 1839, p. 76 (*peloritanus*).

aa. Vomerine teeth strong.

b. Lateral line incomplete; maxillary scaly.

ANOGRAMMA (ἄνω, high; γραμμή, line), gen.nov. (*allporti*).

bb. Lateral line interrupted; maxillary naked.

GRAMMA (γραμμή, line,) Poey, Syn. Pisc. Cuben. p. 296, 1868 (*loreto*).

EDELIA.

Edelia, Castelnau, Proc. Zool. & Acclim. Soc. Vict. ii. 1873, p. 123, (*vittata*).

Body oblong, compressed. Scales large, adherent, finely ciliated, concentrically striated. Lateral line complete, the tubes few, irregular, simple, extending along the entire exposed surface of the scale. Head moderate, almost entirely scaly.

Mouth with small, oblique cleft; jaws equal. Premaxillaries protractile; maxillary exposed at the distal extremity only, naked. Small teeth in the jaws; vomer, palatines,* pterygoids, and tongue smooth. Nostrils distant, simple. Eyes moderate, lateral, high. Preopercle entire, with a double ridge; opercle with two spines. Gill-openings wide; gill-membranes united in front, free from the isthmus; six branchiostegals; pseudobranchiæ present; gill-rakers short and few. Two dorsal fins, connected at the base, with vii-viii, i 9 rays, the spinous longer than the soft; anal short, with iii 8 rays; ventrals inserted behind the base of the pectorals, close together, with a strong spine and five soft rays; pectorals rounded, with 12 or 13 rays, the middle the longest; caudal rounded. Vertebræ $12 + 18 = 30$. *(Deriv. ign.)*

Fresh-water fishes of small size from West Australia.

I am by no means sure of the correct position of this genus in the natural system.

Edelia vittata.

Edelia vittata, Castelnau, Proc. Zool. & Acclim. Soc. Vict. ii. 1873, p. 124; Interior of West Australia.

? *Edelia viridis*, Castelnau, l.c. p. 125; Interior of South-western Australia.

D vii-viii, i 9 A. iii 8. Sc. 29-30/11-12. L.l. 12-15.

Depth of body $2\frac{4}{5}$ to $3\frac{1}{5}$, length of head $3\frac{1}{5}$ to $3\frac{2}{5}$ in the total length. Dorsal profile more strongly arched than the abdominal; upper profile of head obliquely linear. Snout as long as or a little shorter than the diameter of the eye, which is $3\frac{1}{2}$ to $3\frac{4}{5}$ in the length of the head. Interorbital region convex, its width $3\frac{4}{5}$ to $4\frac{1}{2}$ in the head. Maxillary not extending to the vertical from the front margin of the eye, its length $3\frac{2}{3}$ to $4\frac{1}{4}$ in the head, its width at the distal extremity $3\frac{1}{4}$ to $3\frac{3}{4}$ in the diameter of the eye. Three series of scales between the eye and the angle of the pre-

* Castelnau found teeth on the palatine bones, but I fail to discover them.

opercle; lower opercular spine the longer. Gill-rakers 4 + 8. Dorsal fin originating above the last fourth of the pectoral, a little nearer to the tip of the snout than to the base of the caudal; spines strong and curved, the first minute and often wanting, the third the longest, $\frac{2}{3}$ to $\frac{4}{7}$ of the head and a little longer than the middle soft rays; spine of second dorsal very short, but little longer than the last of the spinous; length of soft dorsal $\frac{5}{6}$ to $\frac{2}{3}$ of its height and as long as or somewhat less than that of the anal: second anal spine stronger and longer than the third, $\frac{3}{4}$ to $\frac{3}{5}$ of the anterior soft rays: ventral rounded, $\frac{5}{7}$ to $\frac{5}{8}$ of the head and $\frac{5}{6}$ to $\frac{5}{7}$ of the space between its origin and the vent: pectoral with 12 or 13 rays, reaching to the 7th or 8th body scale, $\frac{4}{7}$ to $\frac{1}{2}$ of the head: caudal rounded, $4\frac{2}{5}$ to $4\frac{3}{5}$ in the total length; least depth of caudal peduncle $\frac{3}{5}$ to $\frac{1}{2}$ of its length and $\frac{2}{5}$ to $\frac{1}{3}$ of the depth of the body. Reddish-brown or olive-green above, orange or yellow below; a blackish band or series of blackish spots along the middle of the body, sometimes reduced to a single shoulder spot; sometimes a less conspicuous band above and another below the median band: fins pale brown the anterior rays of the anal and the outer rays of the ventrals dusky; sometimes these fins are ornamented with small black spots.

Etymology:—*vittata*, striped.

Total length to 60 millimeters (70 *fide* Castelnau).

With the exception of the coloration, always an unstable character on which to rely, the following are absolutely the only distinguishing characters between *Edelia vittata* and *E. viridis* as given by Castelnau:—In the latter the "first dorsal is placed rather more forward than in *E. vittata*" and the caudal is pointed, while in *vittata* it is rounded.

THERAPONIDÆ.

THERAPON HUMERALIS, sp.nov.

D. xii 11. A. iii 10. Sc. 14/88/36. L.l. 69.

Depth of body 3 to $3\frac{1}{5}$, length of head $3\frac{2}{3}$ to $3\frac{1}{2}$ in the total length. Dorsal profile more strongly arched than the abdominal;

upper profile of head feebly convex, the snout obtuse. Diameter of eye $3\frac{3}{4}$ in the length of the head and $\frac{4}{5}$ of that of the snout. Interorbital region gently rounded, its width $4\frac{1}{4}$ in the head. Jaws equal. Maxillary scarcely extending to the vertical from the anterior border of the eye, its length $\frac{1}{3}$ of the head, the width of its distal extremity $\frac{3}{8}$ of the diameter of the eye. No vomerine or palatine teeth. Preorbital strongly serrated on the postero-inferior angle. Outer limb of preopercle naked, the lower border inconspicuously, the angle and hinder border strongly, denticulated; preopercular scales in eight transverse series, interopercular in two or three; lower opercular spine much the longer, strong, and acute. Gill-rakers 5 + 13, the longest $\frac{3}{10}$ of the eye. Dorsal fin high, originating slightly behind the base of the pectoral, the spines increasing in length to the fifth, which is $1\frac{3}{4}$ in the length of the head and subequal to the third and longest soft ray; first spine rather less than half as long as the last, which is shorter than the penultimate and $\frac{5}{8}$ of the third soft ray: anal much longer than its distance from the caudal, the second spine slightly exceeding the third in length, 2 to $2\frac{1}{5}$ in the head: outer border of soft dorsal and anal rays convex: ventral rounded, with the outer ray slightly produced, $\frac{4}{5}$ of the head and nearly reaching to the vent: pectoral with 14 rays, $\frac{5}{7}$ of the head: caudal subtruncate, with the angles rounded, $4\frac{1}{2}$ in the total length; least depth of caudal peduncle $1\frac{1}{4}$ in its length and $2\frac{1}{5}$ in the depth of the body. Light brown above, grey below; five indistinct broad brown bands across the back but not continued below the lateral line; a large oval blackish shoulder-spot below the lateral line; a narrow blackish band below the eye and a second through the eye to the preopercle: caudal fin profusely, soft dorsal and anal sparingly, spotted with dark brown.

Etymology:—*humeralis*, belonging to the shoulder; in reference to the conspicuous dark shoulder-spot.

Type in the author's possession.

Distribution:—Pelsart Island, Houtman's Abrolhos, West Australia, where a single example, 175 millimeters in length, was obtained by Mr. Lea.

This species is allied to *Therapon ellipticus*, Richardson, from which, however, it differs in the fin and scale formula, the more strongly arched spinous dorsal, the truncated caudal, and the somewhat different pattern of the coloration. Richardson's species is also said to belong to the fresh-water section of the genus, while the present fish is a marine form.

Pseudoscarus gymnognathos.

Scarus gymnognathos, Bleeker, Nat. Tijdschr. Nederl. Ind. iv. 1853, p. 498, Batavia.

Pseudoscarus gymnognathos, Bleeker, Atl. Ichth. i. p. 28, pl. xv. f. 3, 1862.

Pseudoscarus gymnognathus, Günther, Catal. Fish. iv. p. 239, 1862.

D. ix 10. A. ii 8. L.l. 20 + 6. L.tr. 2/7.

Depth of body $2\frac{1}{5}$, length of head 3 in the total length. Upper profile of head convex, with a well-marked concavity in front of the eyes. Diameter of eye $4\frac{2}{3}$ in the length of the head and $\frac{1}{2}$ of that of the snout. Lips covering about half the jaws, the inner not reaching midway to the symphysis. Cheek-scales in two transverse series, the lower consisting of six scales, all but the first of which encroach on the preopercle; interopercle with a single series. Jaws reddish-brown, with the tips white; no posterior pointed teeth. Nostrils minute, the anterior without tentacle. Gill-rakers 13 + 24. Dorsal fin originating above the angle of the bony opercle; fourth and fifth spines longest, $2\frac{2}{3}$ in the head and as long as the penultimate and longest rays: anal commencing below the second soft dorsal ray, the space between its origin and the base of the caudal but little more than the length of the head; second spine shorter than the first dorsal spine: dorsal and anal fins angulated posteriorly: ventral pointed, $1\frac{4}{5}$ in the head and $1\frac{2}{5}$ in the distance between its origin and the anal: pectoral with 15 rays, extending to the eighth scale of the lateral line, $1\frac{1}{3}$ in the head: caudal rounded, $\frac{1}{5}$ of the total length; least depth of caudal peduncle $\frac{5}{6}$ of its length and $2\frac{6}{7}$ in the depth of the body. Olive-brown, many of the scales darker at the base; the three lowest series of scales with a median longitudinal golden bar, forming together continuous bands, the upper of which is faintest and does not extend forward beyond the tip of the pectoral; lips and snout violet: dorsal and anal fins violet, with a narrow dark marginal band; ventrals and pectorals gray, more or less tinged with yellow; caudal yellow, broadly tipped with violet.

E t y m o l o g y :—γυμνός, naked: γνάθος, jaw.

D i s t r i b u t i o n :—Pelsart Island, Houtman's Abrolhos.

The description is taken from a single specimen captured by Mr. Lea and measuring 194 millimeters. It seems to agree more closely with Bleeker's *P. gymnognathos* than with any other species, but I am by no means assured that it is that species.

The following family not having hitherto been recorded from Australian waters, it is advisable, on behalf of local ichthyologists, to supplement the late Sir William Macleay's Catalogue by a more extended notice than would otherwise be necessary.

CEPOLIDÆ.

The Band-Fishes.

Body elongate, compressed, provided with minute, cycloid scales. Lateral line incomplete Head small, compressed; snout short and blunt. Mouth anterior, with rather wide, oblique cleft; lower jaw slightly projecting. Premaxillaries protractile; maxillary exposed, strongly dilated distally, reaching to below the eyes. Teeth in the jaws moderate, unequal, more numerous in the upper, some of them caninoid; vomer, palatines, pterygoids, and tongue toothless. Nostrils approximate. Eyes large, sub-lateral. Gill-openings wide; gill-membranes separate, almost wholly free from the isthmus; gills four, a slit behind the fourth; six branchiostegals; pseudobranchiæ present. Vent anterior, without prominent papilla. Dorsal and anal fins long, consisting entirely of articulated rays, more or less continuous with the caudal; ventrals small, thoracic, close together, with a feeble spine and five soft rays; pectorals small, submedian. Air-bladder present. Pyloric appendages in small number. No bony articulation between the infraorbital bone and the angle of the preopercle. Premaxillary processes short; occipital crest feeble. Caudal portion of the vertebral column very long. Vertebræ 69 (15 + 54) in *Cepola macrophthalmus*.

Band-like fishes of moderate size, inhabiting the Mediterranean, north-eastern Atlantic, north-western Pacific, Indian and south-eastern Australian seas.

Two genera are now recognised, and though the first only has as yet been discovered within our limits, the second, having two representatives in the Indian and a third in the Malayan seas, will perhaps eventually be found on our north-western coast. To facilitate the recognition of the two forms, the following brief analysis is given:—

Preopercle entire; scales non-imbricate; head wholly naked ... ... CEPOLA.

Preopercle strongly spinate or denticulate; scales imbricate; head partially sealy ... . ACANTHOCEPOLA.

With respect to the systematic position of the *Cepolidæ*, it is generally conceded at the present day that they fall most fitly between the *Gobioidei* and *Blennioidei*, or to be more exact, between the Dragonets (*Callionymidæ*) and the scaly blenniids (*Clinidæ*). The former family, however, along with the allied *Platypteridæ*, both of which have been associated by most British and continental writers with the true gobies and eleotrins in the somewhat heterogeneous family *Gobiidæ* of Cuvier, Günther, and others, differ from that family in so many important characters (such as the enormously protractile premaxillaries, the greatly developed preopercular spine, the widely separated ventral fins, &c.) that it has been proposed, and I think with justice, to differentiate them as an equivalent group under the name *Callionymoidei*, a group which perhaps has more affinity to the *Platycephaloidei* than is generally admitted. The *Cepolidæ* have, however, been more usually associated with the blennioid than with the gobioid types, but they differ intrinsically from the former in the possession of thoracic and quinqueradial instead of jugular and pauciradial ventral fins. Gill places the *Gadopsidæ* —a family which is structurally much more intimately related to the blennioid than to the gadoid fishes—next to the *Cepolidæ* and between them and the *Clinidæ*. Reviewing the situation in the light of our present knowledge, I am inclined to place the *Cepolidæ* between the eleotrine gobies and *Gadopsis*.

CEPOLA.

Cepola, Linnæus, Syst. Nat. ed. 12, i. p. 445, 1766.

Body tænioid. Scales non-imbricate, deeply embedded. Lateral line originating above the opercle, thence obliquely ascending to the base of the dorsal fin, along which it runs for a variable length. Head entirely naked. Teeth in the jaws in a single series, the anterior strong and hooked; lower jaw with or without a short supplementary series anteriorly. Preopercle entire; opercle with a small concealed spine. Gill-rakers long, rather stout, in moderate number. Dorsal fin originating above the opercle, with 57 to 82 rays; anal very long, coextensive with the caudal portion of the vertebral column, with 48 to 79 rays; pectoral rounded, with 12 to 16 rays, the middle the longest; caudal narrow and pointed.

Etymology.—*Cepole*, *Cepolla*, or *Cepula*, the names given by the Roman fishermen according to Willughby (Hist. Pisc. p. 116): perhaps from *ceps*, head (Jordan, *in lit.*)

Type:—*Cepola macrophthalmus*, Linnæus.

Distribution:—Mediterranean and north-eastern Atlantic, occasionally visiting the British Isles, sometimes even in considerable numbers upon their southern shores (*C. macrophthalmus*);* north-western Pacific (*C. schlegelii*);† and south-eastern Australia (*C. australis*).‡

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* *Cepola macrophthalmus*, Linnæus, Syst. Nat. ed. x., Mediterranean. Syn. *Ophidion macrophthalmum* = *Cepola rubescens* (*fide* Jordan).

† *Cepola schlegelii*, Bleeker, Verh. Batav. Gen. xxvi. 1856, p. 110.

‡ *Cepola australis*, sp.nov. (*v. infra*).

These three species are very closely related, but may apparently be distinguished from one another by the following characters :—

a. Head $\frac{1}{10}$ or less of total length. No anterior supplementary teeth in the lower jaw. A black spot between the premaxillary and maxillary.

b. Dorsal more than 70, anal more than 60: dorsal and anal fins broadly united to the caudal ... ... *schlegelii.*

bb. Dorsal 67-74, anal 60-70; dorsal and anal fins narrowly united to the caudal .. ... *macrophthalmus.*

aa. Head $\frac{1}{9}$ of the total length.* An anterior supplementary band of teeth in the lower jaw. No black spot between the premaxillary and the maxillary.

c. D. 57. A. 48. Dorsal and anal fins narrowly united to the caudal ... ... *australis.*

In the British Museum Catalogue of Fishes (iii. pp. 486-9) Günther recognises seven species of *Cepola* as possibly valid, namely *C. rubescens* (= *macrophthalmus*), *C. schlegelii*, *C. abbreviata*, Cuv. & Val., *C. krusensternii*, Schl., *C. mesoprion*, Blk., *C. marginata*, C.V., and *C. limbata*, C.V., while an eighth, *C. striata*, is regarded with suspicion. In addition to the species described below, two others, *C. oxylepis*, Bleeker, from the Chinese seas, and *C. indica*, Day, from Madras, have been announced since the publication of that volume in 1861. Of these ten species the *C. striata*, Bl. & Schn.,† from Tranquebar, should probably be dismissed as not belonging to the family, leaving, with *C. australis*, ten supposed species, only three of which, as shown above, belong to the genus *Cepola* as restricted by Bleeker.

In reference to *C. schlegelii*, its describer remarks :—

"This species is so nearly allied to *Cepola rubescens* (= *macrophthalmus*), Linn., from Europe, by its slender body, unarmed pre-

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* In the measurement of the head the large opercular lobe is not included, the distance between the tip of the snout and the posterior border of the bony opercle only being considered.

† Ichth. p. 242, 1801.

opercle, inter-maxillary membrane-spot, and small scales that I find no specific difference between the two except in the broader and deeper opercle and the somewhat more numerous dorsal and anal rays. I consider it to be the same as the species figured in the Fauna Japonica, with which, however, the description in that work does not agree."*

Now with regard to the increased number of dorsal and anal rays mentioned above, if we consult the later diagnosis of *C. rubescens* given by Day,† we shall find that the North Atlantic fish often has more than 70 dorsal and normally more than 60 anal rays; as a differential character this is, therefore, valueless, while the size of the opercle is altogether too insignificant to be relied on, especially when we consider how slight were the data on which the distinguished Dutch ichthyologist founded his opinion. The width or narrowness of the junction between the vertical fins is also of too little importance to be seriously considered, and I therefore think it better to look upon *C. macrophthalmus* and *C. schlegelii* as the western and eastern forms of the same species.

Of the seven remaining species, all of which belong to *Acanthocepola*, no less than four are reported as coming from the seas of Japan, and we may perhaps be permitted to suggest that these have been unduly multiplied. The earliest forms made known from those waters were two fishes figured by Krusenstern,‡ and subsequently named (from the drawings) *C. limbata* and *C. marginata* by Cuvier and Valenciennes. These two were distinguished from the other species known to the French savants by the presence of a black spot anteriorly on the dorsal fin.

Writing on the subject, Bleeker says (l.c.):—

"Since then I have discovered that in the Japanese waters at least three species§ exist, the descriptions of which I have communicated here. Not one of these species, however, possesses

* Bleeker, l.c.

† Fishes of Great Britain and Ireland, i. p. 213, 1883.

‡ Reise, pl. lx. ff. 1-2.

§ One of these, *C. schlegelii*, being a true *Cepola*, does not concern us here.

the black spot anteriorly on the dorsal fin, which is said to be present in *C. limbata* and *C. marginata*."

With regard to these two species, it can hardly be contended that Cuvier and Valenciennes have made good their claim to specific distinction, while on the other hand Day has described unmistakably an Indian species which possesses the characteristic black dorsal spot. Having, therefore, three reputed species bearing this spot, two of which are only known from old and possibly inaccurate figures, it seems to me that until further light is thrown on the subject it would be extremely unwise to keep all three in the system as valid species.

Appended is a list of the species as I would at present place them :—

1. *Cepola macrophthalmus*, Linnæus, Syst. Nat. ed. x. 1758 ; Mediterranean and north-eastern Atlantic.

1*a*. *C. rubescens schlegelii*, Bleeker, Verh. Batav. Gen. xxvi. 1856, p. 110; Japan.

2. *C. australis*, Ogilby (*v. infra*); Port Jackson, south-eastern Australia.

3. *Acanthocepola krusensternii*, Schlegel, Faun. Japon. Poiss. p. 130, 1850; Japan.

4. *A. mesoprion*, Bleeker, l.c. p. 109; Japan.

5. *A. oxylepis*, Bleeker, Verh. Ak. Amst. xviii. 1879, p. 8; China

6. *A. indica*, Day, Suppl. Fish. Ind. p. 796, 1888; Madras.

 ?= *A. limbata*, Cuvier & Valenciennes, Hist. Nat. Poiss. x. p. 402; Japan.*

 ?= *A. marginata*, Cuvier & Valenciennes, l.c.; Japan.

7. *A. abbreviata*, Cuvier & Valenciennes, l.c. p. 403; Malay Archipelago to China.

Cepola australis, sp.nov.

D. 57. A. 48.

Depth of body $11\frac{3}{5}$, length of head 9 in the total length; width of body $\frac{2}{3}$ of its depth. Snout obtuse, rounded, shorter than the

* This being the earliest name, must be used should the three forms prove to be identical.

eye, which is $3\frac{1}{3}$ in the length of the head. Interorbital region flat, its width $6\frac{1}{3}$ in the head. Maxillary extending to the vertical from the middle of the eye, its length from the tip of the snout $\frac{4}{9}$ of the head, its width at the distal extremity more than half the diameter of the eye. Anterior teeth in the upper jaw strong, hooked inwards and backwards; lateral teeth numerous, decreasing in size posteriorly; teeth in the lower jaw increasing in size posteriorly, the series terminating in a strongly curved canine; a supplementary series of four pairs of strong teeth on the outer edge of the lip anteriorly. Preopercle rounded. Gill-rakers 16 + 21, the longest $\frac{3}{8}$ of the diameter of the eye. Vertical fins subcontinuous with the caudal;* dorsal originating above the opercular lobe, the longest rays in the anterior third of the fin, rather less than half the length of the head: anal originating below the eighth dorsal ray, its distance from the tip of the mandible $4\frac{7}{8}$ in the total length: ventral rounded, about half the length of the head, not nearly reaching to the vent: pectoral with 16 rays, shorter than the ventral: caudal acutely pointed, with 9 rays, the middle ray somewhat inspissate, about $\frac{2}{3}$ of the head. Nape scaleless. Lateral line terminating below the twenty-sixth dorsal ray. Body and fins bright red, the middle of the sides with some angular yellow bars; no intermaxillary or dorsal spots.

Etymology:—*australis*, southern: the genus not having been hitherto represented south of the tropics.

Type in the possession of the Commissioners for Fisheries of New South Wales.

Distribution:—Port Jackson. I am indebted to my friend Mr. Brodie, Secretary to the New South Wales Fisheries Commissioners, for the opportunity of describing this unique example of a family not hitherto recorded from Australia. The specimen was taken in a seine net and measures 260 millimeters over all.

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* The posterior part of the tail having been dried, it is difficult to ascertain accurately to what extent this contiguity exists; apparently, however, it was narrow.

DESCRIPTION OF A NEW OPHIURAN.

By H. Farquhar.

(Communicated by the Secretary.)

(Plate xv.)

Ophioplocus Huttoni, n.sp.

Diameter of disc 6 mm.; length of arms about two and a half times the diameter of the disc; width of arms near the disc 1·2 mm. Disc round, slightly swollen, covered above and below with rounded, irregular, imbricating scales; two or three small scales in the centre of the disc surrounded by a rosette of five larger ones, outside of these are rows of larger scales (about 0·5 mm. wide), each of these larger scales surrounded by smaller, irregular ones; one broad scale on the edge of the disc in the middle of the interbrachial space; a number of very small scales where the arms join the disc. Radial shields small (about 0·6 mm. long), oval, far apart, sunk in the scaling of the disc. Scales on the under side of the disc smaller than those above and more regular, decreasing in size from without inwards. Mouth-papillæ five on each side of the mouth-angle, crowded, the outermost and innermost pointed, the others squarish, the outermost but one largest, others decreasing in size, the innermost one smallest. Mouth-shields broad, fan-shaped. Side mouth-shields oblong, broader without than within, meeting within. Under arm-plates slightly broader than long, lateral and inner lateral sides re-enteringly curved. First under arm-plate like the mouth-shields in shape, but smaller. Side arm-plates well developed, bearing two short rather stout, bluntly pointed arm-spines. Halves of upper arm-plates near the base of the arms rounded, and separated by a number of supplementary pieces—one large piece on the middle of the arm, surrounded by three large ones within and three or four smaller ones without. One flat, broadly ovate tentacle-scale entirely covering the tentacle-pore. Colour uniform pale yellowish.

The above is a description of an individual.

Hab.—Lyall Bay (one of Captain Hutton's old collecting grounds), near Wellington, New Zealand; one specimen, found at low water on rocks, among seaweed.

The occurrence of this genus in New Zealand is interesting. Our species differs in many respects from the other two known forms—*O. imbricatus*, Müller and Troschel, and *O. Esmarki*, Lyman. All are littoral. The latter species occurs on the coasts of California, and *O. imbricatus* ranges throughout the Indo-Pacific region, having been found on the northern coast of Australia, at Amboyna, Timor, Java, Philippine Islands, Japan, Samoa, Kingsmill Islands, New Caledonia, Zanzibar, Mozambique, and Mauritius.

In a former paper, "On the Echinoderm Fauna of New Zealand" (Proc. Linn. Soc. N.S.W., 1898, p. 300), I spoke of the East Indian region as lying to the north of the Australian Region. Having looked up the marine fauna of this area, I find that the proposed East Indian Region must be abandoned, and we must revert to the late Mr. Woodward's Indo-Pacific Region as defined in his "Manual of the Mollusca," 4th edit., 1880. The marine fauna of this immense region, extending from the eastern shores of Africa to the eastern Pacific, is one, at any rate as regards the Echinoderms and Mollusks, a great many of the forms being widely spread within this area. (Professor Tate, of Adelaide, the greatest authority on the Australian Molluscan fauna, appears to accept Woodward's divisions—Trans. Roy. Soc. S. Aust., Vol. ix., p. 80).

I have to correct two other misstatements in the above-mentioned paper. Two species of *Echinobrissus* are known from the Australian Tertiaries—*E Australiæ*, Duncan, and *E. vincen-*

tinus, Tate (Trans. Roy. Soc. S. Aust., xiv., p. 276), not one only, as stated on page 302. Our Holothurians are not all endemic. Mr. Whitelegge has made known the interesting fact that *Stichopus mollis*, Hutton, our commonest form, occurs also in New South Wales (Records Australian Museum, Vol. iii , No. 2, p. 50).

EXPLANATION OF PLATE.

Ophioplocus Huttoni.

Fig. 1.—Seen from above (× 16).

Fig. 2.—Seen from below (× 16).

Fig. 3.—The tip of an arm from above (× 16).

NOTES AND EXHIBITS.

Dr. F. Tidswell gave a summary of what is known of Tick- or Texas-fever in cattle, and in illustration of his address he exhibited a comprehensive series of preserved specimens, microphotographs, and microscopic preparations of Ticks and of the Tick-fever hæmatozoon, *Pyrosoma bigeminum*.

Mr. Maiden exhibited plants in flower of the following species:—

Stenoglottis longifolia (author ?), received from J. Medley Wood, Curator of the Botanic Gardens, Natal, in 1898. It is closely allied to *S. fimbriata*, Lindl., (figured in *Bot. Mag.* t. 5872), but differs from the latter in not having blotches on the leaves, and in its markedly fimbriate labellum whereas that of the plant figured is non-fimbriate. From Natal.

Phalænopsis violacea, Teijsm. & Binnend. A dainty little orchid from Sumatra. (See Nichols' *Dict. Gard.* iii. 93.)

Globba atrosanguinea, Teijsm. & Binnend., (Syn. *G. coccinea*, Hort. Veitch). An elegant Scitaminaceous plant from Borneo. (See *Bot. Mag.* t. 6626). Received from Veitch.

Hymenocallis calathinum, Nichols' *Dict. Gard.* ii. 165. Figured as *Pancratium* in *Bot. Mag.* t. 1561. From Brazil.

Mr. Froggatt exhibited a collection of Diptera of the sub-family *Trypetinæ*, commonly known as Fruit-Flies from the damage their their larvæ do to ripening fruit, including the American Fruit-maggot, *Trypeta pomonella*, Walsh ; a new species of the same genus bred from guavas from the New Hebrides; the Queensland Fruit-Fly, *Tephritis tryoni*, Froggatt ; a new species of the same genus bred from bananas from New Caledonia; and the Mediterranean Fruit-Fly, *Halterophora capitata*, Wiedem., this being the common species about Sydney; larvæ and pupæ were also shown.

Mr. Whitelegge exhibited and communicated the following Note upon three New South Wales Ferns not recorded in the "Census of Australian Plants":—

(1). *Diplazium japonicum*, Thunb., is recorded from Illawarra in Vol. vii. of the "Flora Australiensis," p. 750 (1878). At the end of the very brief description occurs the following note, "N.S. Wales, Illawarra, a single specimen in Herb. F. Mueller without the collector's name, so possibly some mistake." The late Baron von Mueller evidently regarded the record as erroneous, and omitted it from his Census of Australian Plants published in 1882, and also from the second edition of the same issued in 1889, notwithstanding the fact that Bailey had recorded the plant from Nerang Creek on the southern border of Queensland in the Synopsis of the Queensland Flora published in 1883 (p. 208). It is highly probable that the original specimen in the Muellerian herbarium was correctly noted as to locality. A few months ago I gathered several plants in the Illawarra district, and I have since seen living specimens in cultivation from the same region, but from a habitat much further south.

(2). *Lastrea acuminata*, Houlston & Moore, appears to be a new record for New South Wales. I have gathered plants on the south coast and also on the Blue Mountains. A variety is recorded from Queensland, but there does not appear to be any mention of the occurrence of the species in New South Wales, unless the late Dr. Woolls' remarks (Contribution to the Flora of Australia, p. 66, 1867) can be regarded as such. However it is not included in his list at the end of the paper, nor in a subsequent list published some years later. The plant is by no means rare, and is frequently seen for sale in Sydney under a great variety of names. It is a very hardy plant, and is much used for table decoration in the restaurants of Sydney.

(3). *Aspidium eumundi*, Bailey.—I have lately received plants of this species from the Richmond River District, collected by the Rev. W. W. Watts.

Mr. C. Hedley communicated the following Note:—

A South Sea Island canoe was cast up on the beach on the night of January 21st, 1896, at a point five miles south of Cape Byron, N.S. Wales. It was at once photographed by Mr. R. A. P. Goodwin, in whose possession it is, and to whom I am indebted for this information. A copy of that photograph I now exhibit. An account of the circumstance was published in the *Evening News* (Sydney), Saturday, July 4th, 1896, together with a drawing of the vessel. A few months ago I enjoyed an opportunity of inspecting the canoe. From sundry peculiarities of construction, I was enabled to identify it with confidence as New Caledonian. On it was a cluster of barnicles, identified by Mr. Whitelegge as *Lepas hillii.*

The incident is not unique in my experience. Mr. R. Paterson, lessee of Curtis Island, Queensland, informed me that a South Sea canoe was washed ashore about twelve or fifteen years ago on the eastern beach of that island, near Cape Capricorn.

The flotsam cast on the Australian coast is of considerable interest, both from an ethnological and zoological aspect, and is worthy of being carefully chronicled. Coconuts, the fruits of *Barringtonia butonica*, Nautilus shells, always, so far as I know, *N. pompilius*, and pumice are fairly plentiful. Mr. T. Whitelegge has shown me pieces of pumice which he gathered on Maroubra beach, to which are attached small corallia of a species of *Pocillopora.* This very interesting find confirms similar observations of Guppy and Saville Kent and indicates an unexpected method of transport of corals to distant localities.

Mr. Palmer showed four curiously carved Boomerangs from the Queensland coast between Bundaberg and Port Mackay. Also from Lawson, Blue Mountains, abnormally developed flowering and fruiting specimens of Cosmos and Zea; a coral-like fungus, not determined; and a Coccus (*Pulvinaria tecta*), very common this year on indigenous shrubs on the Blue Mountains.

[Printed off July 25th, 1899.]

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PERAMELES OBESULA

Fig. 3.

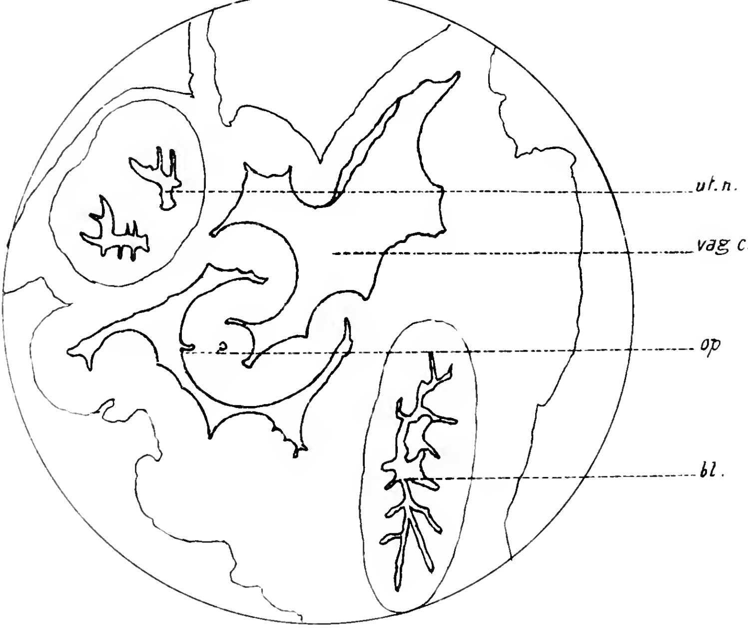
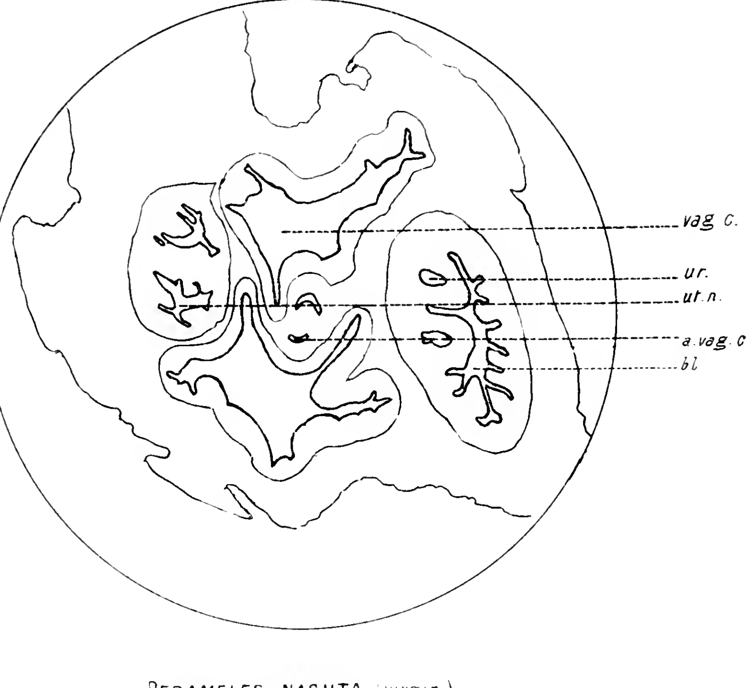


Fig. 4.



PERAMELES NASUTA (virgin)

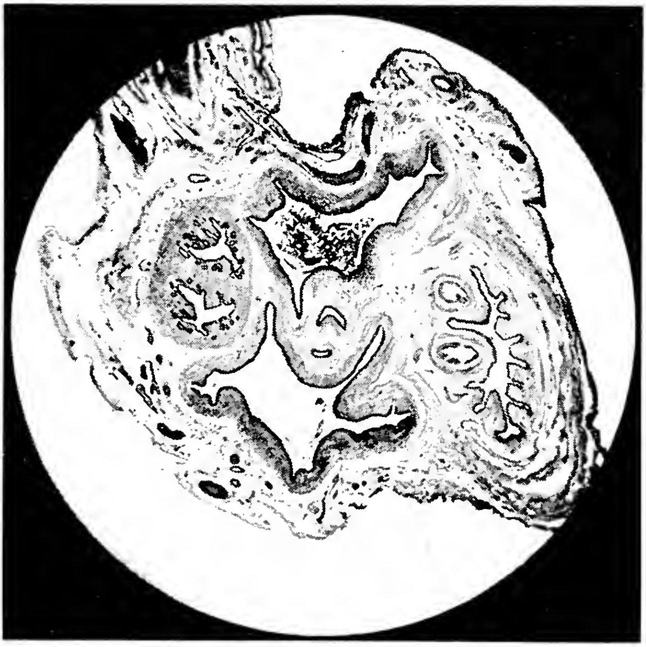
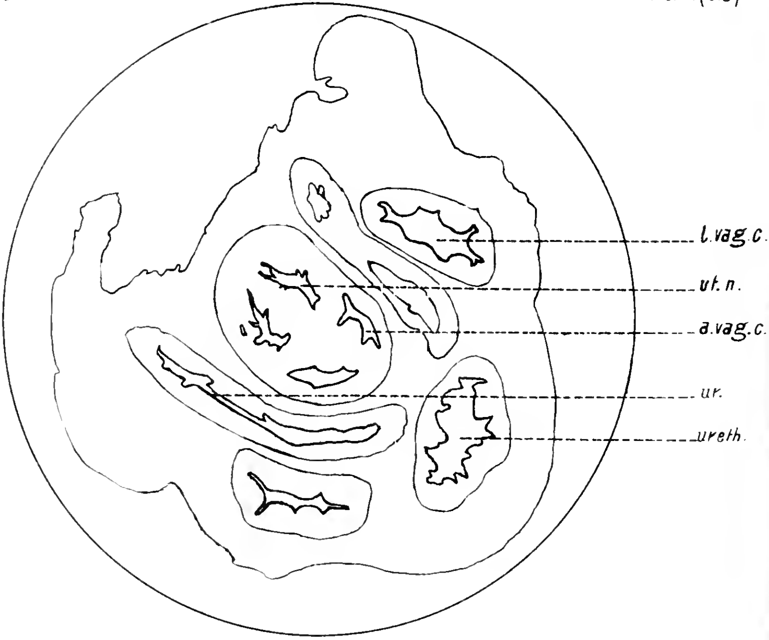


Fig. 5.



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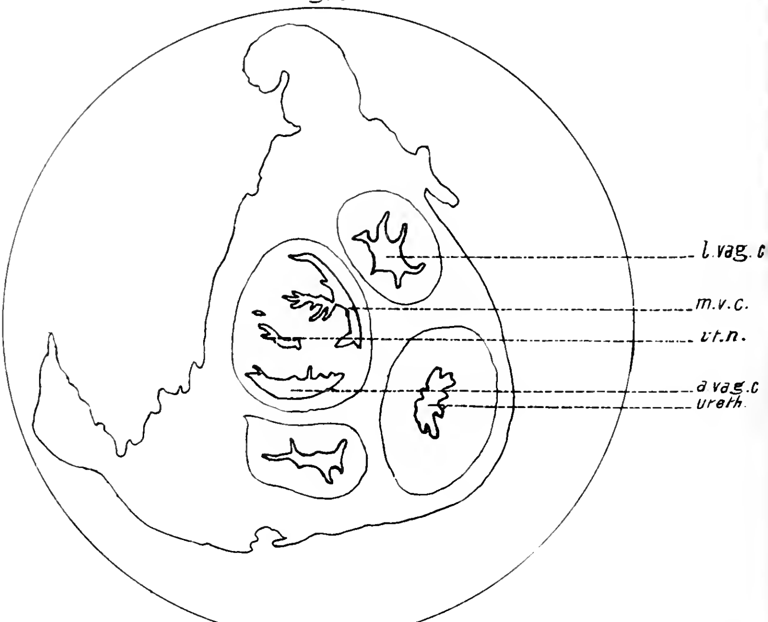


PERAMELES NASUTA (virgin.)

Fig. 7.

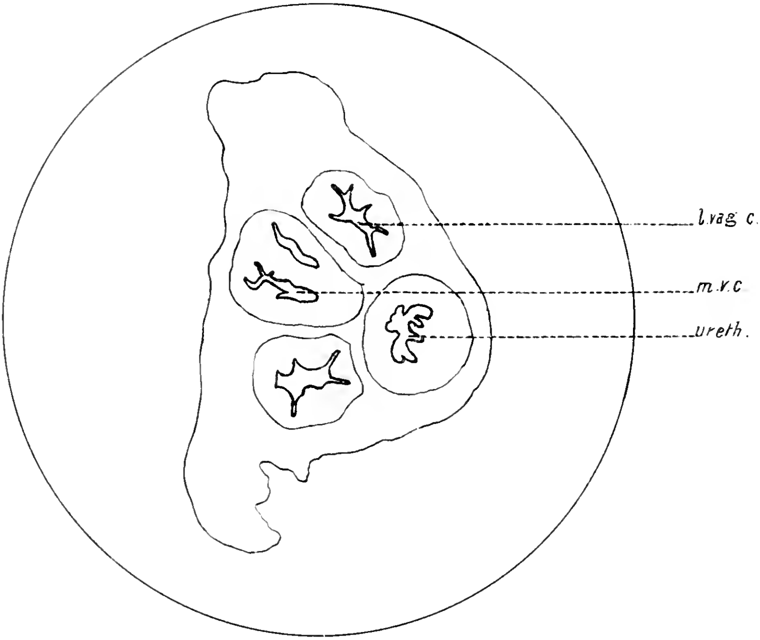
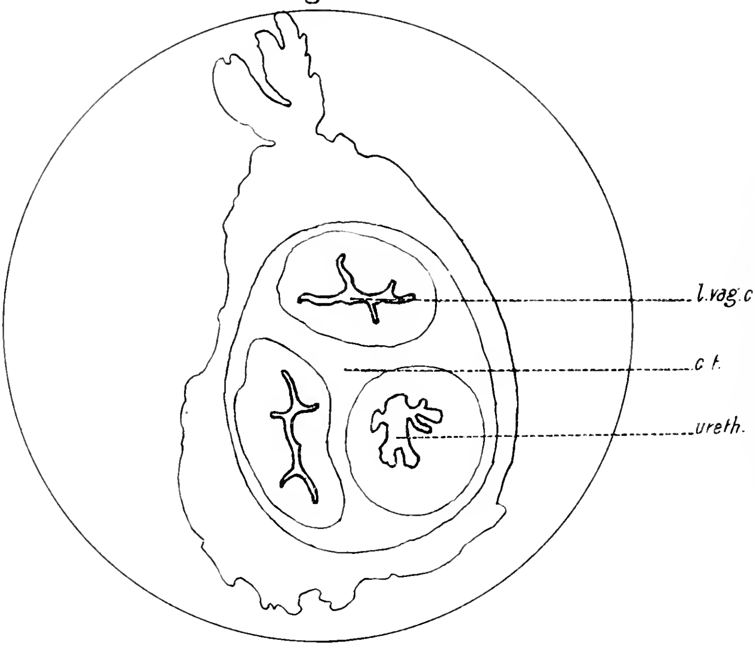


Fig 8.



PERAMELES NASUTA.

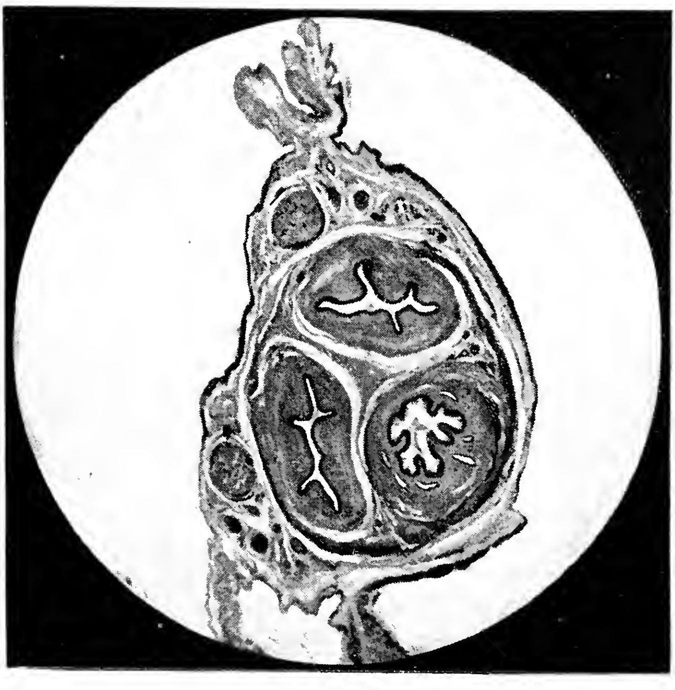
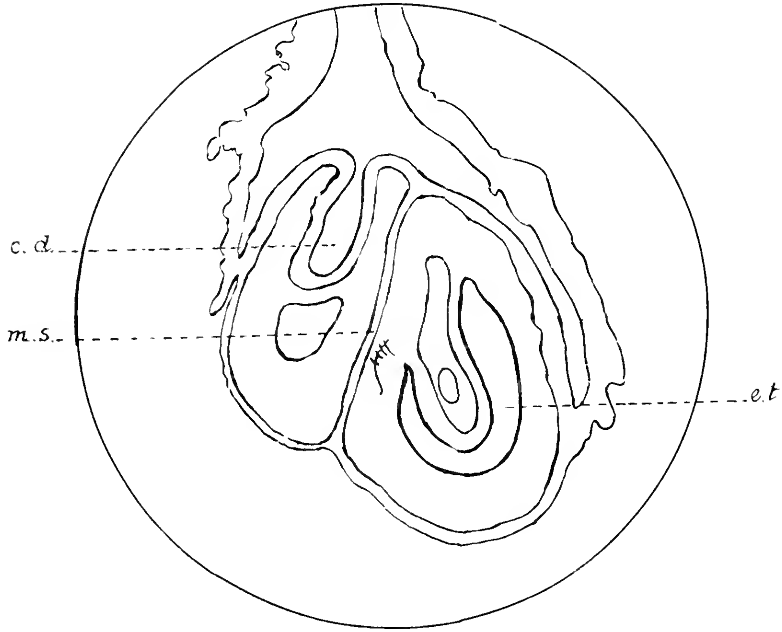


Fig. 9



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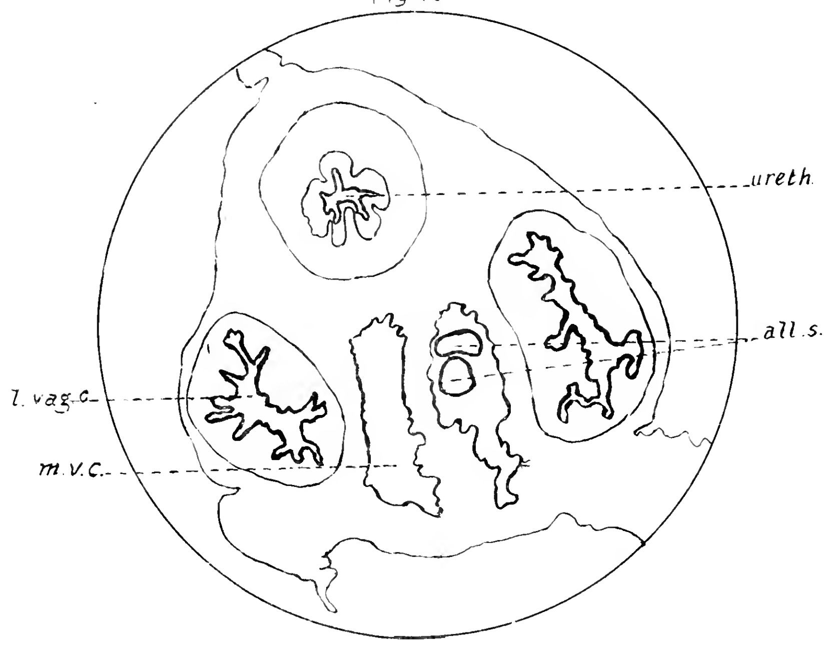

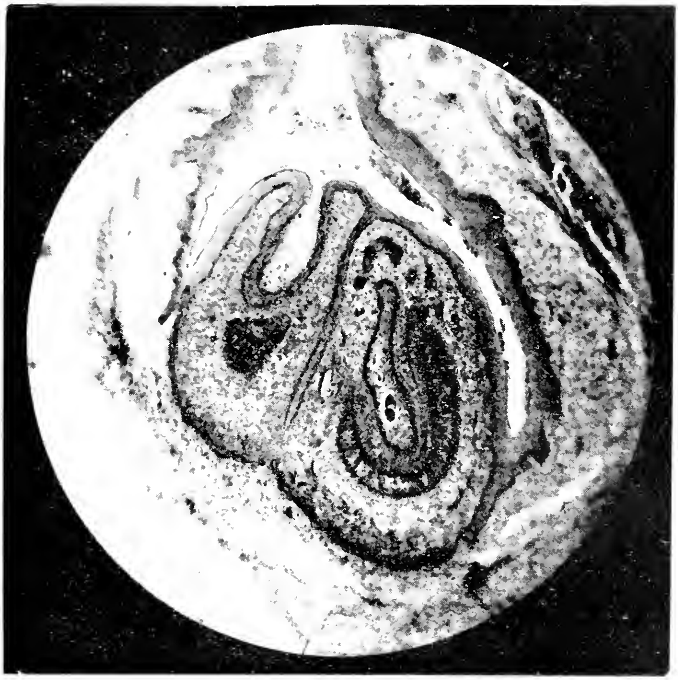

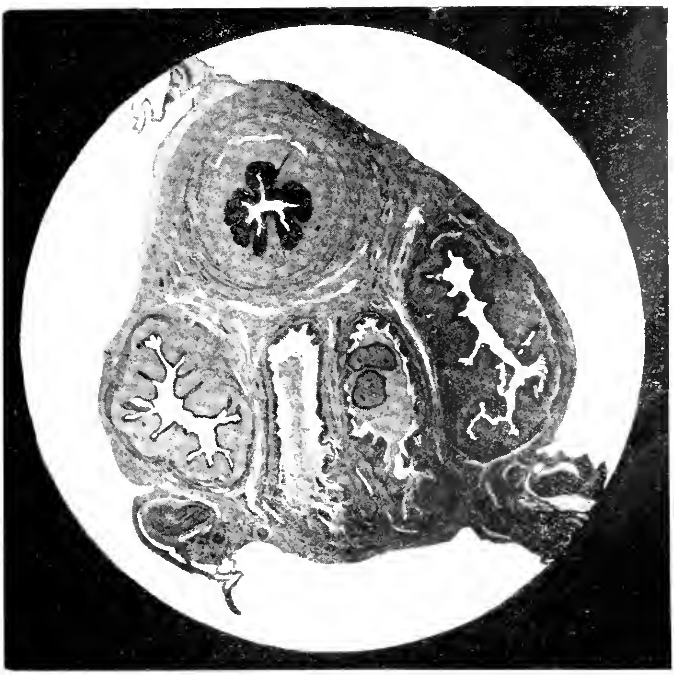

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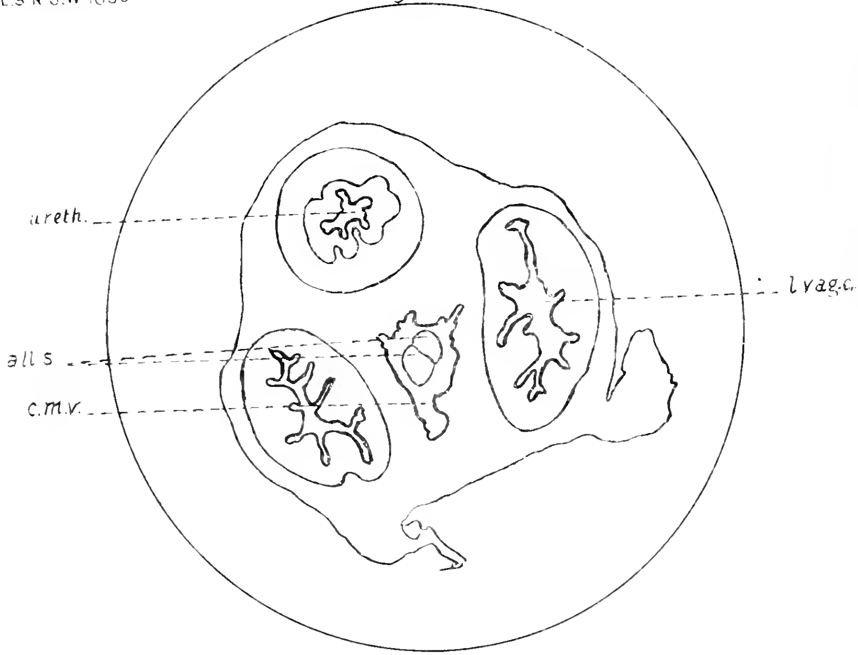
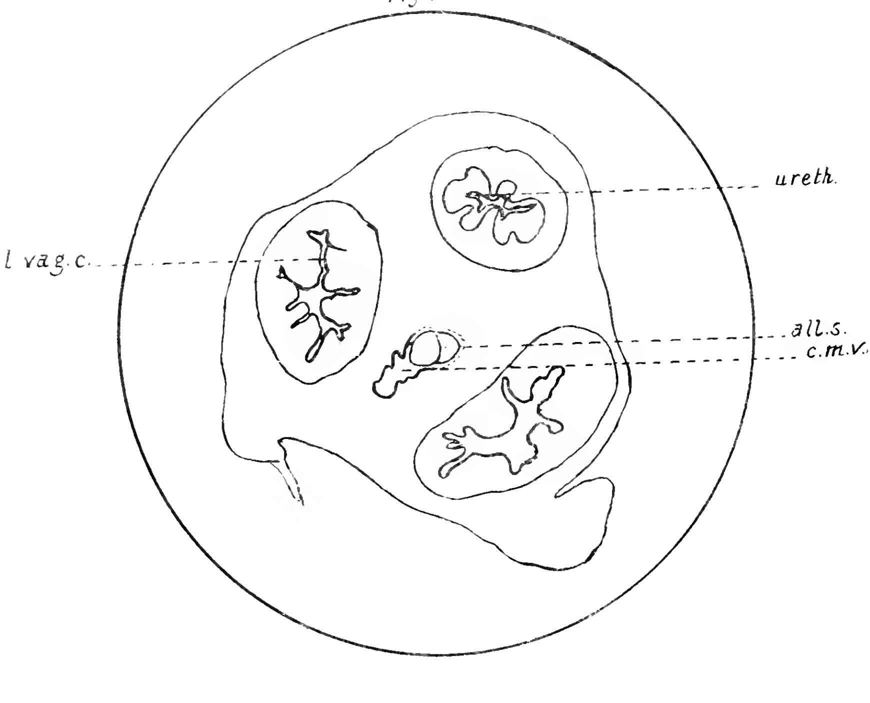
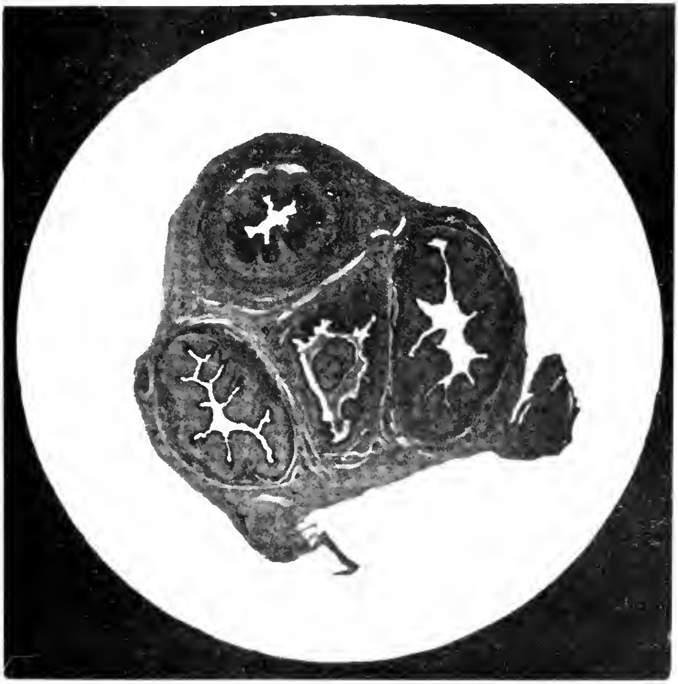
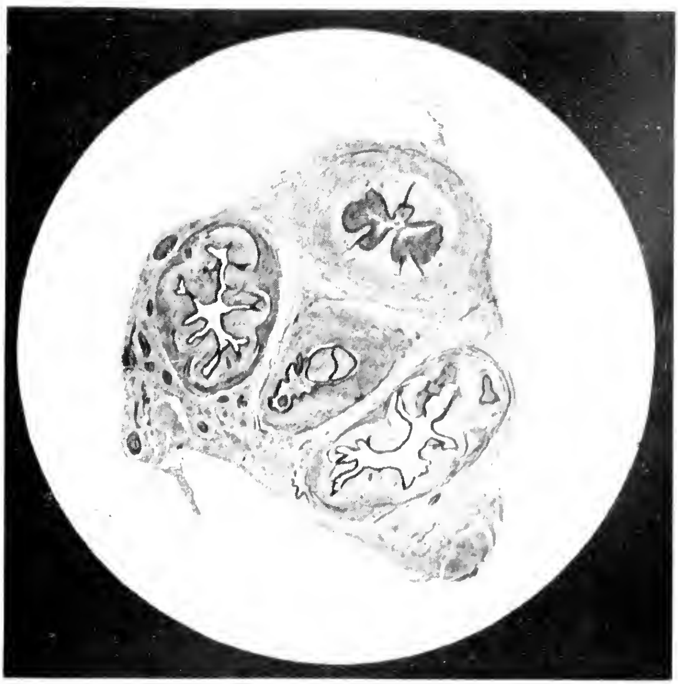


Fig 12







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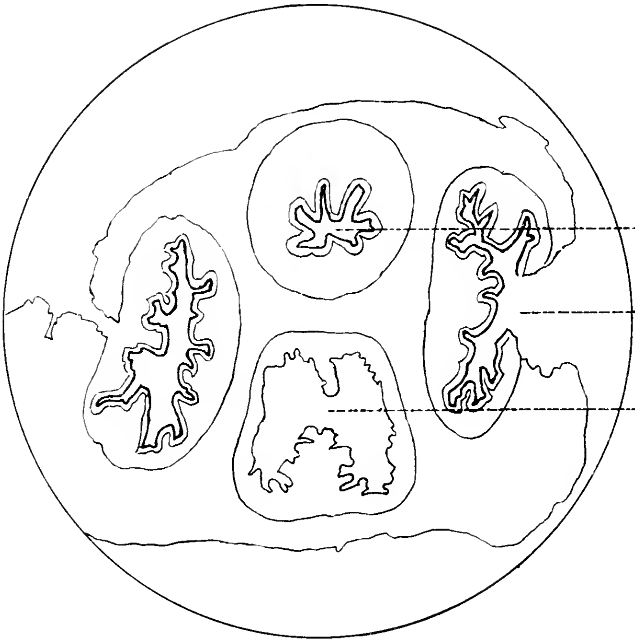
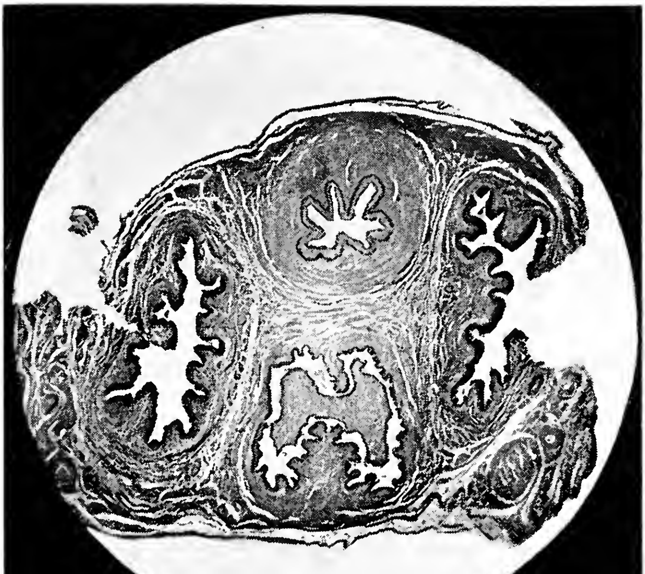


PERAMELES OBESULA.



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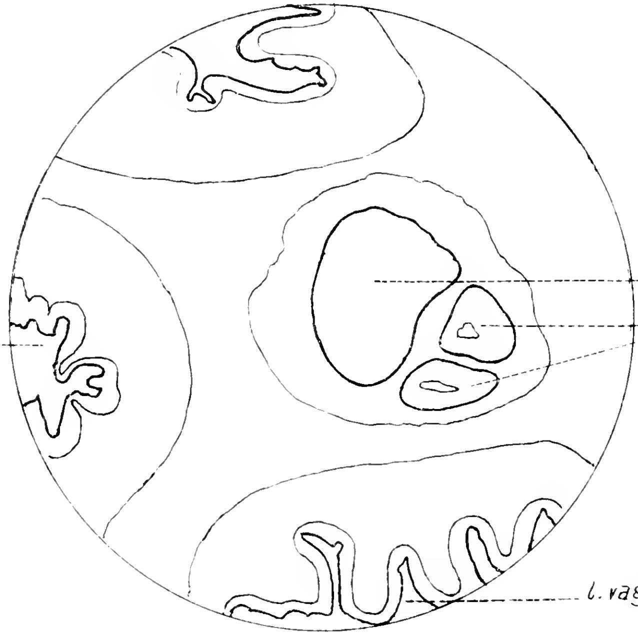

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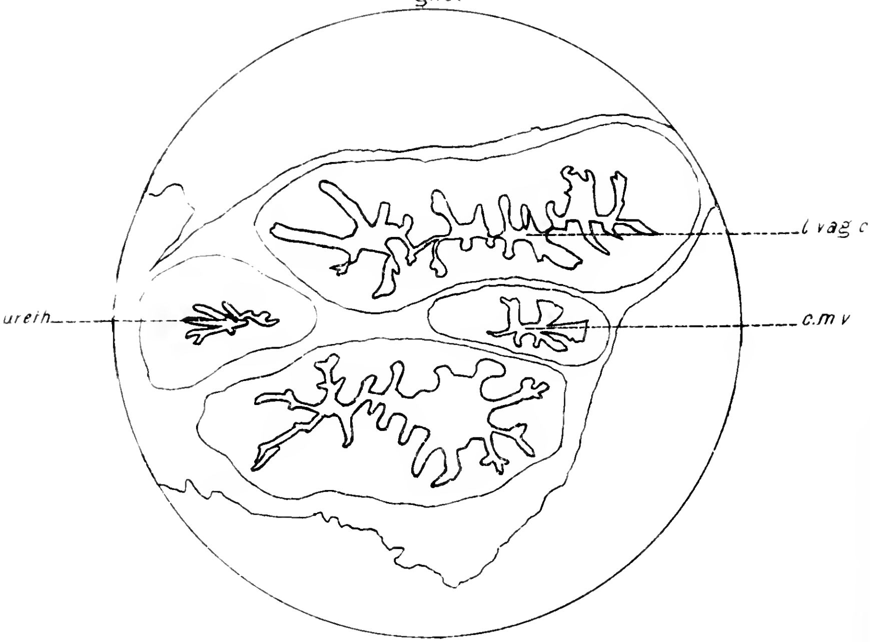


FIG. 14. P. OBESULA FIG. 18. P. NASUTA (?)

Fig 20.

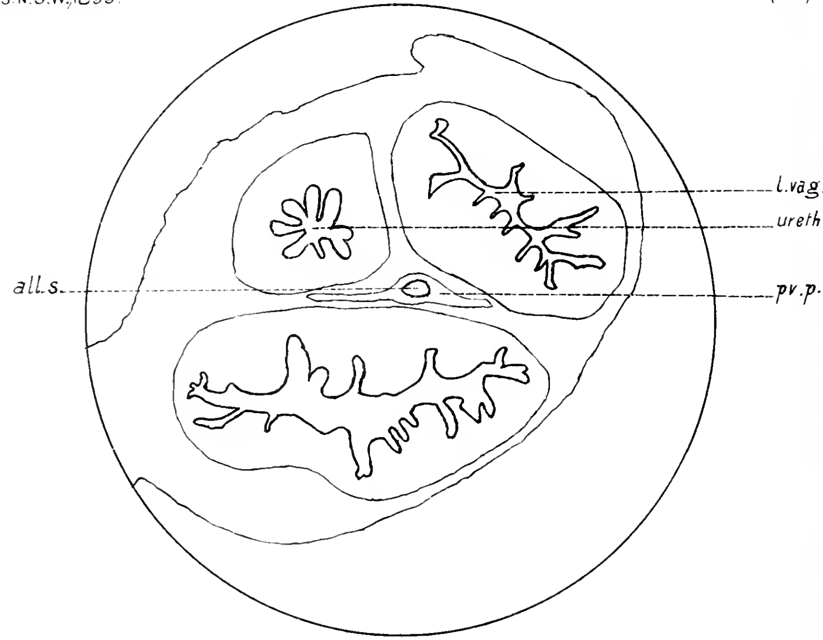
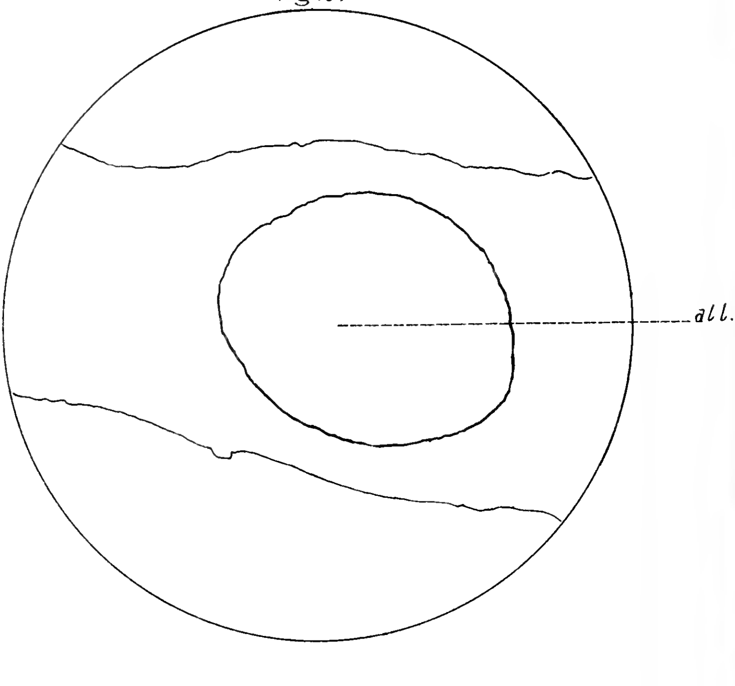
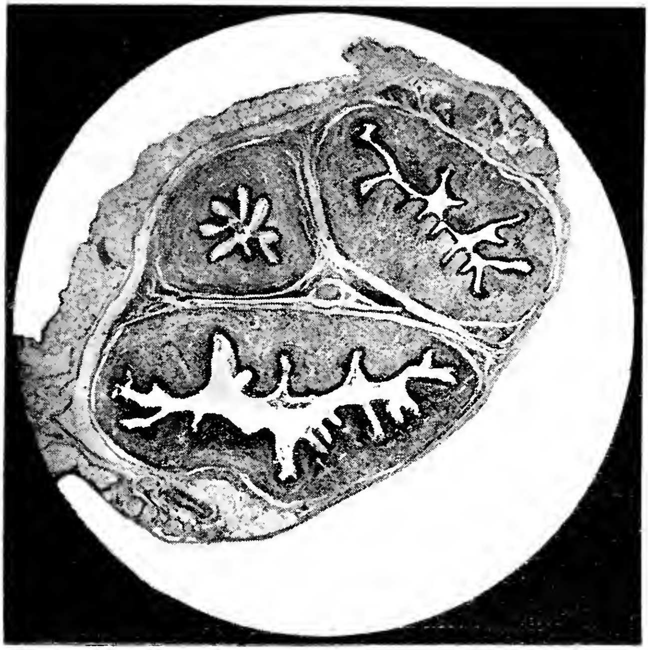
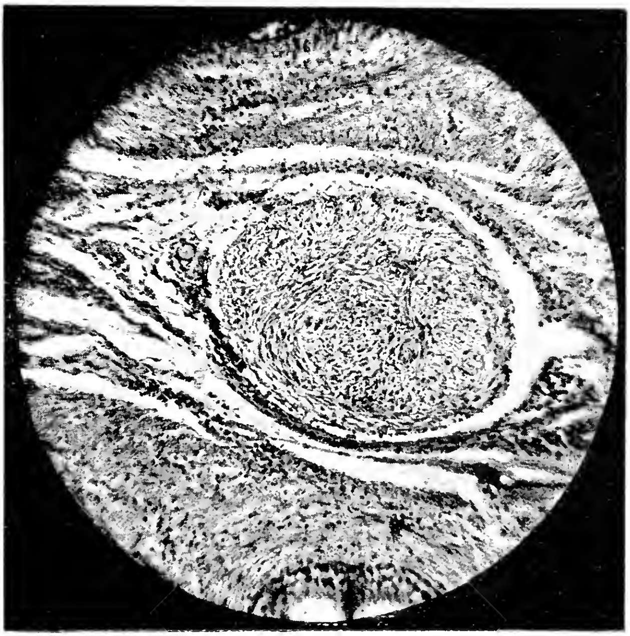


Fig 19.



PERAMELES NASUTA (?)





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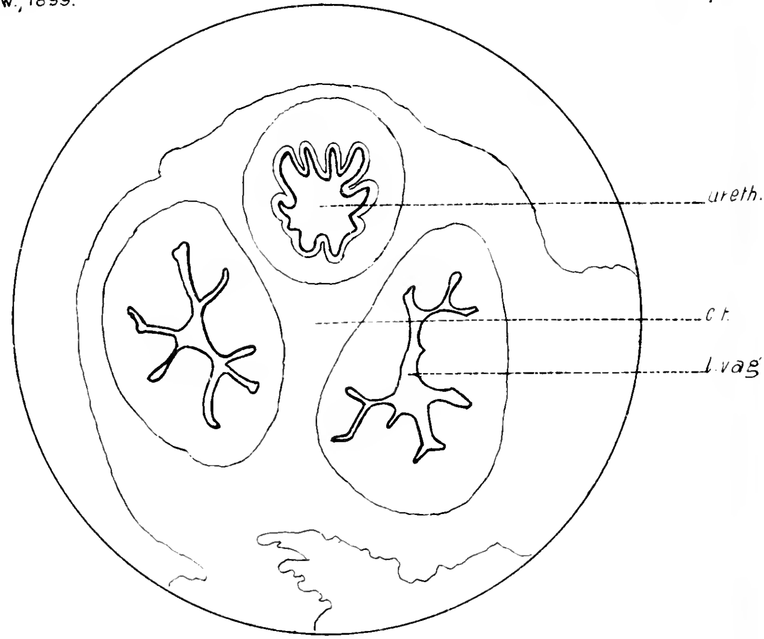
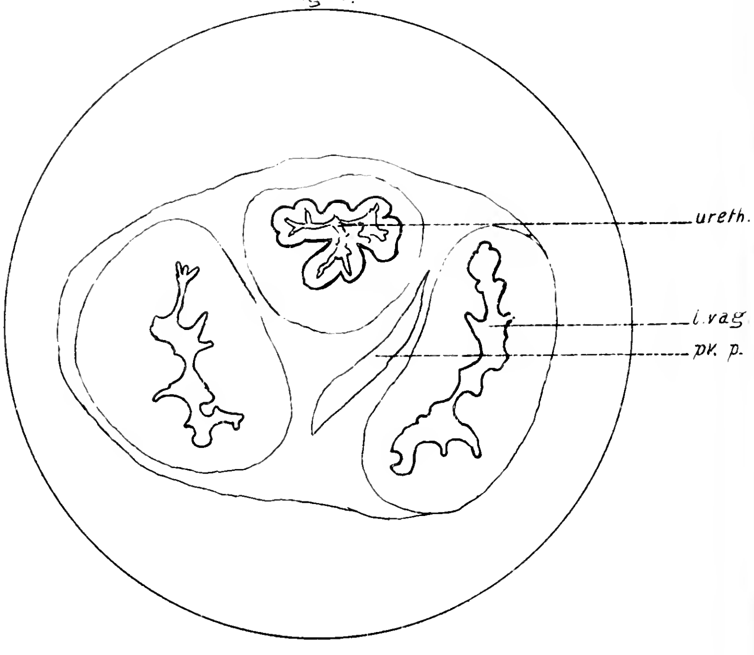


Fig 15.



PERAMELES OBESULA.

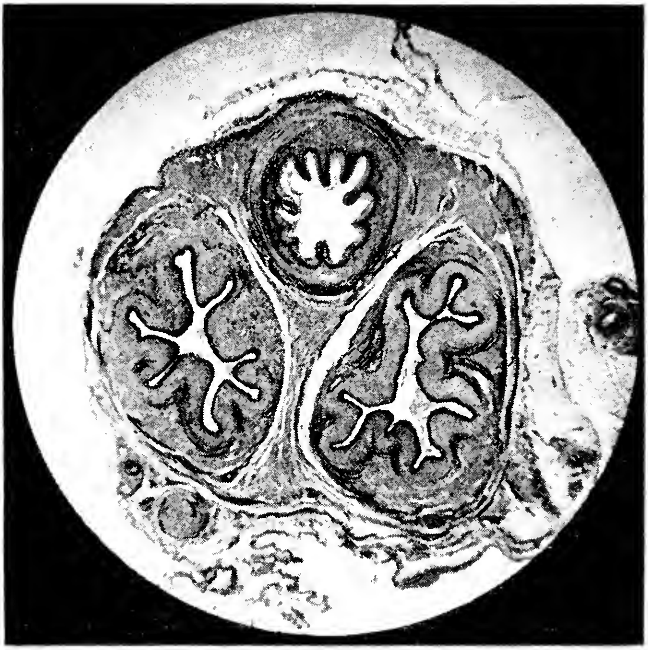
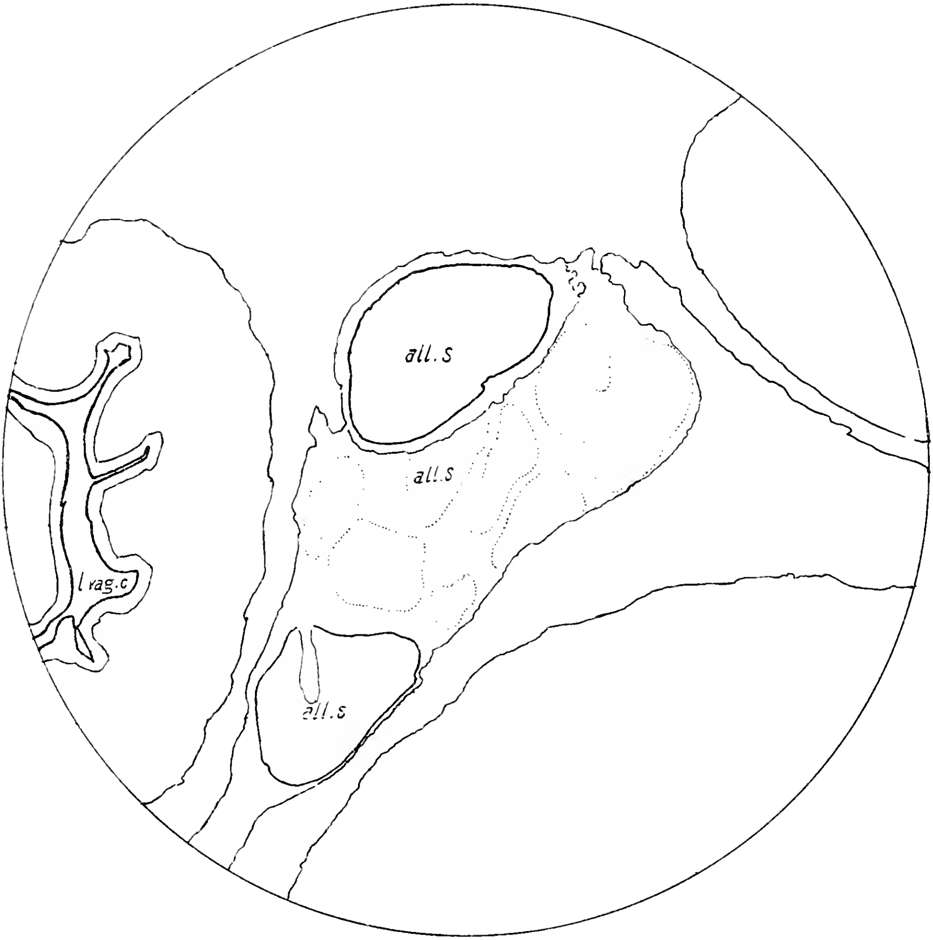
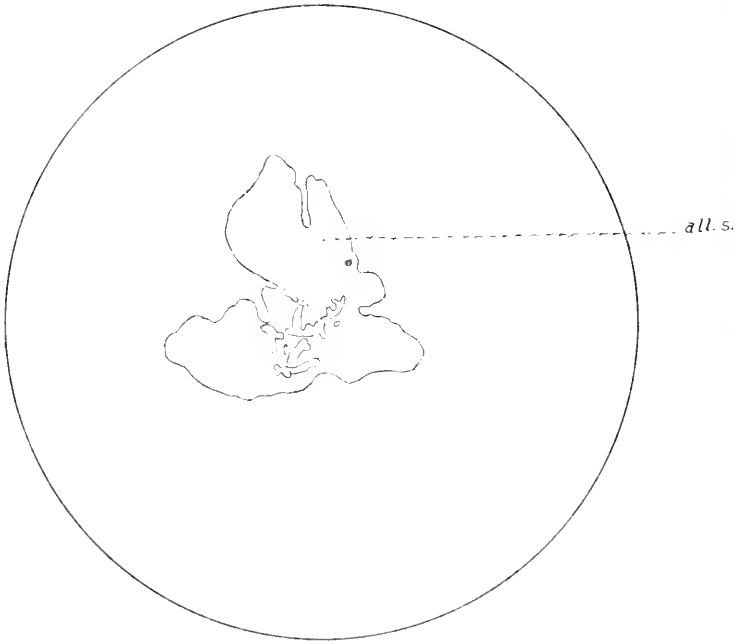


Fig 17.



PERAMELES OBESULA.

Fig. 16.



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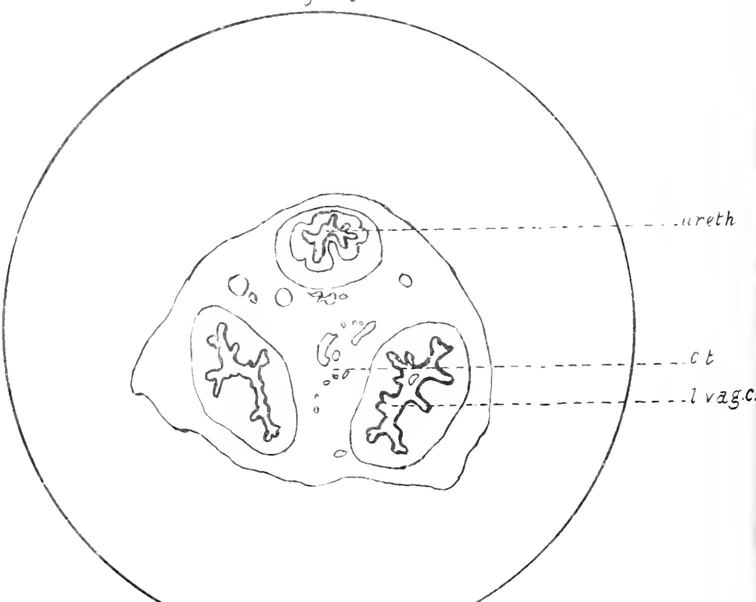
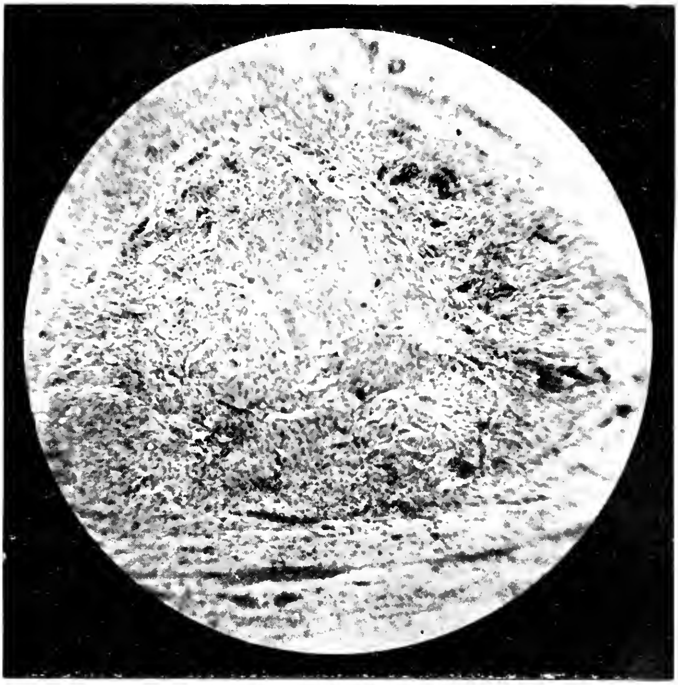
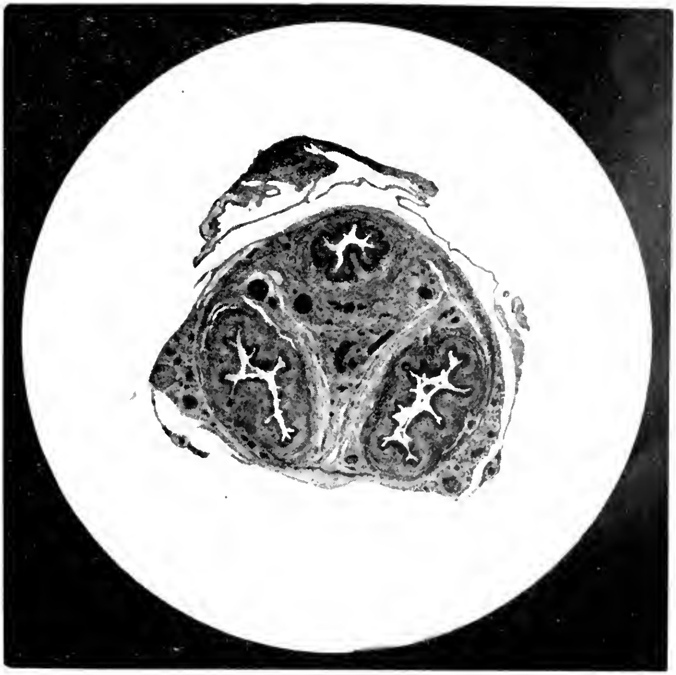
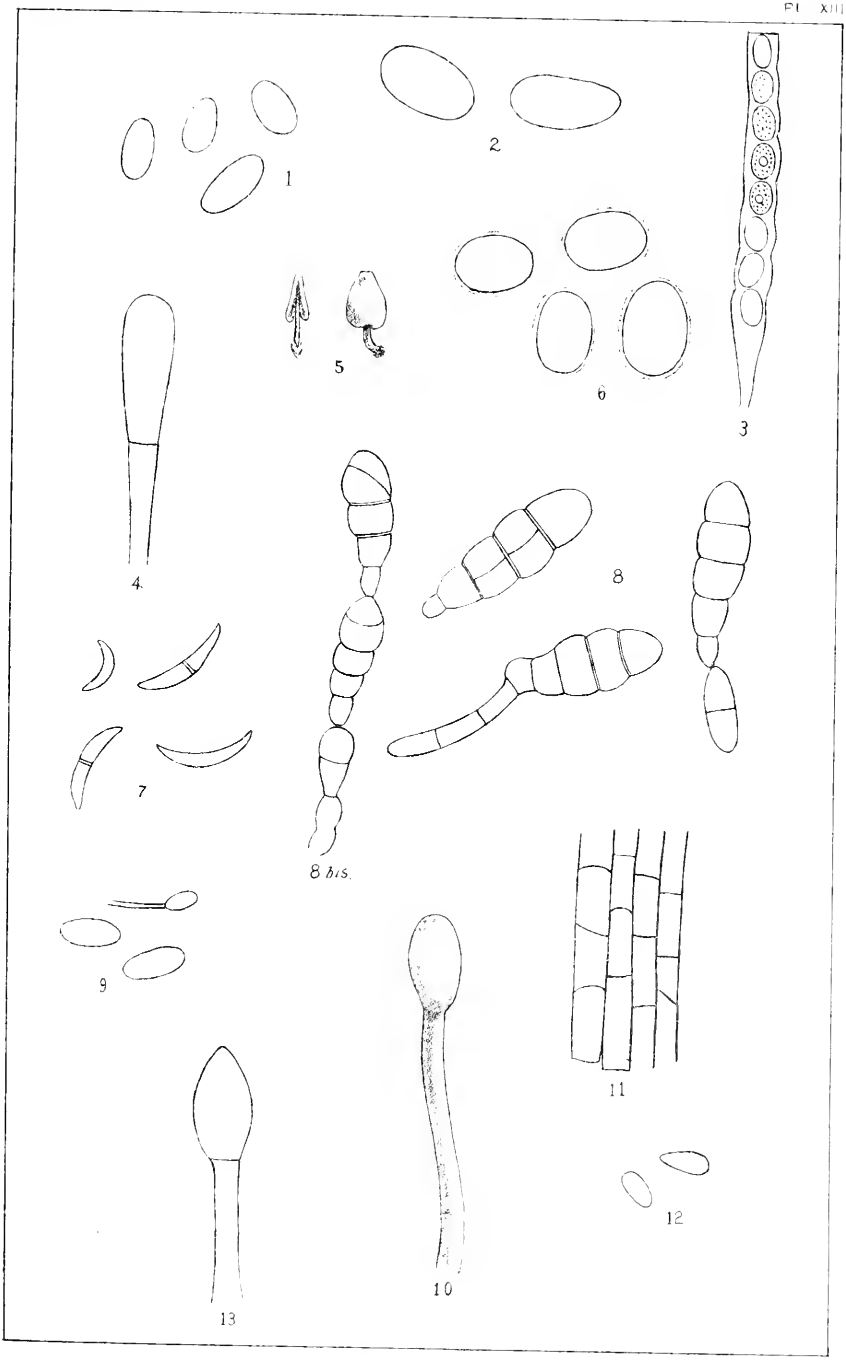
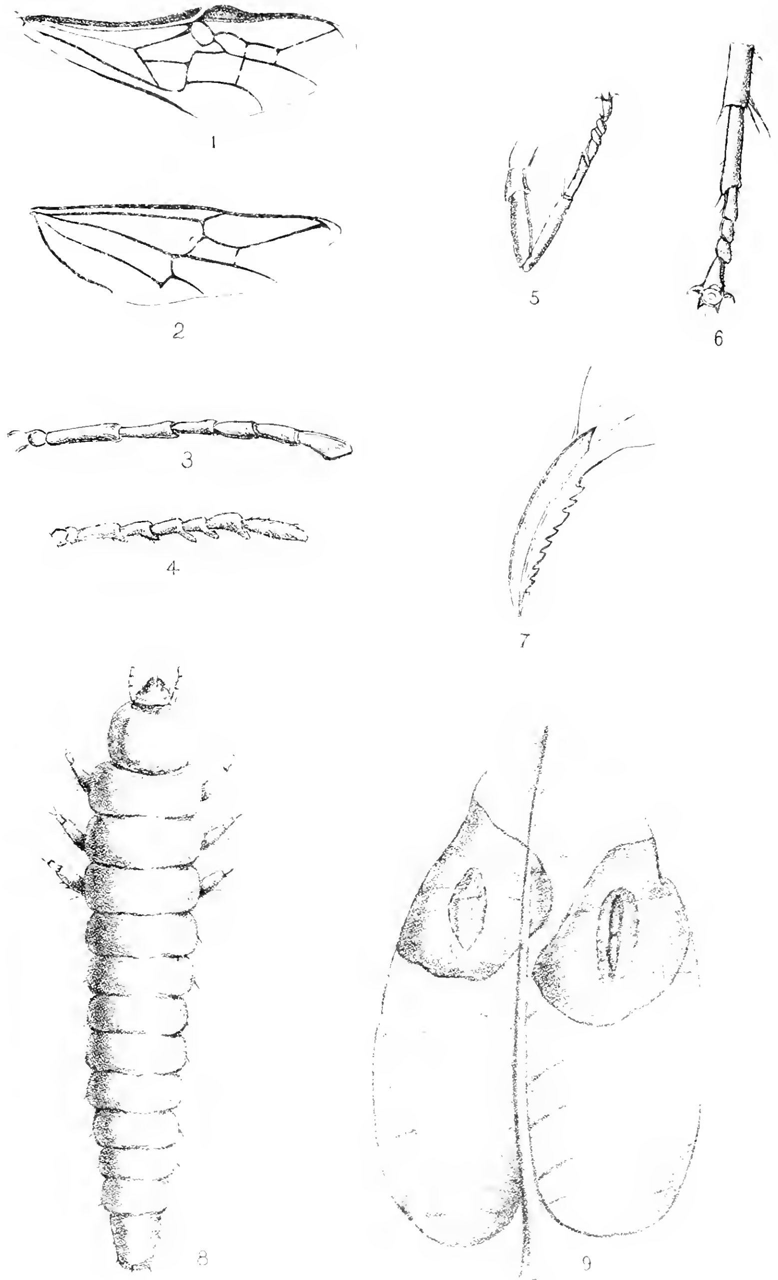






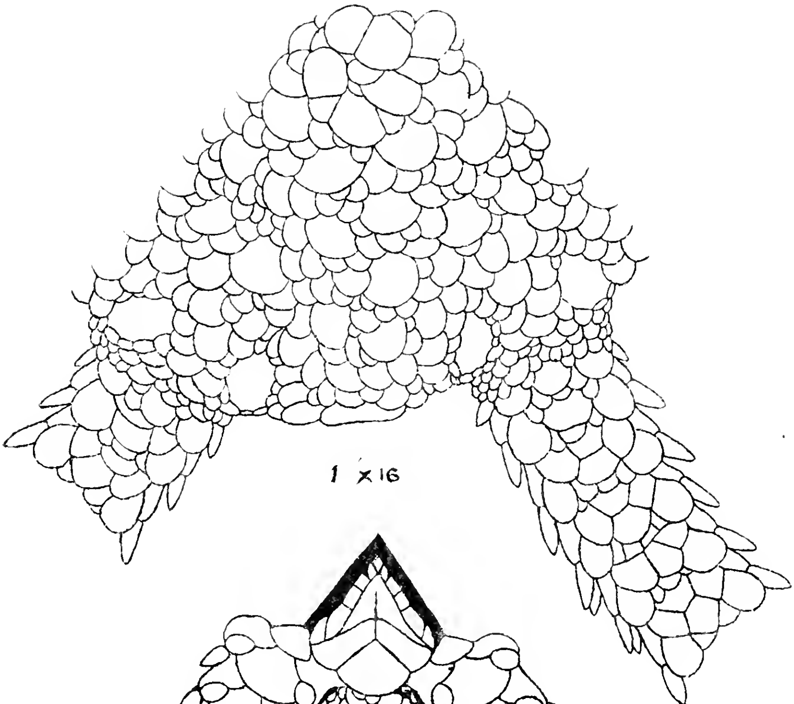


NEW SOUTH WALES FUNGI



W.W.F. del.

PHYLACTEOPHAGA EUCALYPTI.



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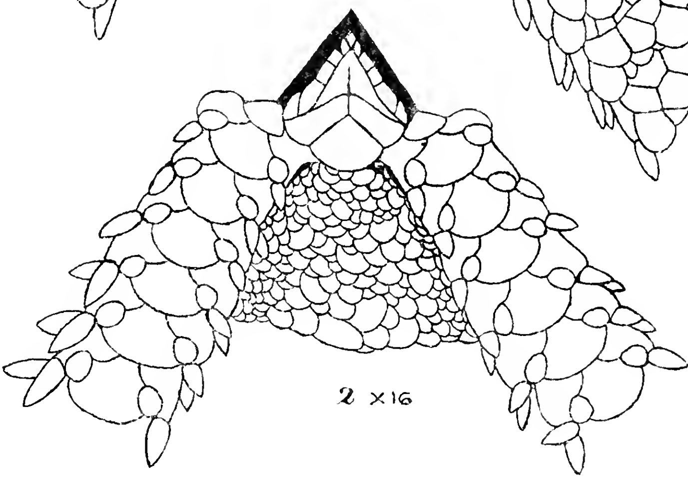

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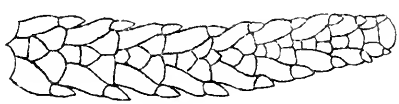

3 ×16

H.F. del. OPHIOPLOCUS HUTTONI

Mr. Maiden exhibited and explained a very fine series of enlarged photographs taken by his assistant, Mr. W. Forsyth, especially to illustrate some of the characteristic botanical features of the Mt. Kosciusko Plateau, such as the gregarious habit of plants like *Aciphylla glacialis*, *Richea Gunnii*, *Celmisia longifolia*, and *Astelia alpina;* the dwarfed habit of shrubs growing in the open, exemplified by *Oxylobium ellipticum*, var. *alpinum*, *Eriostemon ovatifolius*, and *Grevillea australis*, var. *alpina;* the clinging and scrambling habit of shrubs which best withstand the wind in the shelter afforded by granite boulders, of which *Podocarpus alpina*, *Orites lancifolia*, *Drimys aromatica*, and some of the Epacrids furnish examples ; the pasturage afforded by the conspicuous grass *Danthonia robusta;* and the Snow Gums (*Eucalyptus coriacea*) at the tree-line.

Mr. Fletcher exhibited a series of specimens illustrative of, and offered some remarks on, the fauna of the higher portion of the Mt. Koscuisko Plateau (above the tree-line, approximately about 6000 feet), supplementing Mr. R. Helms' general account of the fauna met with from 3000 feet upwards. At the higher elevation the fauna does not compare with the flora in respect of the variety, or the novel or otherwise striking character of the forms which come under notice. The animals are chiefly either summer immigrants, or they are such as are able to hibernate under a covering of snow for a period of five months or longer of each year. Of vertebrates actually met with or reported by Mr. Helms there seem to be known but 15 species: mammals (including the hare, and a rat at the Observatory) 4 species; Birds 4; Lizards 2; Snakes 2 ; Batrachia 2, and Pisces 1. Of these the fish (*Galaxias findlayi*, Macl.) is the only species not found elsewhere. The two frogs (*Crinia signifera*, Giard, and *Hyla ewingii*, D. & B. var.nov.) occur in company near water up to fully 7000 feet. The Hyla is remarkable by its acquisition of a rich green in place of the usual shade of brown as the groundcolour of the exposed upper surfaces of the body and limbs, and the darker tint and more strongly marked character of the dorsal stripes and the inguinal and other spots and blotches. The explanation of this is probably to be found in its more or less complete adoption of a diurnal habit necessitated by the coldness of the nights, in a region where trees (and consequently fallen leaves, chips and logs) are absent, and grass, herbaceous plants and dwarf shrubs make up the vegetation, cover being afforded by boulders, crevices, &c.

Mr. Fletcher exhibited also specimens of *Heleioporus pictus*, Ptrs., from West Australia, part of a collection made by Mr. A. M. Lea, "within 100 miles of Perth." This species is an addition to the Batrachian fauna of West Australia, and is evidently a widely dispersed and characteristic member of the fauna of the Eyrean Sub-region.

Mr. Musson exhibited a clump of the woody galls of the Brachyscelid *Cylindrococcus spiniferus*, Mask., on *Casuarina suberosa*, gathered at Richmond, which had been forcibly broken open, presumably by predaceous birds for the purpose of extracting the enclosed coccid. Also specimens of four indigenous grasses affected with parasitic fungi, gathered at Richmond, not included in the list of affected species given by Mr. Fred. Turner (Proceedings, 1897, p. 686), namely, *Anthistira ciliata*, L., *Andropogon refractus*, R.Br., *Panicum pygmaeum*, R.Br., and *Sorghum plumosum*, Beauv.

WEDNESDAY, MAY 31st, 1899.

SPECIAL GENERAL MEETING.

The Hon. James Norton, LL.D., M.L.C., President, in the Chair.

On the motion of Mr. P. N. Trebeck, the resolution passed at the Special General Meeting, held on the 19th April—that for the remainder of the current year the payment of Entrance Fees as provided for by Rule vi., should be suspended—was confirmed.

MONTHLY MEETING.

The Hon. James Norton, LL.D., M.L.C., President, in the Chair.

Mr. Augustus Gross, Queensland Offices, Bridge Street, Sydney; Mr. Stephen J. Johnston, B.A., Technological Museum, Sydney; and Mr. Henry G. Smith, F.C.S., Technological Museum, Sydney, were elected Ordinary Members of the Society.

DONATIONS.

Department of Agriculture, Brisbane—Queensland Agricultural Journal. Vol. iv. Part 5 (May, 1899). *From the Secretary for Agriculture.*

Geological Survey of Queensland—Geological Map of Charters Towers Goldfield (in 6 Sheets; 1898). *From the Director.*

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Department of Mines and Agriculture, Sydney—Agricultural Gazette of New South Wales. Vol. x. Part 5 (May, 1899); Geological Survey—Records. Vol. vi. Part 2, (1899): Mineral Resources. No. 5 (1899), Report on the Wyalong Goldfield. By J. A. Watt, M.A., B.Sc. *From the Hon. the Minister for Mines and Agriculture.*

Royal Society of New South Wales—Abstract, May 3rd, 1899: Anniversary Address. By the President, G. H. Knibbs, F.R.A.S. (May 3rd, 1899). *From the Society.*

The Surveyor, Sydney. Vol. xii. No. 5 (May, 1899). *From the Editor.*

Two Separates from Report of Australasian Association for the Advancement of Science, January, 1898. By T. Steel, F.L.S., F.C.S. *From the Author.*

Australasian Journal of Pharmacy. Melbourne. Vol. xiv. No. 161 (May, 1899). *From the Editor.*

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Royal Geographical Society of Australasia: Victorian Branch —Report of the Council for the Fifth Triennial Period ending 31st December, 1898. *From the Society.*

University of Melbourne.—Examination Papers — Annual, October, and December, 1898; Final Honour, Degrees, &c., February, 1899; Matriculation, November, 1898. *From the University.*

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Canadian Institute, Toronto — Proceedings. New Series. Vol. ii. Part 1 (Feb., 1899). *From the Institute.*

Natural History Society of New Brunswick—Bulletin. No. xvii. (1899). *From the Society.*

Academy of Natural Sciences of Philadelphia—Proceedings, 1898. Part ii. (April-Sept.) *From the Academy.*

Academy of Science of St. Louis—Transactions. Vol. vii. Nos. 17-20 (Sept., 1897-Feb., 1898); Vol. viii. Nos. 1-7 (Jan.-May, 1898). *From the Academy.*

American Museum of Natural History, New York—Bulletin. Vol. xii. Articles iii.-iv. (pp. 19-80; March-April, 1899). *From the Museum.*

American Naturalist (Cambridge). Vol. xxxiii. No. 388 (April, 1899). *From the Editor.*

Indiana Academy of Science, Indianapolis—Proceedings, 1897. *From the Academy.*

Johns Hopkins University, Baltimore—University Circulars. Vol. xviii. No. 139 (March, 1899): Memoirs. Vol. iv. Nos. 1-2 (1898). *From the University.*

Museum of Comparative Zoology, Harvard College, Cambridge, Mass.—Bulletin. Vol. xxxii. No. 9 (February, 1899). *From the Director.*

New York Academy of Sciences—Annals. Vol. x. Nos. 1-12 (Oct., 1898); Vol. xi. Part ii. (Aug., 1898). *From the Academy.*

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U.S. Geological Survey, Washington: Department of the Interior—Bulletin. Nos. 88, 89, 149 (1897-98): Monographs. Vol. xxx. (1898). *From the Director.*

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Asiatic Society of Bengal, Calcutta—Journal. Vol. lxv. Part i. Title-page and Index (1896); Vol. lxvii. Part. i. No. 4; Part ii. Title-page and Index; Part iii. No. 2 (1898): Proceedings, 1898. Nos. ix.- xi; 1899, Nos. i.-iii.: The Kaçmīraçabdāmṛta, a Kāçmīrī Grammar. Part ii. (1898). Edited by G. A. Grierson, C.I.E., Ph.D., &c. *From the Society.*

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Department of Agriculture, Cape Town—Annual Report of the Geological Commission for 1897. *From the Government Geologist.*

La Habana Medica, Habana. Ano ii. Núm. 3 (Marzo, 1899). *From the Editor.*

REVISION OF THE AUSTRALIAN CURCULIONIDÆ BELONGING TO THE SUBFAMILY *CRYPTORHYNCHIDES.*

By Arthur M. Lea.

Part III.

The genera treated in this part form a natural division of the subfamily, the anterior coxæ in all being rounded, and although decidedly separated the separation is much less pronounced than is usually the case. In none of them is the intercoxal process of the mesosternum cavernous, nor in fact does the apex of the rostrum, in the majority of the genera, rest on it. The species are often almost naked on the upper surface, and but few are clothed with scales. *Lybæba*, with several other genera, were first referred by Mr. Pascoe to the *Erirhinidæ*, but afterwards placed by him in the vicinity of *Melanterius*, which is undoubtedly their true position, although in a number of the *Erirhinidæ* (*Cydmæa*, *Storeus*, &c.) the anterior coxæ are more or less noticeably separated. *Enide*, for reasons given, has been regarded as synonymous with *Lybæba*; *Melanterius carinicollis* has been placed in a new genus (*Neomelanterius*), its eyes being very different from those of *Melanterius*. Mr. Pascoe's genera *Euthebus*, *Mæchius* and *Teutheria* are evidently closely allied to *Melanterius*, but as I have not been enabled to identify them they are not included in the following tabulation.

Rostrum passing mesosternum.
  Elytra tuberculate.. Hybophorus.
  Elytra not tuberculate.
    Second abdominal segment moderately large.*
      Eyes projecting.. Arthriticosoma.

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* Except in *Melanterius centralis* and *M. æratus*.

Eyes embedded in head.
 Eyes widely separated beneath.................... MELANTERIUS.
 Eyes almost touching beneath..................... NEOMELANTERIUS.
Second abdominal segment small.................... ... LYBÆBA.
Rostrum not passing mesosternum.
 Eyes finely faceted.. PSYDESTIS.
 Eyes coarsely faceted.
 Claw-joint long and thin................................ MELANTERIOSOMA.
 Claw-joint thicker, dilating to apex......... .... PSEUDOSTOREUS.

Genus HYBOPHORUS, Waterhouse.

Trans. Ent. Soc. 1853, Vol. ii. (n.s.), p. 205; Lacordaire, Gen. Col. Tome vii. p. 66.

Head small, convex, not concealed by prothorax. *Eyes* large, subreniform, coarsely faceted, almost touching above and moderately separated below. *Rostrum* long, thin, curved. *Antennæ* slender; scape inserted much closer to apex than base of rostrum, passing apex, the length of funicle; two basal joints of funicle moderately elongate, 7th strongly transverse; club small, ovate, free. *Prothorax* convex, transverse, subconical, apex produced and not half the width of base, base bisinuate; ocular lobes obtuse, almost level with apex. *Scutellum* small, oblong-elliptic. *Elytra* convex, subtriangular, much wider than prothorax, base trisinuate, shoulders and apex rounded. *Pectoral canal* wide in front, narrowed between and dilated behind anterior coxæ. *Mesosternal plate* widely transverse, feebly curved and very feebly concave. *Metasternum* moderately large, middle strongly produced in front and emarginate behind; episterna large. *Abdomen* moderately large, sutures distinct; basal segment the length of three following combined, intercoxal process rounded, produced in middle, apex truncate; 2nd the length of apical and but little longer than 3rd, 3rd slightly longer than 4th. *Legs* moderately long; femora thick, grooved, each strongly dentate and with a very small tooth in the apical emargination, posterior terminating almost level with apex of abdomen; tibiæ compressed, strongly curved at base; tarsi shorter than tibiæ, 3rd joint wide, deeply bilobed, claw-joint elongate. Short, broad, convex, tuberculate, punctate, glabrous, winged.

A peculiar genus closely allied to *Melanterius*. The difference in the lengths of the 3rd and 4th abdominal segments, though but slight, is sufficiently distinct; in but few genera are these segments unequal in size. The only known species may be easily recognised on account of its shape and the large reddish tubercles of the elytra.

HYBOPHORUS RUFOTUBEROSUS, Waterh.; Mast. Cat. Sp. No. 5407.

Piceous-black and shining with a slight satiny lustre; elytral tuberosities, antennæ and tarsi reddish.

Head sparsely and finely punctate. Rostrum slightly longer than prothorax, terminated beyond mesosternum; finely punctate, punctures in rows before antennæ. *Prothorax* strongly transverse, sides rounded towards base, raised towards middle; an obtuse carina in middle terminating before base and apex; near apex with a row of deep longitudinal punctures, small punctures sparsely and irregularly distributed on disc, but becoming numerous towards sides. *Elytra* subtriangular, almost twice the width of prothorax, not much longer than wide ($4\frac{1}{2} \times 5\frac{1}{2}$ mm.); each with a number of reddish tubercular elevations of which the largest is on the 3rd interstice about the middle and the next largest on the shoulder: irregularly punctate, punctures large, each encroached upon by two or four granules. *Metasternum* finely punctate in middle, each side with about six large round punctures; episterna impunctate. Basal segment of *abdomen* with large round punctures, the others impunctate; apical segment transversely excavated in middle. Length $7\frac{1}{2}$, rostrum $2\frac{1}{2}$; width $4\frac{1}{2}$ mm.

Hab.—Q.: "Moreton Bay" (Waterhouse); Rockhampton (Mr. Horace W. Brown)—N.S.W.: Richmond River (Lea).

ARTHRITICOSOMA, n.g.

Head small, not concealed by prothorax; ocular fovea feeble. *Eyes* ovate, convex, very prominent, not very distant, coarsely faceted. *Rostrum* long, rather thin, curved, continued beyond mesosternum. *Antennæ* slender; scape inserted distinctly nearer apex than base of rostrum, the length of funicle; two basal joints of funicle elongate; club subelliptic, of moderate size. *Prothorax* transverse, convex, subcylindrical, slightly narrowed and scarcely produced in front; base truncate, ocular lobes rounded and almost level with apex *Scutellum* small, somewhat rounded. *Elytra* moderately convex, considerably wider than and about thrice the length of prothorax, shoulders and apex rounded. *Pectoral canal* wide in front of anterior coxæ, these slightly excavated above and but feebly separated. *Mesosternal plate* transverse, depressed, scarcely concave, apex about twice the width of base. *Metasternum* large, slightly longer than basal segment of abdomen; episterna distinct. *Abdomen* moderately large, sutures distinct except that of 1st and 2nd, which is rather feeble across the middle; two basal segments moderately large, the 1st not much longer than 2nd, incurved to middle of apex, intercoxal process rounded and not very wide; intermediates large, flat, level with the other segments and together longer than 2nd or apical. *Legs* rather long; femora stout, clavate, not grooved, strongly dentate, posterior not extending to apex of abdomen; tibiæ thin and rather long, distinctly bisinuate beneath, terminal hook very acute; tarsi rather thin, 3rd joint not much wider than long, deeply bilobed, claw-joint long and thin, strongly exserted; claws small, widely separated. Subovate, feebly convex, punctate, winged.

The large and very prominent eyes at once distinguish this genus from *Melanterius;* and the scrobes and the sculpture of the elytra are different from those of most of its allies. The tibiæ are thin and resemble those of *Hybophorus.*

ARTHRITICOSOMA VIGILANS, n.sp.

Red, shining; elytra somewhat paler than prothorax, but in places tinged with black, the two colours sharply defined. Under surface black, the sides in places feebly diluted with red. Legs and antennæ somewhat paler than rostrum. Sparsely clothed all over with small ochreous scales.

Head with dense and rather large but shallow punctures. Rostrum longer than prothorax, rather strongly curved; sulcate-punctate and with three rather obtuse ridges behind antennæ; finely punctate on apical half; scrobes deep and oblique near base of antennæ, very shallow towards eyes. Funicle with the 1st joint stouter but no longer than 2nd. *Prothorax* densely and coarsely punctate, punctures round, rather larger on disc than elsewhere. *Elytra* wide and almost twice the width of prothorax; very feebly striate, punctures rather large, quadrate, distinctly separated, becoming much smaller beyond the middle; interstices wider or narrower than punctures, the suture, 3rd, 5th and 7th feebly raised and rather narrower than the others. *Under surface* moderately densely punctate, the punctures round and rather shallow, smaller on three apical segments of abdomen than elsewhere; the apical segment with a shallow but very distinct circular impression. *Femora* very feebly punctate; the tibiæ with feeble punctures in very feeble grooves. Length $4\frac{1}{4}$, rostrum $1\frac{1}{2}$; width $2\frac{1}{2}$ mm.

Hab.—Australia (Herr J. Faust).

The unique specimen under examination appears to be a female.

Genus MELANTERIUS, Erichson.

Wiegm. Arch. 1842, p. 209; Lacord. Gen. Col. Tome vii. p. 65.

Head round, convex; ocular fovea either very small or represented by a shallow depression. *Eyes* of various shapes, coarsely or moderately coarsely faceted, varying from subcontiguous to distant. *Rostrum* long, thin, parallel or almost parallel, feebly or moderately curved; with or without feeble lateral grooves, parallel or not with scrobes; apex terminating beyond mesosternal plate. *Antennæ* usually slender; scape inserted distinctly closer to apex than base and passing apex; two basal or basal joint only of funicle moderately elongate; club more or less ovate. *Prothorax* usually slightly transverse, not overhanging head, densely punctate, with or without median line; ocular lobes varying from moderately prominent to almost absent. *Scutellum* small, distinct, rounded or oblong. *Elytra* more or less cordate, wider than prothorax, each with nine or ten rows of more or less elongate punctures placed in grooves; the interstices usually raised and costate, sometimes only on apical and lateral parts. *Pectoral canal* wide and shallow, the anterior coxæ more or less excavated to receive rostrum, but seldom distinctly separated at their bases. *Mesosternal plate* more or less depressed, apex usually emarginate, anterior angles more or less raised, sides incurved or oblique, base usually much narrower than apex. *Metasternum* with depressed disc and precipitous sides; episterna rather narrow, each with one row of punctures sometimes placed in a groove. *Abdomen* with distinct sutures, two basal segments large, 1st frequently slightly concave, intermediates combined usually slightly longer than apical. *Legs* of moderate size; femora grooved beneath, strongly dentate, posterior not extending beyond and seldom reaching apical abdominal segment: tibiæ more or less compressed, frequently with punctures running in rows and giving the parts affected a grooved appearance; tarsi the length of or shorter than tibiæ, 1st joint moderately long, 3rd wide, deeply bilobed; claw-joint long, thin, feebly or not at all pubescent, claws feeble, feebly or moderately separated. Ovate or elliptic, convex, sparsely clothed, densely punctate, winged.

There are many points of interest about this genus. Certain species have characters which were they supported by other characters might be considered as worthy of generic rank, yet as there are so many connecting links between species and species I think that it is inadvisable to erect genera which in all probability would only be degraded as their relationships became better known. It would be easy to erect a dozen genera from *Melanterius* all founded (on paper) on sufficiently strong characters, but I do not think that technical characters, however much use they may be in defining genera, should be allowed to ride roughshod over very obvious affinities. The peculiar abdomen of *ventralis*, did it exist in a species in another part of the subfamily, would, in all probability, cause me to think that the species was generically distinct; but in *Melanterius*, which appears to be intermediate in position between the *Erirhinides* and the true *Cryptorhynchides*, I think some latitude may be allowed. If the mesosternal receptacle (or plate as it appears in this and allied genera), and the pectoral canal be regarded as the main generic features (as I think they should), several technical genera would be required; yet in this genus undoubtedly closely allied species differ in these important features. In one species (*porcatus*, the type of the genus), the rostrum is perfectly straight, and Pascoe erects a genus (*Euthebus*) on this one detail. In several species the legs are not, or scarcely, dentate. In a number there exists a narrow groove above the scrobe, whilst others are without it. The abdomen is sometimes feebly convex and sometimes a depression exists in the 1st or 1st and 2nd segments, and this is, moreover, often sexual. The majority of the species appear to be glabrous at first sight, but under a lens minute scales or setose hairs may be seen; they are always more noticeable on the under than on the upper surface, perhaps on account of the punctures (in which they are placed) being deeper on the upper surface

Melanterius and its allies are perhaps worthy of being erected into a subfamily which on the one hand would be separated from the *Erirhinides* by the mesosternal plate and pectoral canal, and from the *Cryptorhynchides* by the rostrum not terminating in a mesosternal receptacle and continued beyond its position; this continuation of the rostrum is an exceedingly important feature, and except in *Melanterius* and its allies is seen in no genus of *Cryptorhynchides*,* although sufficiently common in the *Erirhinides*.

Following is a table of the species :—

Rather densely squamose, shoulders square.
  Metasternal episterna each with a single row of punctures.......................... *uniseriatus*, n.sp.
  Metasternal episterna densely punctate.
    Apical segment of abdomen distinctly larger than intermediates combined............................ *congruus*, n.sp.
    Apical segment smaller than intermediates...... *amplipennis*, n.sp.
Rarely more than feebly pubescent, shoulders rounded or oblique.

* In *Myrtesis* the rostrum is continued beyond the metasternum, but when at rest is received into a pectoral canal for its entire length.

Femoral emargination with a supplementary tooth or granule.	
Rostrum perfectly straight..........................	*porcatus*, Er.
Rostrum slightly curved..........................	*bidentatus*, n.sp.
Femoral emargination normal.	
Scape inserted nearer base than apex of rostrum	*aberrans*, n.sp.
Scape inserted nearer apex than base.	
Elytra with irregular interstices..................	*semiporcatus*, Er.
Elytra with regular interstices.	
Intermediate segments of abdomen each larger than 2nd..............................	*ventralis*, n.sp.
Intermediate segments each equal to 2nd....	*aratus*, Pasc.
Intermediate segments combined about equal to 2nd.	
Interstices flattened or rounded on basal half of elytra.*	
Punctures sometimes concealed by clothing..............................	*floridus*, Pasc.
Punctures not at all concealed.	
Interstices similar throughout.	
More than 3 mm. in length..........	*compactus*, n.sp.
Less than 3 mm..........................	*castaneus*, n.sp.
Interstices triangularly raised posteriorly.	
Elytra on basal half scarcely striate, punctures clearly defined.	
Apical segment of abdomen with a few large punctures.............	*adipatus*, n.sp.
Apical segment densely punctate...	*porosus*, n.sp.
Elytra striate, punctures not sharply defined.	
Prothorax clothed.	
Scape passing apex of rostrum	*impolitus*, n.sp.
Scape not passing apex..........	*tenuis*, n.sp.
Prothorax not at all or scarcely visibly clothed.	
Metasternum with a pad of white hairs on each side..............	*pectoralis*, n.sp.
Metasternum normally clothed.	
Metasternal episterna with regular punctures.	

* This does not include the lateral interstices, which are sometimes triangularly raised; *tristis* is intermediate, only the suture and two interstices on each side of it being flattened on the basal half.

Elliptic..........................	*interstitialis*, n.sp.
Ovate..........................	*incomptus*, n.sp.
Metasternal episterna with regular punctures only in middle...................... ...	*tristis*, n.sp.
Interstices more or less carinate or triangularly raised on basal half.*	
Antennæ comparatively stout†...........	*antennalis*, n.sp.
Antennæ slender.	
Separation of eyes less than width of rostrum at base.	
Derm reddish..............................	*cordipennis*, n.sp.
Derm black.	
Ridging of interstices continued to extreme base...	*unidentatus*, n.sp.
Ridging interrupted before base.	
Less than 4 mm. in length.. ...	*vulgivagus*, n.sp.
More than 4 mm...........	*strabonus*, n.sp.
Separation of eyes equal to or more than width of rostrum at base.	
Shoulders not at all produced..... ..	*scrutulus*, Pasc.
Shoulders feebly produced on to prothorax.	
Elytra maculate.	
Very decidedly so	*vinosus*, Pasc.
Feebly..........	*maculatus*, n.sp.
Elytra not at all maculate.	
Prothorax with median carina	*solitus*, n.sp.
Prothorax without median carina.	
Scape of ♀ not passing apex of rostrum..................	*parvidens*, n.sp.
Scape of ♀ passing apex.	
Apical segment of abdomen with a transverse impression	*cinnamomeus*, Pasc.
Apical segment with a circular impression.....	*acaciæ*, n.sp.

* Not always including extreme base.

† This character is quite sufficient to distinguish this species amongst those with which I have placed it.

MELANTERIUS SEMIPORCATUS, Er.; Mast. Cat. Sp. No. 5400.

Broad, ovate, shining, somewhat depressed, coarsely punctate. Black, claw-joint and antennæ dull red. Glabrous, legs only with sparse minute whitish hair.

Head densely punctate; eyes coarsely granulate, subapproximate; ocular fovea feeble, longitudinal. Rostrum long, thin, curved, almost parallel to insertion of antennæ, thence narrowed and then widened to apex; in neither sex carinate; punctate, the punctures irregular and in places appearing in rows. Antennæ inserted about two-fifths from apex of rostrum; scape passing apex; two basal joints of funicle moderately elongate, all increasing in width and decreasing in length to apex; club shorter than three preceding joints. *Prothorax* very feebly if at all transverse, basal two-thirds subparallel, base bisinuate, posterior angles almost right angles; ocular lobes feeble; with dense, large, shallow punctures or foveæ, apex with smaller punctures; a feeble shining impunctate median line scarcely traceable at base and apex, but distinct about middle, where it is encroached upon in places by punctures. *Scutellum* rounded, granuliform. *Elytra* cordate, distinctly wider than prothorax and about twice its length; coarsely punctate, the punctures very irregular in shape, either subreniform or subelliptic, each encroached on in the middle by granules; interstices wavy, the alternate ones feebly raised, but all very narrow and irregular, small punctures about suture and interstices. *Pectoral canal* shallow, broad; anterior coxæ large, separation slight. *Mesosternal plate* transverse, depressed, feebly concave, obsoletely punctate, apex wider than base and both emarginate. *Metasternum* coarsely and irregularly punctate; episterna with a continuous row of punctures and a few smaller ones at base. *Abdomen* with basal segment large, coarsely punctate, as long as 2nd-3rd combined; 2nd coarsely punctate, except at apex and sides where punctures are small; intermediates combined slightly longer than 2nd, each with a transverse row of small punctures and a few others scattered about; apical segment densely punctate. *Legs* densely punctate; femora grooved, the anterior very feebly, teeth distinct, posterior extending to apical segment of abdomen; tibiæ compressed, the four posterior strongly curved, the posterior distinctly grooved, the others with punctures in irregular rows but scarcely grooved; claw-joint feebly pubescent, claws moderately separated. Length 7, rostrum $2\frac{1}{3}$; width $3\frac{1}{2}$ mm.

Hab.—"Neuholland" (Erichson)—Q.: Somerset (Mr. C. French), Rockhampton (Mr. Horace W. Brown)—S.A.: Eyre's Peninsula (Rev. T. Blackburn, No. 893)—N.S.W.: (Mr. W. Kershaw, Senr.), Tamworth (Lea). Numerous specimens were taken at night time whilst they were crawling on the newly barked trunk of a Eucalypt.

In this species the elytral punctures are very coarse and irregular; they appear at first sight to run in double rows, but on examination under a lens this doubling is very indistinct; the interstices are narrow, extremely irregular, waved by punctures, depressed in places, and their outline interrupted by granules. The 2nd segment of abdomen has in ♂ one row of coarse punctures in the middle; these are connected with the base by feeble ridges; in the ♀ the punctures are more numerous, smaller, and in about three rows.

MELANTERIUS PORCATUS, Erichs.; *l.c.* No. 5399.

Moderately broad, ovate, shining, somewhat depressed. Black; two apical joints of tarsi and antennæ dull red. Prothorax with a scarcely visible hair in each puncture, under surface and legs with whitish short hairs, somewhat more distinct than those on prothorax.

Head densely punctate; eyes large, subtriangular, moderately close together, rather coarsely faceted; ocular fovea small, level with bases of eyes. Rostrum long, thin, straight, in ♀ almost straight, in ♂ parallel-sided except at base; densely punctate at base; ♀ without carina; ♂ with five carinæ behind antennæ, only the median one sharply defined, the others being considerably interrupted by punctures; sides above scrobes with a very shallow narrow impression continued from eyes almost to extreme apex. Antennæ thin; scape inserted about two-fifths from apex of rostrum in ♀, somewhat closer in ♂; two basal joints of funicle elongate; 3rd-6th subequal, slightly increasing in width, 7th distinctly longer and wider than 6th; club slightly longer than two preceding joints. *Prothorax* scarcely transverse, sides slightly rounded, feebly increasing to base, posterior angles rounded, base bisinuate; ocular lobes rather prominent, slightly rounded; densely and regularly punctate, punctures smaller at apex than elsewhere; a feeble shining median line continued to base and apex. *Scutellum* rounded, granuliform. *Elytra* wider than prothorax and about twice its length, cordate, shoulders and sides oblique, each with ten* rows of large, elliptic, shelving punctures, near base separated by transverse ridges; interstices (including suture) narrow, raised, slightly waved by punctures near base, elsewhere straight; sides of interstices with small punctures. *Pectoral canal* wide, moderately deep; anterior coxæ compressed, distinctly separated. *Mesosternal plate* transverse, depressed, base straight, apex very feebly emarginate, anterior angles oblique, middle with a transversely elliptic shallow fovea. *Metasternum* slightly depressed in middle, coarsely and irregularly punctate; episterna each with a continuous row of slightly elongated punctures. *Abdomen* with the two basal segments coarsely punctate, 1st as large as 2nd-3rd combined; 2nd transversely convex; intermediates slightly raised at their bases, obsoletely punctate; apical segment densely punctate and in the ♂ with a distinct circular impression. *Legs* densely punctate, punctures frequently confluent; femora distinctly dentate and each with a smaller tooth or granule in emargination; posterior reaching apex of abdomen; tibiæ grooved, curved at base, anterior bisinuate beneath; claw-joint feebly pubescent, claws moderately separated. Length $5\frac{1}{2}$, rostrum $2\frac{1}{4}$; width 3 mm.

Hab.—Tasmania (Erichson), Hobart (Messrs. Griffith and Norman)—S. Australia—N.S.W.: (Macleay Museum), Forest Reefs (Lea; on *Acacia decurrens*).

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* I have in all cases counted the short subhumeral row.

MELANTERIUS BIDENTATUS, n.sp.

Broad, ovate, shining, somewhat depressed. Black; elytra feebly tinged with red, claw-joint and antennæ dull red. Prothorax with a scarcely traceable hair in each discal puncture, but more distinct towards sides; legs with short, white, moderately distinct hair, densest at base of anterior femora.

Head densely and minutely punctate; eyes large, semicircular, rather coarsely faceted, moderately separated; ocular fovea small, situate between bases of eyes. Rostrum long, slightly curved, moderately stout (for the genus); densely punctate throughout, punctures somewhat oblong; not carinate; parallel-sided except between antennæ and apex, where it is slightly incurved. Antennæ moderately stout; scape perfectly straight, inserted about two-fifths from apex of rostrum which it slightly passes; funicle with joints 1st-6th cylindrical, 7th transverse, 1st and 2nd elongate, 3rd slightly shorter; club top-shaped, longer than two preceding joints. *Prothorax* slightly transverse, sides and posterior angles rounded, base bisinuate; ocular lobes obtuse, densely and regularly punctate, apex with smaller punctures than elsewhere; a feeble shining median line not continued to base or apex. *Scutellum* circular, punctate. *Elytra* cordate, wider than prothorax and more than twice its length; shoulders oblique; sides slightly obliquely rounded; each with nine rows of large, elliptic, shelving punctures, which near base are encroached upon by obtuse granules; interstices narrow, raised, very slightly waved and with minute punctures; suture near base slightly flattened, elsewhere raised. *Pectoral canal* wide, shallow; anterior coxæ hollowed out but not distinctly separated. *Mesosternal plate* depressed, slightly concave, obsoletely punctate, apex wide, feebly emarginate, base narrow, almost truncate, sides oblique. *Metasternum* feebly depressed in middle, where punctures are shallow and irregular, sides with larger, denser and more regular punctures; episterna each with a continuous row of rather deep punctures. *Abdomen* with basal segment as long as two following combined, with moderately dense shallow punctures sparser about intercoxal process than elsewhere; 2nd not as long as intermediates combined, with rather sparse shallow punctures; intermediates with almost obsolete punctures; apical segment moderately densely punctate, a shallow depression near its apex. *Legs* densely punctate, punctures small; femora distinctly dentate, each with a smaller tooth or granule in emargination; posterior almost extending to apex of abdomen; tibiæ rather feebly grooved, moderately curved at base; claw-joint feebly pubescent, claws moderately separated. Length $6\frac{2}{3}$, rostrum $2\frac{1}{2}$; width $3\frac{1}{3}$ mm.

Hab.—N.W. Australia (Mr. G. Masters)—N.Q.: Somerset (Mr. C. French).

Somewhat resembling the preceding species, but—besides the more noticeable differences of rostrum, antennæ, abdomen and pectoral canal—differs in being somewhat more bulky, with less trigonal elytra, larger scutellum, more obtuse ocular lobes, stouter femora and more regular elytral interstices. The granule in the femoral emargination occurs (so far as I am aware) only in this and the preceding species.

Melanterius porosus, n.sp.

Elliptic, shining, convex. Black; tibiæ, tarsi, rostrum and antennæ dull red. Punctures of prothorax, under surface and legs each with a minute hair.

Head densely punctate; eyes large, rather widely separated, coarsely faceted. Rostrum long, parallel, curved; densely punctate, punctures decreasing in size to apex; not carinate. Scape inserted about one-third from apex of rostrum, about half its length passing apex; 1st joint of funicle moderately long, 3rd-7th short; club briefly ovate. *Prothorax* scarcely transverse, rounded, base very feebly bisinuate, posterior angles almost right angles; densely, shallowly and very regularly punctate; median line almost invisible; ocular lobes very feeble. *Scutellum* small, oblong. *Elytra* not much wider than prothorax and more than twice its length, widest about one-third its length from base; each with ten rows of deep, narrow, oblong punctures, connected together by almost invisible grooves; interstices on basal half distinctly wider than punctures, flat and with fine punctures, on apical half becoming raised and narrow and with punctate sides; the suture is flat for more than two-thirds its length. *Pectoral canal* shallow, apex wide; anterior coxæ hollowed for rostrum, feebly separated. *Mesosternal plate* depressed, feebly concave, punctate, almost curvilinearly triangular, apex moderately wide, base narrow. *Metasternum* feebly depressed in middle, densely punctate; episterna each with a row of small, deep, subcontiguous punctures. Two basal segments of *abdomen* large, not very coarsely punctate, flattened or very feebly concave in middle; 1st as long as 2nd-3rd combined; intermediates combined slightly longer than 2nd, each with a distinct transverse row of small punctures; 5th densely punctate, a shallow somewhat circular impression near its apex. *Legs* densely punctate; femora dentate, teeth of anterior pair rather small, posterior not extending to middle of apical segment; tibiæ narrow, compressed, grooved, base curved, anterior very feebly bisinuate beneath; claw-joint very feebly pubescent, claws feeble, diverging at an angle of about 30°. Length 4, rostrum $1\frac{1}{3}$; width 2 mm.

Hab.—North Queensland: Cooktown (Herr J. Faust's No. 69).

If *Machius* is to be recognised as a genus, this species should go into it; but I can see no reason for separating it from *Melanterius*: the species can scarcely be *M. anaglyptus*, which is described as—"Rostro . . . in medio fere obsolete carinato," and "Elytris profunde late sulcatis . . . interstitiis carinatis et utrinque uniseriatim punctulatis." Pascoe also gives the length as $2\frac{2}{3}$ lin.

Melanterius ventralis, n.sp,

Elliptic, shining, convex. Black; tarsi and antennæ dull red. Upper surface with very minute pubescence, on prothorax in punctures, and on elytra at sides of interstices; under surface and legs with sufficiently distinct hairs in punctures; four apical segments of abdomen with long, yellowish, straggling hair.

Head densely punctate; ocular fovea very feeble; eyes rounded, coarsely faceted, rather widely separated. Rostrum long, rather thick, curved, densely punctate and carinate; carinæ punctate; a feeble groove at sides continuous from eyes almost to apex and parallel with scrobes. Antennæ inserted about one-third from apex of rostrum; scape passing rostrum for the length of funicle; club large, its outline continuous with that of funicle. *Prothorax* feebly transverse, sides slightly rounded, posterior angles feebly acute; ocular lobes obtuse, emargination feeble; densely punctate, punctures round, at apex smaller and sometimes confluent; without median line. *Scutellum* small, oblong, corners rounded. *Elytra* distinctly wider than prothorax and about thrice its length, widest slightly behind base; shoulders oblique, feebly impinging on prothorax; each with ten rows of rather large oblong punctures, distinctly separated from each other; interstices raised, triangularly convex; at base not so much raised as near apex, much wider than punctures; suture flat to near apex, irregularly punctate, the punctures becoming compressed into one narrow row on posterior declivity; interstices laterally punctate, on basal third more coarsely than elsewhere and appearing to be obsoletely and irregularly granulate. *Pectoral canal* wide, moderately deep; separation between tops of anterior coxæ almost the width of apex, at their bases distinctly separated. *Mesosternal plate* separated from metasternum by a straight groove or suture, greatly depressed, very feebly concave, apex straight except the extreme sides, which are directed forwards, sides narrower than base or apex, feebly incurved. *Metasternum* convex at sides, disc flattened or very slightly depressed, rather densely punctate; episterna each with a narrow row of punctures appearing as a feeble groove. Basal segment of *abdomen* large, its sides convex, disc flattened or slightly convex, posteriorly in middle raised and almost laminate; densely punctate; 2nd segment almost impunctate, highly polished, apex of middle raised as in 1st: intermediates each distinctly larger and longer than 2nd, their combined length almost equal to that of 1st-2nd, and much longer than apical, three apical segments densely punctate. *Legs* moderately long, densely punctate; anterior femora edentate, posterior with rather small and intermediate with very small teeth; posterior not extending to apex of abdomen; tibiæ slightly curved at base, anterior straight, densely punctate, punctures oblong but scarcely confluent, posterior feebly grooved. Length $3\frac{1}{3}$, rostrum 1; width $1\frac{1}{2}$ mm.

Hab.—New South Wales (Macleay Museum), Sydney (Lea).

The abdomen of this species renders it the most distinct in the whole genus, even if it only depended on the clothing of the apical segment. The shape of the 1st segment might be regarded as indicating an approach to *Amydala* and *Ampagia*. The size of the intermediates is almost without parallel in the subfamily.

MELANTERIUS SERVULUS, Pasc.; *l.c.* No. 5401.

♂. Elliptic-ovate, shining, moderately convex. ♂. Black; legs and rostrum dark brown, antennæ dull red; ♀ piceous. Upper surface with scarcely traceable hairs; under surface with more distinct hairs which are of a yellowish colour.

Head densely punctate; ocular fovea not traceable; eyes semicircular, rather coarsely faceted, separated by width of rostrum. Rostrum long, thin, parallel, strongly curved; densely punctate, punctures suboblong and giving it a feebly (but falsely) carinate appearance; a scarcely traceable lateral groove commencing at eye and terminating at antennal insertion. Antennæ inserted about one-fourth from apex of rostrum; about half of scape passing apex; funicle with 1st joint as long as 2nd-3rd combined, 2nd slightly longer than 3rd, 3rd-7th subequal in length but increasing in width; club subsolid, rather large, as long as three preceding joints combined. *Prothorax* large, transverse, sides rounded, posterior angles feebly acute; emargination feeble, lobes small, obtuse; densely punctate, punctures round, at apex smaller and somewhat confluent; a raised median line or feeble carina flat and highly polished. *Scutellum* small, granuliform, punctate *Elytra* cordate, distinctly wider than prothorax and not much more than twice its length, shoulders rounded; each with nine rows of rather large oblong punctures set in grooves, interstices flat, distinctly wider than punctures, becoming feebly triangularly raised on posterior declivity, each with a row of small punctures at the sides, more distinct near base, and in places and with certain lights appearing raised in the middle. *Pectoral canal* rather broad, moderately deep; separation of anterior coxæ sufficiently distinct, their sides hollowed out. *Mesosternal plate* depressed, densely punctate, not concave; apex wide, feebly emarginate, base straight, narrow, its width about equal to length, sides incurved. *Metasternum* densely punctate, sides raised, disc flattened and feebly depressed; episterna each with a continuous row of punctures. *Abdomen* densely punctate; 1st segment large, flattened on disc, 2nd distinctly larger than each of intermediates, the combined length of these slightly longer than apical, apical with a very feeble transverse impression close to apex. *Legs* moderately long, densely punctate; four anterior femora almost edentate, teeth of posterior very small; posterior almost extending to apex of abdomen; tibiæ curved at base, anterior very feebly bisinuate, all densely punctate but not grooved, a few punctures on the posterior pair confluent but not sufficiently so to cause grooves; claws small, moderately separated, in certain lights appearing as if soldered together at base. Length 3, rostrum 1; width $1\frac{3}{5}$ (vix) mm.

Hab.—W.A.: "King George's Sound" (Pascoe), Swan River (Lea).

A specimen, which I take to be the female, is slightly broader; rostrum shining and impunctate except at base, the insertion of antennæ about two-fifths from base and the median prothoracic line invisible from most directions, appearing little more than the sides of three pairs of punctures. Mr. Pascoe's diagnosis was probably drawn up from a female specimen.

Melanterius strabonus, n.sp.

Elliptic-ovate, shining, moderately convex. Blackish-piceous; elytra feebly tinged with red, legs and rostrum dark reddish-brown, claw-joint and antennæ dull red. With short, minute, whitish hairs or scales, confined on prothorax and undersurface to punctures, and on elytra to sides of interstices.

Head densely punctate; eyes subreniform, rather large, coarsely faceted, separation about half the width of rostrum. Rostrum long, slightly curved, thin, parallel-sided except for a very feeble incurvature between antennæ and apex; densely and somewhat irregularly punctate, punctures feebler towards apex; from some directions appearing feebly carinate; a feeble lateral groove not parallel with scrobe and continued from eye to apex. Antennæ inserted about three-sevenths from apex of rostrum; scape scarcely extending to apex; two basal joints of funicle moderately elongate, 3rd-4th subglobose, 5th-7th transverse; club ovate. *Prothorax* feebly transverse and (including the head) subcordate, base bisinuate, sides rounded; emargination feeble, lobes feeble; densely punctate, punctures at extreme apex smaller than elsewhere, without trace of median line. *Scutellum* small, round, densely punctate. *Elytra* not much wider than prothorax, elongate-cordate, shoulders oblique; each with nine rows of suboblong subcontiguous punctures set in grooves; interstices (except 1st and 2nd at their bases) distinctly raised and narrow, at base near suture as wide or nearly as wide as punctures, elsewhere much narrower; suture flat almost to apex, rather densely and irregularly punctate; interstices distinctly punctate at sides near base, near apex almost impunctate. *Pectoral canal* moderately wide, rather deep; separation of anterior coxæ distinct. *Mesosternal plate* joined to metasternum by a short, shining, depressed space, thence widened at almost right angles; the sides distinctly raised (leaving a hollow space) and directed obliquely inwards to apex; apex wide, emarginate. Disc of *metasternum* feebly depressed, densely punctate; episterna each with one row of small, shallow and rather distant punctures. *Abdomen* not very densely punctate, the punctures almost as large as those on metasternum; basal segment large, intercoxal process semicircular, raised and almost impunctate, a feeble projection in its middle; intermediates combined slightly longer than 2nd or apical, each with one distinct row of punctures in middle; apical with a feeble depression at apex. *Legs* moderately long; trochantins, especially the anterior, separated from coxæ by a rather distinct groove; femora coarsely punctate, teeth large, distinct, the anterior sharper and somewhat smaller than posterior, posterior scarcely extending to apical segment; tibiæ short, compressed, grooved; claw-joint feebly pubescent, claws small, moderately separated. Length $4\frac{1}{4}$, rostrum $1\frac{1}{3}$; width 2 mm.

Hab.—N.W. Australia: King's Sound (Macleay Museum), Upper Ord River (Mr. R. Helms), Wyndham (Mr. Inspector Stephens).

The scape in this species certainly does not pass the apex of rostrum, though from some directions it appears to; looked at from some directions it appears to be much shorter; actual measurements show that there is a difference of about half a millimètre. Though having nine specimens under examination, I can find no sexual differences in the rostrum and antennæ except that in the males the puncturation is somewhat coarser and with a tendency to run in rows. The mesosternal plate is most peculiar, and it has taken me some time to fully realise its structure; its shape as noted above is the best definition that I can give of it after numerous attempts

In one of my specimens the claws of two of the tarsi appear to be soldered together at their bases, but this is purely accidental. This apparent partial soldering of the claws I have noticed in a good many weevils (not alone in the *Cryptorhynchides*) and probably is done when the specimens are being mounted, when if the claws are feeble and loosely articulated (as is frequently the case) and happen to catch in the drying paper; they would probably be drawn together. Weak spirits (as is well known) frequently relax the joints (seldom rigid in weevils) and moreover frequently cause the protrusion of the pygidium. I have pointed this out because, though apparently not an important matter, it has probably caused (through the claws of only one tarsus having been examined) genera to be founded erroneously.

MELANTERIUS CINNAMOMEUS, Pasc.; *l.c.* No. 5395.

Elliptic-ovate, moderately shining and somewhat convex. Dull reddish-brown or dark castaneous; under somewhat darker than upper surface, antennæ slightly paler. With short, minute, yellowish scales, confined on prothorax and under surface to punctures and on elytra to sides of interstices.

Head with dense feeble punctures; ocular fovea represented by a feeble depression; eyes small, almost circular, not very coarsely faceted, distant. Rostrum long, thin, slightly curved, in ♀ parallel to apex, in ♂ slightly wider at apex than base; densely punctate in ♂, the punctures oblong and similar on apical two-thirds, in ♀ the punctures are sparser, feebler, and become much smaller towards apex; very feeble lateral grooves running parallel with scrobes and terminating at antennæ. Antennæ rather long; scape almost perfectly straight, slightly thickened at apex, inserted about one-fourth from apex of rostrum which it passes for about half its length; basal joint of funicle longer than 2nd, 4th-7th transverse; club ovate. *Prothorax* scarcely transverse, emargination feeble, lobes obtuse, sides rounded, base feebly bisinuate, posterior angles feebly acute; densely punctate, punctures frequently confluent; ♂ with a very feeble median line not traceable in ♀. *Scutellum* small, slightly longer than wide, rounded, punctate. *Elytra* not much wider than prothorax and about twice and one-half its length, sides subparallel to near apex; shoulders oblique, feebly produced on to prothorax; each with nine rows of oblong punctures set in grooves and somewhat obscured by scales; interstices raised, subcostiform, wider (taking their full width) than punctures, punctate near base and shoulders, very obsoletely granulate. *Pectoral canal* rather shallow; anterior coxæ scarcely visibly separated and feebly excavated at their tops. *Mesosternal plate* depressed, feebly concave, apex wide, emarginate, almost twice the width of base, sides incurved. *Metasternum* depressed at base and apex of disc, slightly convex transversely; densely punctate; episterna each with a row of feeble squamose punctures and a few extra ones at base. *Abdomen* densely punctate; basal segment large, intercoxal process wide, middle depressed, depression continued on to 2nd, causing a hollow very noticeable in ♂ but much less so in ♀; intermediates combined slightly longer than 2nd and noticeably longer than apical, apical segment with a distinct transverse depression at apex. *Legs* moderately long, densely punctate; femora acutely dentate, anterior teeth very small; posterior reaching middle of apical segment; punctures of tibiæ occasionally confluent but scarcely causing grooves; claw-joint long, shining, apex only pubescent, claws feeble, separated at an angle of about 25°. Length $4\frac{1}{2}$, rostrum $1\frac{2}{5}$; width $2\frac{1}{2}$ (vix) mm.

Hab.—W. A.: "Champion Bay" (Pascoe), Swan River, Donnybrook (Lea).

Very much the build of the preceding species, but of a paler colour, punctures and clothing different; but very different in pectoral canal, mesosternal plate and abdomen. In certain lights both sexes appear to have a feebly carinate rostrum.

MELANTERIUS ACACIÆ, n.sp.

Elliptic, feebly shining, moderately convex. Piceous-black, claw-joint and antennæ dull reddish-brown, ♀ occasionally entirely dark brown. Upper surface with short, yellowish, moderately distinct decumbent setæ; on prothorax slightly rising above punctures and on elytra bordering interstices; under surface with somewhat paler and stouter setæ, denser on ♀ than ♂.

Head densely and rather coarsely punctate; ocular fovea represented by a feeble depression; eyes small, subcircular, coarsely faceted, distant. Rostrum long, thin, feebly curved, feebly decreasing in width to base; densely punctate, punctures elongate and causing several feeble carinæ to appear in ♂; ♀ with a central carina continued on to head; very feeble lateral grooves running almost parallel with scrobes and terminating at antennæ. Scape inserted about one-fourth from apex in ♂, two-fifths in ♀, passing apex; basal joint of funicle longer than 2nd, 5th-7th transverse. *Prothorax* (if anything) slightly longer than wide, and (with the head) subtrigonal, base bisinuate; densely punctate, punctures frequently confluent and causing in a number of specimens the appearance of numerous short carinæ; a median line sometimes but not usually visible. *Scutellum* rounded, punctate. *Elytra* elongate, subcordate, shoulders somewhat oblique, feebly produced on to prothorax; each with nine rows of not very large subcontiguous punctures set in grooves and sometimes feebly separated by short transverse ridges or granules; interstices raised and carinate, near base almost flat, rather densely punctate and wider than rows of punctures, near apex slightly narrower than punctures. *Pectoral canal* rather shallow; anterior coxæ distinctly separated. *Mesosternal plate* depressed, punctate, base truncate, about two-thirds the width of apex, apex emarginate, its sides raised, sides incurved. *Metasternum* slightly depressed in middle, densely punctate, sides almost vertical; episterna with a narrow row of small punctures. *Abdomen* not very densely punctate, punctures deeper and sparser in ♂ than in ♀; basal segment large, in ♂ depressed in middle, in ♀ near intercoxal process, which is arcuate in both sexes; 2nd large, convex; intermediates with deep and very distinct sutures, their combined length slightly more than that of 2nd and much longer than apical, in ♂ with a transverse row of punctures, in ♀ punctures irregular; apical segment with a depression near apex, smaller and deeper in ♂ than in ♀. *Legs* rather long, densely punctate; femora sublinear, dentate, teeth rather acute; posterior in ♂ reaching, in ♀ not extending to apical segment; posterior tibiæ slightly grooved, the others not; claw-joint and claws as in preceding. Length $4\frac{1}{2}$, rostrum $1\frac{1}{3}$; width 2 mm.

Hab.—N.S.W.: Forest Reefs (Blackmore, Dumbrell and Lea)—S. Australia (Macleay Museum)—Victorian Alps and Tasmania (Rev. T. Blackburn).

This species is variable in size, some specimens being fully thrice as large as others; some large females are of a reddish-brown colour (immature?). Numerous specimens were obtained from a tree of *Acacia decurrens* growing in a deep gully. This species might almost have been regarded as a variety of the preceding had the pectoral canal and abdomen been similar in character.

MELANTERIUS MACULATUS, n.sp.

Elliptic, subopaque, convex. Piceous-brown; legs and rostrum dull brown, antennæ and claw-joint paler. Prothoracic punctures with yellowish setose scales, elytra with somewhat similar scales or setæ on interstices; under surface with sparser, longer and paler setose hair.

Head densely punctate, punctures confluent on vertex; ocular fovea represented by a very shallow depression; eyes rounded, distant. Rostrum long, curved, very feebly decreasing in width from apex to base; basal two thirds punctate in four or more rows, giving that part a feebly carinate appearance, apical third feebly punctate. Scape inserted about two-fifths from apex of rostrum, passing apex; 1st joint of funicle distinctly longer than 2nd, 2nd slightly longer than 3rd, 5th-7th transverse. *Prothorax* scarcely transverse, base bisinuate, sides feebly rounded; emargination and lobes obtuse; densely punctate, punctures sometimes confluent. *Scutellum* oblong, minutely punctate. *Elytra* distinctly wider than prothorax and about thrice its length; shoulders slightly oblique, basal two-thirds subparallel; each with nine rows of oblong subcontiguous punctures; interstices distinctly wider than punctures, near base and suture flattened, elsewhere raised in the middle, punctate, near base feebly transversely corrugate. *Pectoral canal* wide, rather shallow, anterior coxæ very feebly separated. *Mesosternal plate* slightly depressed, apex emarginate, sides incurved, base truncate. *Metasternum* flattened, sides subvertical; densely punctate; episterna each with a distinct row of punctures. *Abdomen* moderately densely punctate, basal segment as long as 2nd-3rd combined; 2nd as long as intermediates combined and slightly longer than apical; apical with a feeble depression near apex. *Legs* densely punctate; femora dentate, posterior almost extending to apex of abdomen; tibiæ densely punctate, feebly grooved, apices somewhat widened; claw-joints pubescent, claws feeble. Length 4 (vix), rostrum $1\frac{1}{8}$; width 2 (vix) mm.

Hab.—Victoria (Macleay Museum), Benalla (Mr. R. Helms) —N. Holland (Herr J. Faust).

In shape and size much the same as the two preceding, but may be readily distinguished by its maculate appearance, non-depressed basal segments of abdomen, elytral interstices, &c.

Melanterius interstitialis, n.sp.

Elliptic, moderately shining, convex. Piceous; legs and rostrum dark brown, antennæ dull red. Upper surface with scarcely traceable hairs, more distinct but very small on legs and under surface.

Head densely punctate, punctures almost obsolete near base; eyes large, rounded, coarsely faceted, rather distant. Rostrum long, distinctly curved, parallel; densely punctate and having a feeble multicarinate appearance. Scape inserted about one-third from apex of rostrum, passing apex, apex and base slightly thickened; 1st joint of funicle almost as long as 2nd-3rd combined, 3rd-5th feebly, 6th-7th widely transverse; club longer than three preceding joints. *Prothorax* slightly transverse, apex very feebly semicircularly produced, base almost truncate, sides rounded; emargination and lobes obtuse; densely punctate, punctures confluent only at apex. *Elytra* wider than prothorax and scarcely thrice its length, widest about basal third, thence feebly decreasing to apex; shoulders scarcely rounded or oblique; each with nine rows of elliptic subapproximate punctures; interstices densely punctate, distinctly wider than rows of punctures, flattened, becoming raised in middle of posterior declivity and towards sides. *Pectoral canal* rather shallow, moderately wide, anterior coxæ distinctly separated. *Mesosternal plate* transversely depressed, punctate, apex emarginate, sides incurved, base truncate. *Metasternum* feebly depressed on disc, densely punctate; episterna with a distinct row of punctures. *Abdomen* not very densely punctate; 1st segment large, largely depressed on disc, slightly longer than 2nd and 3rd combined; intermediates with deep sutures; their combined length slightly more than that of apical; apical slightly longer than 2nd, its apex with a moderately distinct transverse impression. *Legs* rather long, densely punctate; femora dentate, posterior almost reaching apex of abdomen; tibiæ thin, somewhat rounded, not grooved. Length 3, rostrum 1; width $1\frac{1}{4}$ mm.

Hab.—N.S.W.: Sydney.

My specimen is probably ♂; it has the rostrum slightly broader than is usual, with the insertion of scape slightly more distant from the base, and the tibiæ less compressed than is usual. The puncturation of the elytral interstices is more pronounced than in any of the preceding species.

Melanterius parvidens, n.sp.

Elliptic, moderately shining, somewhat convex. ♂. Piceous, feebly tinged with red; legs and rostrum paler; ♀ almost black. Hairs or setæ on upper surface traceable only with extreme difficulty under a Coddington lens; more distinct and of a whitish colour on the under surface and legs.

Head densely punctate; eyes rounded, coarsely faceted, rather distant. Rostrum long, thin, parallel, moderately curved: ♂ with five narrow carinæ continuous from base to antennæ with rows of punctures between; ♀ without carinæ except at extreme base, shining and almost impunctate. Scape in ♂ inserted one-fourth from apex of rostrum and passing apex, in ♀ inserted very slightly in advance of the middle and scarcely reaching apex; two basal joints of funicle subelongate, 5th-7th transverse. *Prothorax* very feebly transverse; emargination semicircular, ocular lobes rounded but rather prominent; apex narrowed, sides somewhat rounded, base scarcely bisinuate; densely punctate, punctures frequently confluent; median line unmarked. *Scutellum* suboblong, punctate. *Elytra* distinctly wider than prothorax and almost four times its length, shoulders oblique, very feebly impinging on prothorax; widest slightly before middle; each with nine rows of elongate, subapproximate punctures set in grooves; interstices finely punctate, raised, and even at base narrower than rows of punctures. *Pectoral canal* rather narrow and shallow; anterior coxæ feebly separated. *Mesosternal plate* depressed, punctate, anterior angles distinctly raised, apex emarginate, sides incurved, base truncate. *Metasternum* feebly depressed, densely punctate, sides precipitous, with large rpunctures than disc; episterna each with a distinct row of punctures, those at base being slightly larger than those at apex. *Abdomen* rather densely punctate; basal segment large, in ♂ slightly concave in middle, in ♀ slightly convex; 2nd equal in size to apical and slightly shorter than intermediates combined, these densely punctate, punctures irregular. *Legs* densely punctate; femora slightly thickened, teeth not very large, subequal in ♂, in ♀ anterior teeth very small, posterior rather acute; posterior not extending to apex of 4th abdominal segment; tibiæ compressed, not grooved, anterior stouter in ♂ than in ♀; claw-joint rather long, scarcely pubescent, claws feeble and feebly separated, appearing soldered at their bases. Length $3\frac{2}{5}$, rostrum 1; width $1\frac{1}{5}$ mm.

Hab.—Q.: Port Curtis (Mr. G. Masters).

This can scarcely be Pascoe's *Mechius anaglyptus*, for besides being smaller than the size given (even if the rostrum be included) it is not briefly ovate; the tibiæ are not uniseriately punctate, and only the ♀ is black; the 2nd joint of the funicle is slightly shorter than the 1st, though from same directions it appears to be longer.

MELANTERIUS ANTENNALIS, n.sp.

♂. Elliptic, somewhat shining, convex. Black, two apical joints of tarsi and antennæ dull reddish-brown. Upper surface with minute, slightly visible whitish hairs; under surface with the hairs somewhat more distinct.

Head densely and very shallowly punctate; eyes semicircular, not very coarsely faceted. Rostrum moderately long, comparatively wide, curved, basal third rounded, then widened and vertically compressed; densely longitudinally punctate, punctures coarser at base than elsewhere; a feeble carina or impunctate line (invisible from some directions) in middle. Antennæ rather thick, short; scape inserted close to apex of rostrum and considerably passing apex; 1st joint of funicle equilaterally triangular, 2nd-3rd subglobular, 4th-7th transverse; club ovate, the length of four preceding joints. *Prothorax* slightly longer than wide, base very feebly bisinuate, basal half almost parallel; without median line; densely punctate, punctures subconfluent in places; emargination very feeble; ocular lobes not at all prominent. *Scutellum* small, subgranuliform. *Elytra* slightly wider than prothorax and not thrice its length; shoulders feebly rounded and oblique, feebly impinging on prothorax; each elytron with nine rows of subapproximate punctures set in narrow grooves, interstices appearing narrower than punctures owing to being raised and costiform in middle, but in reality wider, 6th and 7th joined at base and forming shoulder, 7th not continued to base. *Pectoral canal* rather wide and shallow; anterior coxæ feebly separated but largely excavated to receive rostrum. *Mesosternal plate* depressed, transversely impressed, punctate, anterior angles oblique, apex scarcely emarginate, sides incurved, base truncate. *Metasternum* densely punctate, disc feebly depressed; episterna with almost invisible punctures. *Abdomen* densely punctate; basal segment large, disc somewhat concave, intercoxal process semicircular; intermediates combined slightly longer than 2nd or apical, their sutures wide and very distinct, with very minute and sparse punctures, from some directions appearing to form a single row on each; apical with a circular depression. *Legs* densely punctate; femora thick, teeth in all (especially anterior) obtuse and rather small; posterior extending to apical segment of abdomen; tibiæ moderately stout, somewhat compressed, not grooved, feebly bisinuate beneath; claw-joint long, claws very feeble. Length $2\frac{3}{4}$, rostrum $\frac{2}{3}$; width $1\frac{1}{4}$ mm.

Hab.—N.S.W.: Gosford.

In this species the rostrum is broader and the antennæ stouter than in any other known to me. When viewed from the side the base of the rostrum appears as if granulate, as also do certain parts of the legs. The antennæ appear from some directions almost as if placed at the apex, but this appearance is caused by the curvature of that part of the rostrum.

Melanterius adipatus, n.sp.

Ovate, shining, subconvex. Black; legs and rostrum dull reddish-brown, antennæ dull red. Prothorax with very minute hairs, elytra certainly glabrous; legs and under surface with sufficiently distinct whitish hairs.

Head feebly punctate, punctures moderately distinct behind eyes; ocular fovea appearing as a shallow subtriangular impression; eyes elliptic, coarsely faceted, subapproximate. Rostrum long, thin, shining, curved, parallel; with several irregular rows of feeble punctures; a feeble scarcely traceable median carina or flattened impunctate space. Antennæ slender; scape inserted about one-third from apex of rostrum which it considerably passes; two basal joints of funicle equal in length, but the 2nd from most directions appearing the longer, 4th-7th transverse; club small. *Prothorax* feebly transverse; ocular lobes very feeble; basal two-thirds subparallel, posterior angles almost right angles, base feebly bisinuate; a moderately distinct median line interrupted at base; densely punctate, punctures sometimes confluent. *Scutellum* very small, shining, granuliform. *Elytra* cordate, wider than prothorax and about twice and one-half its length; shoulders rounded, scarcely impinging on prothorax; each with nine rows of rather large, elliptic, subcontiguous punctures, set in grooves on posterior declivity and sides only; interstices sparsely and minutely punctate, near base scarcely raised and slightly if at all wider than punctures, on declivity feebly triangularly raised and noticeably wider than punctures. *Pectoral canal* shallow, moderately wide; anterior coxæ feebly separated. *Mesosternal plate* distinctly transverse, depressed, sides suboblique, base and apex very feebly arcuate. *Metasternum* densely and irregularly punctate, episterna each with a row of punctures in a narrow groove. Basal segment of *abdomen* large; disc somewhat concave, with large irregular punctures; 2nd about the length of apical, with coarse punctures in about three rows; intermediates with deep and distinct sutures, almost impunctate, their combined length more than that of 2nd; apical transversely impressed, with two round punctures on each side and a row of about six across middle. *Legs* moderately long, densely punctate; femora sublinear, posterior almost extending to apex of abdomen, all with small and rather sharp teeth; tibiæ thin, feebly grooved, very feebly bisinuate beneath; claw-joint long, claws very feeble. Length 3, rostrum $1\frac{1}{6}$; width $1\frac{3}{4}$ mm.

Hab.—N.S.W.: Sydney.

The elytra of this species have a peculiar almost greasy appearance, and the punctures appear proportionately larger than in many others having them of equal size or even larger; owing to heir whole extent being readily seen the puncturation of the abdomen is a very distinctive character.

Melanterius castaneus, n.sp.

♂. Elliptic-ovate, shining, convex. Castaneous; under surface slightly darker than upper. Punctures with scarcely visible whitish hairs.

Head sparsely and feebly punctate; eyes subreniform, coarsely faceted, separation less than width of rostrum. Rostrum moderately long, curved, subparallel to antennæ, thence slightly narrowing to apex; densely and shallowly punctate; with a feeble median carina. Scape inserted about one-fourth from apex of rostrum, which it passes for about half its length; basal joint of funicle obtriangular, longer than 2nd, 5th-7th transverse, the length of club. *Prothorax* about as long as wide, emargination and ocular lobes feeble; densely punctate, punctures sometimes confluent and with a slight trend outwards. *Scutellum* small, punctate. *Elytra* cordate, wider than prothorax and scarcely twice its length, shoulders rounded; each with ten rows of small punctures set in narrow grooves; interstices wide, flat, densely punctate, distinctly wider than grooves. *Pectoral canal* wide, shallow; anterior coxæ rounded, feebly separated. *Mesosternal plate* feebly depressed, rather coarsely punctate, base and apex almost truncate, sides oblique, anterior angles raised. *Metasternum* densely punctate; episterna each with a row of narrow punctures. *Abdomen* not very densely and rather regularly punctate; basal segment very large, feebly longitudinally depressed; 2nd slightly shorter than intermediates combined, these minutely punctate. *Legs* moderately long, densely punctate; femora with very small teeth, posterior reaching apical segment; tibiæ thin, grooved, not bisinuate beneath; claw-joint long, claws very feeble, appearing soldered at their bases. Length $2\frac{2}{5}$ (vix), rostrum $\frac{3}{4}$; width $1\frac{2}{5}$ mm.

Hab.—W.A.: Pinjarrah.

A specimen, also from Pinjarrah, and which is probably ♀, has the rostrum much longer, thinner, more noticeably curved, parallel and noticeably punctate only at base, without median carina; the antennæ are longer and thinner and are inserted about one-third from apex; the basal segment of abdomen is without discal impression and the anterior femora are edentate, the teeth of the four posterior very small. A male recently captured at Donnybrook has the elytra of a dark piceous-brown colour.

This species agrees with Pascoe's diagnosis of *Teutheria*, but is certainly not his *T. insculpta*. I do not think the claws soldered at the base should be considered generically important, in this part of the subfamily at least, and I can find nothing else in Pascoe's diagnosis to warrant the separation of *T. insculpta* from *Melanterius*. In the species described above the femoral teeth are invisible when viewed from above, and in the supposed female are traceable with extreme difficulty only.

Melanterius tristis, n.sp.

♀ (?). Elliptic-ovate, shining, moderately convex. Dark castaneous; antennæ dull red. Prothoracic punctures with minute hairs, becoming very indistinct on elytra; under surface and legs with moderately distinct, short whitish hairs.

Head densely and somewhat obsoletely punctate; eyes subreniform, coarsely faceted, separated for the width of rostrum between antennæ; a transverse depression between eyes with very feeble ocular fovea. Rostrum long, thin, curved, feebly increasing to base; base densely punctate and obsoletely grooved, elsewhere feebly punctate. Antennæ inserted about two-fifths from apex of rostrum; scape passing apex; basal joint of funicle about one-third the length of scape and as long as 2nd-3rd combined, 3rd-5th globular, 6th-7th transverse; club briefly ovate. *Prothorax* feebly transverse, sides oblique; emargination feeble; ocular lobes almost absent; densely punctate, punctures round, nowhere confluent; without median line. *Scutellum* oblong, punctate. *Elytra* cordate, distinctly wider than prothorax and not thrice its length; shoulders rounded, feebly impinging on prothorax, each with ten rows of elliptic punctures set in grooves; interstices flattened, wider than rows of punctures near base, near apex raised, narrow and narrower than punctures; base densely punctate, regularly decreasing to apex. *Pectoral canal* moderately wide, very shallow, anterior coxæ feebly separated. *Mesosternal plate* distinctly transverse, depressed in middle, rather coarsely punctate, apex emarginate, base truncate, sides oblique, anterior angles scarcely visibly raised. *Metasternum* densely punctate, disc depressed; episterna rather densely punctate at base and apex, and with an almost regular row in middle. *Abdomen* regularly and not coarsely punctate; two basal segments large, 1st as long as 2nd-3rd combined; intermediates combined the length of 2nd and slightly longer than apical, their sutures very distinct; apical with a somewhat circular depression. *Legs* densely punctate; femora with rather strong teeth, posterior extending to apical segment of abdomen; tibiæ grooved, anterior feebly bisinuate beneath; claw-joint long, claws moderate, separated at an angle of about 30°. Length $3\frac{3}{4}$, rostrum $1\frac{1}{6}$; width 2 mm.

Hab.—N.S.W.: Como (Lea)—S.A.: Adelaide (Rev. T. Blackburn, No. 2115).

The basal joint of funicle is decidedly long; the mesosternal plate appears to be flattened, with a circular impression or almost a fovea in the middle towards apex; the femoral teeth are strong and almost equal; the puncturation of the metasternal epipleuræ appears to be a good specific character.

Melanterius floridus, Pasc.; *l.c.* No. 5396.

Elliptic-ovate, opaque, moderately convex. Piceous-black; legs scarcely so dark; tarsi, antennæ and middle of rostrum dull red. Clothed with ochreous setose scales, in places massed together, and forming three irregular longitudinal stripes on prothorax, and very feeble and irregular maculæ on elytra; under surface with similar but shorter and more evenly distributed scales.

Head densely punctate; eyes rather large, semicircular, coarsely faceted, separation about half the width of rostrum at base. Rostrum long, somewhat flattened, slightly curved, very feebly increasing in width to base and still less to apex, densely punctate; behind antennæ with five carinæ, of which the central one extends to position of ocular fovea and the others terminate before eyes. Scape inserted about three-sevenths from apex of rostrum and just passing apex; two basal joints of funicle elongate, 1st scarcely the length of 2nd-3rd combined, 7th transverse; club shorter than three preceding joints. *Prothorax* transverse, disc and sides rounded, apex slightly produced, base bisinuate; ocular lobes obtuse; densely punctate, punctures rounded, sometimes suboblong or elliptic, occasionally confluent. *Scutellum* subtriangular, punctate. *Elytra* distinctly wider than prothorax and not thrice its length, base feebly trisinuate; obsoletely granulate; shoulders rounded, not impinging on prothorax; each with ten rows of sub-elliptic punctures set in grooves and partially concealed by clothing; interstices wide, flat, near apex and sides becoming raised and narrower, the 3rd, 5th and 7th slightly raised above the others except near base, where all the interstices are wider than rows of punctures, all densely punctate *Pectoral canal* wide, shallow; anterior coxæ feebly separated. *Mesosternal plate* depressed, punctate, apex almost triangularly emarginate, anterior angles slightly raised, oblique, sides oblique, base very narrow. *Metasternum* densely punctate on disc (which is slightly depressed) and sparsely at sides; episterna each with a row of rounded punctures and a few others at base and apex. *Abdomen* rather coarsely and densely punctate, punctures partially concealed; apical segment with a shallow impression near apex. *Legs* densely punctate; anterior femora almost edentate, four posterior with equal and rather sharp teeth, posterior extending to apical segment of abdomen; tibiæ grooved on lower sides, except at base almost straight; claw-joint long. Length $4\frac{1}{2}$, rostrum $1\frac{3}{4}$; width $2\frac{1}{2}$ mm.

Hab.—South Australia (Pascoe, Macleay Museum)—N.S.W. (Macleay Museum), Whitton (Lea).

On close examination the punctures between the carinæ appear to be in two very irregular rows; the mesosternal receptacle is of a rather peculiar shape; the teeth of the anterior femora are almost invisible and are only traceable with great difficulty and from certain directions.

Melanterius aberrans, n.sp.

Elliptic, moderately convex, somewhat shining. Dark piceous-brown; rostrum, antennæ and tarsi brownish-red. Clothed with yellowish, stout, decumbent setæ, denser and more regular on legs and under surface than elsewhere, on the elytra forming feeble spots; head and basal fourth of rostrum clothed.

Head very small; densely punctate, punctures almost concealed; eyes almost round, separated for the width of rostrum at base. Rostrum very long, thin, moderately curved, near base and apex slightly but sensibly dilated in width; sparsely punctate, punctures of moderate size near base, rather smaller towards apex, nowhere in grooves. Antennæ thin; scape decidedly shorter than funicle, inserted nearer base than apex of rostrum; two basal joints of funicle elongate, 1st longer than 2nd; club small, elliptic. *Prothorax* almost as long as wide, apex half the width of base, base bisinuate, sides subparallel towards base; densely and strongly punctate, punctures scarcely confluent but somewhat obscured by clothing; without median line. *Scutellum* small and oblong. *Elytra* about once and one-half the width and thrice the length of prothorax, shoulders rounded, sides subparallel to apical fourth; seriate-punctate, punctures large, of irregular outline and feebly connected; 3rd, 5th and 7th interstices acutely ridged except on basal third. *Mesosternal plate* depressed, concave, anterior edges acutely raised. *Metasternum* depressed in middle, densely punctate; episterna each with a single row of punctures at base but becoming double at apex. *Abdomen* densely and regularly punctate; except that those of the three apical segments are somewhat smaller; intermediates combined slightly shorter than 2nd and slightly longer than 5th. *Legs* not very long; femora strongly grooved and feebly dentate; tibiæ densely and not seriately punctate. Length $5\frac{1}{2}$, rostrum $2\frac{1}{4}$; width $2\frac{1}{4}$ mm.

Hab.—Q.: Rockhampton (type in Macleay Museum).

An aberrant species as regards the insertion of scape, but in all other characters conformable to the genus.

MELANTERIUS VINOSUS, Pasc.; *l.c.* No. 5402.

Elliptic, convex, moderately shining. Reddish-brown; elytra, rostrum, antennæ and claw-joints paler. Head, base of rostrum, prothorax, under surface and legs rather sparsely clothed with stout yellowish setæ; elytra more densely clothed, the setæ almost squamose and condensed into very distinct spots.

Head densely punctate, but punctures rather small and shallow; a depression between eyes; eyes almost round, widely separated. Rostrum feebly curved, not cylindrical, feebly dilated at base and apex; rather densely punctate, punctures coarser at base than elsewhere, but scarcely confluent. Scape shorter than funicle, inserted about two-fifths from apex of rostrum. *Prothorax* convex, feebly transverse, sides gently rounded; apex about half the width of base, base bisinuate; densely and strongly punctate, punctures in places confluent; with a feeble median line. *Scutellum* rounded. *Elytra* about once and one-third the width, and more than twice the length of prothorax; shoulders oblique; seriate-punctate, punctures large, oblong, feebly connected; interstices (except the suture) ridged, the ridges of the 3rd and 5th rather more prominent than the others on the posterior declivity. *Mesosternal plate* strongly transverse, depressed and feebly concave. *Metasternum* and *abdomen* rather sparsely and irregularly punctate, punctures rather small, on episterna (except at apex) and on intermediate segments, in single rows; the latter combined longer than 2nd or 5th. *Legs* moderately long; femora feebly grooved, moderately strongly dentate; tibiæ compressed, curved at base, posterior seriately punctate. Length $5\frac{3}{4}$, rostrum 2; width $2\frac{3}{4}$ mm.

Hab.—"S Australia" (Pascoe), "Mount Squires" (Rev. T. Blackburn).

Mr. George Masters has kindly lent me a specimen (probably ♀) for description.

MELANTERIUS SOLITUS, n.sp.

♂. Elliptic, convex, moderately shining. Piceous; legs piceous-brown, antennæ dull red. Sparsely clothed with short whitish setæ, which are stout and very indistinct on prothorax.

Head densely and rather strongly punctate, depressed between eyes; eyes subreniform, widely separated. Rostrum (for the genus) comparatively stout, feebly curved; parallel-sided to between antennæ, then dilated and parallel to near apex; coarsely punctate, punctures confluent and leaving several feeble ridges, of which only the median one is at all distinct. Scape inserted one-fourth from apex of rostrum, longer than funicle but shorter than funicle and club combined. *Prothorax* feebly transverse, apex more than half the width of base, base bisinuate; densely punctate, punctures shallow and not very large; with a distinct median line. *Scutellum* small, suboblong. *Elytra* elongate-subcordate, not much wider than and not thrice the length of prothorax, shoulders oblique; seriate-punctate, punctures moderately large, elongate-oblong, feebly connected; interstices (except near base) acutely ridged. *Under surface* somewhat sparsely and irregularly punctate, metasternal episterna and intermediate segments of abdomen each with a single row; combined length of the latter slightly more than that of 2nd or 6th. *Femora* shallowly grooved, all strongly and acutely dentate, but the anterior less noticeably so; tibiæ thin, bisinuate beneath, seriately punctate. Length $4\frac{1}{2}$, rostrum $1\frac{1}{2}$ (vix); width $2\frac{1}{3}$ mm.

Hab.—S.A.: Yorke's Peninsula (Rev. T. Blackburn, No. 474).

Melanterius impolitus, n.sp.

Elliptic, convex, subopaque. Reddish-castaneous; extreme apex of rostrum infuscate. Rather sparsely clothed with stout, elongate, yellowish setæ.

Head rather large, flat between eyes; eyes briefly ovate, widely separated. Rostrum the length of prothorax, scarcely visibly diminishing in width to apex, almost flat, feebly curved; moderately punctate, punctures more or less confluent but leaving no distinct ridges. Scape thin, inserted two-fifths from apex of rostrum, the length of funicle; club rather large. *Prothorax* decidedly transverse; apex about one-third less than width of base, base feebly bisinuate; densely punctate, punctures rather small and shallow; without median line. *Scutellum* small and subglobose. *Elytra* once and one-fourth wider, and twice and one-half longer than prothorax, shoulders rounded; seriate-punctate, punctures comparatively small and subquadrate; interstices flat, wider than punctures, nowhere ridged. *Under surface* with small and irregular punctures; intermediate segments of abdomen irregularly punctate, their combined length slightly more than that of 2nd or 5th. *Femora* rather stout, shallowly grooved, strongly dentate; tibiæ curved at base, not seriately punctate. Length $3\frac{3}{4}$, rostrum $1\frac{1}{6}$; width $1\frac{4}{5}$ mm.

Hab.—New South Wales (Macleay Museum).

The specimen described is probably ♀.

MELANTERIUS TENUIS, n.sp.

Elongate-elliptic; moderately convex, somewhat shining. Reddish-brown; rostrum, antennæ, and legs somewhat paler. Rather sparsely clothed with pale yellowish setæ.

Head with rather small and dense punctures; depressed between eyes; eyes rather large, subreniform, separation slightly less than width of rostrum at base. Rostrum rather long and thin, moderately curved; towards apex rather sparsely punctate, behind antennæ with punctures in rather feeble grooves. Scape thin, inserted slightly nearer apex than base of rostrum, slightly shorter than funicle; 1st joint of funicle as long as two following combined. *Prothorax* transverse, comparatively small; base bisinuate and not much wider than apex; with moderately dense and rather small punctures; without median line. *Scutellum* subglobose. *Elytra* elongate-subcordate, about once and one-third wider than and fully thrice the length of prothorax; seriate-punctate, punctures rather small and obscure; interstices rounded, much wider than punctures, towards apex apparently feebly ridged. *Under surface* sparsely and rather finely punctate; intermediate segments of abdomen combined slightly longer than 2nd or 5th. *Legs* long; femora sublinear, very feebly (especially the anterior) dentate; tibiæ curved, somewhat rounded, dilated towards apex. Length $3\frac{1}{2}$ (vix), rostrum 1; width $1\frac{1}{2}$ mm.

Hab.—N.W. Australia (type in Macleay Museum).

Melanterius cordipennis, n.sp.

♂. Elliptic, convex, polished. Reddish-castaneous, head, rostrum and legs darker than prothorax and elytra. Upper surface with almost microscopic setæ; under surface and legs sparsely clothed with whitish setæ.

Head densely punctate, punctures small and shallow; not depressed between eyes; eyes very large, subreniform, almost touching above. Rostrum moderately long, comparatively stout, curved, feebly dilated between antennæ; rather coarsely punctate, punctures strongly confluent and leaving five feeble ridges exposed behind the antennæ. Scape rather stout, inserted two-fifths from apex of rostrum, decidedly shorter than funicle. *Prothorax* feebly transverse, apex about two-thirds the width of base; base bisinuate; densely punctate, punctures of moderate size but very sharply defined and nowhere confluent. *Scutellum* suboblong. *Elytra* cordate, once and one-third as wide and twice as long as prothorax, shoulders rounded; seriate-punctate, punctures rather large, suboblong, open at both ends; interstices triangularly raised except at base. *Metasternum* and two basal segments of *abdomen* with large punctures; intermediates each with a feeble row of punctures, their combined length slightly more than that of 2nd or 5th. *Femora* stout, acutely dentate; tibiæ seriately punctate. Length $3\frac{3}{4}$, rostrum $1\frac{1}{6}$; width $1\frac{3}{4}$ mm.

Hab.—Q.: Endeavour River (Macleay Museum).

A very distinct species. The elytral punctures are large, but being shelving at both ends appear to be smaller than they actually are; the clothing of the upper surface is so minute that it is only traceable with difficulty.

Melanterius unidentatus, n.sp.

♂ (?). Ovate, somewhat depressed, shining. Black; antennæ dull red. Prothoracic punctures each with a very small and scarcely traceable seta; elytra scarcely visibly clothed. Under surface and legs with moderately elongate whitish setæ.

Head with dense but small and shallow punctures; eyes large, subreniform, separated for almost the entire width of rostrum at base.

Rostrum long, thin, cylindrical, feebly curved, very feebly dilated between antennæ; basal portion rather coarsely punctate, the punctures in grooves. Scape inserted two-fifths from apex of rostrum, shorter than funicle; club elliptic-ovate and rather small. *Prothorax* feebly transverse, apex half the width of base, base bisinuate, sides rounded; densely and moderately strongly punctate, punctures sharply defined; without median line. *Scutellum* somewhat rounded. *Elytra* cordate, shoulders rounded, sides decreasing in width from near base; seriate-punctate, punctures large, subquadrate, in shallow grooves; interstices much narrower than punctures, all acutely ridged, but those nearest the suture less noticeably so. *Metasternum* and two basal segments of *abdomen* with rather large punctures; episterna and intermediate segments each with a single somewhat irregular row of small punctures; combined length of the latter slightly more than that of 2nd or 5th. *Legs* rather long; femora not very thin, not grooved, posterior strongly, intermediate moderately, anterior feebly dentate; tibiæ feebly curved, anterior feebly bisinuate beneath, with punctures in grooves, those of the posterior being very distinct. Length 6, rostrum $1\frac{2}{3}$; width 3 mm.

Hab.—N.S.W.: Galston (Mr. Walter Dumbrell).

Somewhat after the size and build of *bidentatus*; the elytral interstices when viewed from the sides appear to be seriate-punctate.

MELANTERIUS VULGIVAGUS, n.sp.

Elliptic-ovate, somewhat depressed, shining. Black; antennæ and tarsi dull red. Upper surface scarcely visibly clothed; under surface and legs with stout whitish setæ.

Head with small and shallow punctures; eyes subreniform, in ♀ separation slightly less than width of rostrum at base, in ♂ considerably less. Rostrum slightly longer than prothorax, curved, slightly dilated between antennæ; punctures in grooves causing (in the ♂ only) five rather acute ridges. Scape moderately stout, in ♂ inserted two-fifths from apex of rostrum, slightly more in ♀, shorter than funicle; club rather large. *Prothorax* moderately transverse, base bisinuate and almost twice the width of apex, sides rounded; densely punctate, punctures of moderate size and sharply defined; without median line. *Scutellum* subglobose. *Elytra* subovate, more than twice the length of prothorax, and across shoulders but little wider; seriate-punctate, punctures moderately large, subquadrate, in shallow grooves; interstices acutely ridged except basal half of suture and 2nd, basal third of 3rd and bases of the others. *Metasternum* and two basal segments of *abdomen* with sparse and moderately large shallow punctures, episterna each with a single row; intermediates sparsely and irregularly punctate, their combined length slightly more than that of 2nd or 5th; 5th densely punctate. *Femora* stout, moderately grooved beneath, acutely dentate; the posterior strongly, the others rather feebly; tibiæ curved, subseriately punctate. Length $3\frac{1}{2}$, rostrum 1; width $1\frac{3}{4}$ mm.

Hab.—Q.: Gayndah (Sydney Museum), Port Denison, Endeavour River (Macleay Museum).

MELANTERIUS PECTORALIS, n.sp.

Elliptic-ovate, somewhat depressed, shining. Black or piceous-black; antennæ, tibiæ and tarsi dusky red. Punctures of head and prothorax each with a very small and scarcely traceable seta; elytra glabrous. Under surface and legs with stout whitish setæ, which on the metasternum are formed into a pad on each side between the coxæ.

Head densely punctate, punctures rather small and shallow; eyes ovate, separation slightly less than width of rostrum at base. Rostrum moderately long, curved throughout, shining; feebly punctate, in ♂ the punctures feebly seriate at sides of base, ♀ almost impunctate. Scape thin, curved, inserted two-fifths from apex of rostrum; the length of funicle; three basal joints of funicle elongate. *Prothorax* moderately transverse, base bisinuate and fully twice the width of apex, sides rounded; densely punctate, punctures comparatively small; without median line. *Scutellum* subglobose. *Elytra* subcordate, shoulders rounded; seriate-punctate, punctures suboblong, of moderate size; interstices flat, much wider than punctures, and punctured on basal half, triangularly raised on apical half. *Mesosternal plate* strongly transverse, depressed, concave and punctate. *Metasternum* depressed and impunctate in middle, raised between coxæ, sides strongly punctate; episterna each with a single row of punctures. Two basal segments of *abdomen* irregularly and not densely punctate; intermediates sparsely and finely, their combined length slightly more than that of 2nd or 5th; 5th densely punctate. *Femora* stout, feebly grooved, strongly dentate; tibiæ thin, compressed, bisinuate, punctures in decided grooves. Length $4\frac{1}{6}$, rostrum $1\frac{2}{3}$; width $2\frac{1}{3}$; variation in length $3\frac{1}{3}$-$4\frac{1}{2}$ mm.

Hab.—S. Australia (Macleay Museum).

The pads on the metasternum should render this species easy of recognition; they are not confined to (although more distinct on) the males.

MELANTERIUS ARATUS, Pasc.; *l.c.* No. 5393.

Ovate, moderately convex, shining. Black; antennæ red. Prothorax with a spot of silvery scales in the middle of the base; elytra with a few smaller spots of similar scales scattered about. Under surface and legs moderately densely clothed with stout white setæ; the 2nd-4th abdominal segments almost glabrous.

Head densely punctate, punctures small and shallow; eyes large, subreniform, feebly separated. Rostrum moderately stout, parallel-sided, curved; rather densely punctate. Scape stout, inserted two-fifths from apex of rostrum, noticeably shorter than funicle; club subcontinuous with funicle. *Prothorax* transverse, base bisinuate and not twice the width of apex; with dense, comparatively small and sharply defined punctures. *Scutellum* globose. *Elytra* triangularly cordate, not much more than twice the length of prothorax; seriate-punctate, punctures large and suboblong, in shallow grooves; interstices triangularly raised, towards base and suture more obtusely so than elsewhere. *Metasternum* decidedly shorter than usual, with sparse large punctures; episterna with a scarcely traceable row of very small punctures. Basal segment of *abdomen* almost as long as the three following combined and with a few large punctures, 2nd-4th with fine punctures, the 2nd but very slightly, if at all, longer than either the 3rd or 4th, 5th densely punctate. *Legs* moderately long; femora stout, feebly grooved, posterior moderately strongly dentate, the others feebly so; tibiæ somewhat rounded, bisinuate beneath, curved at base, punctures confluent in all. Length $3\frac{3}{4}$; rostrum 1; width 2 mm.

Hab.—N.Q.: "Somerset" (Pascoe), Cairns (Macleay Museum).

The clothing and shape, and the sizes of the abdominal segments render this species very distinct.

MELANTERIUS COMPACTUS, n.sp.

Ovate, somewhat depressed, shining. Piceous or piceous-brown; head, rostrum, and prothorax slightly darker than elsewhere. Upper surface scarcely visibly clothed, under surface and legs with whitish setæ.

Head with dense and moderately large punctures; eyes subreniform, separation slightly less than width of rostrum at base. Rostrum moderately long and stout, feebly curved; densely punctate, punctures more or less confluent and causing (towards the base) several feeble and irregular ridges to appear. Scape moderately stout, inserted one-third from apex of rostrum, the length of funicle. *Prothorax* comparatively large, feebly transverse base very feebly bisinuate and not twice the width of apex; densely punctate, punctures rather small and feebly obliquely confluent. *Scutellum* round. *Elytra* briefly cordate, not twice the length of and considerably wider than prothorax; seriate-punctate, punctures moderately large, subquadrate, in shallow grooves; interstices wider than punctures, flat, themselves punctate, nowhere ridged. *Mesosternal plate* densely punctate. *Metasternum* and two basal segments of *abdomen* with not very large or dense punctures; episterna each with a row of very small punctures; intermediates feebly punctate, their combined length equal to that of 2nd or 5th, 5th densely punctate. *Femora* long, grooved, strongly dentate, posterior extending to apex of abdomen; tibiæ strongly curved at base, straight elsewhere, punctures partially confluent. Length $3\frac{3}{4}$, rostrum $1\frac{1}{6}$; width $2\frac{1}{6}$ mm.

Hab.—W.A.: Swan River.

The sexual differences are very slight (I have a pair which were taken *in cop.*); the ♂ has the rostrum slightly thinner, longer, and more coarsely punctate and the posterior tibiæ ciliate towards apex; the insertion of the scape is the same in both sexes. The extension of the femora to the apex of the abdomen is an unusual feature.

MELANTERIUS INCOMPTUS, n.sp.

Ovate, moderately convex, shining. Black; antennæ, tibiæ, and tarsi somewhat red. Upper surface very indistinctly clothed, the under surface and legs with whitish setæ.

Head densely punctate, punctures rather small and shallow; eyes subreniform, separated for the width of rostrum at base. Rostrum moderately long and slender, distinctly curved; rather strongly punctate towards base, but punctures scarcely confluent. Scape thin, inserted one-third from apex of rostrum, the length of funicle. *Prothorax* feebly transverse, base very feebly bisinuate and twice the width of apex, sides rounded. *Scutellum* suboblong. *Elytra* briefly subcordate, twice the length of and at base but little wider than prothorax; seriate-punctate, punctures moderately large, in shallow grooves; interstices towards base and suture flat and punctate, elsewhere triangularly ridged. *Metasternum* shorter than usual and rather coarsely punctate, intermediates finely; combined length of the latter equal to that of 2nd or 5th. *Femora* feebly grooved beneath and rather feebly (except the posterior) dentate; tibiæ comparatively stout, almost straight, punctures scarcely confluent. Length $2\frac{2}{3}$, rostrum 1 (vix); width $1\frac{1}{7}$ mm.

Hab.—Australia (Sydney Museum).

The following species would appear on first sight as if generically distinct, but I am convinced that they should go in with *Melanterius*, or that at the most they are only entitled to subgeneric rank; they differ principally in the square shoulders, denser clothing, outwardly curved tibiæ (denoting an approach to *Psepholax*?) and longer rostrum. Two of them, *M. congruus* and *M. ampli-*

pennis, have the metasternal episterna densely punctate. *M. congruus* has the anterior coxæ almost globular and the claw-joints short. They should, perhaps, stand at the head rather than at the end of the table.

Melanterius congruus, n.sp.

Elliptic-ovate, opaque, somewhat convex. Uniformly dull-red. Densely and uniformly clothed with pale brownish-grey setose scales closely adpressed to derm, on disc of prothorax directed forwards and on the sides directed towards disc. Scutellum naked; elytra with rows of punctures showing through clothing and with several very feeble, irregular, paler bands of scales. Under surface, legs, and head with similar but somewhat smaller scales than those on elytra.

Head densely punctate; ocular fovea small, rounded; eyes round, rather large, moderately faceted, somewhat prominent, separated for the width of rostrum. Rostrum long, thin, curved, feebly carinate; densely punctate, punctures smaller on apical than basal half, on the latter portion also they are partially concealed by scales. Antennæ slender; scape inserted about two-fifths from apex of rostrum, which it considerably passes; basal joint of funicle obtriangular, slightly shorter than 2nd, 7th feebly transverse; club ovate. *Prothorax* very feebly transverse; ocular lobes almost obsolete; apex about half the width of base, base bisinuate; densely punctate, punctures partially concealed; no median line. *Scutellum* raised, slightly longer than wide, punctate, almost glabrous. *Elytra* distinctly wider than prothorax and not much more than twice its length, shoulders squared; each elytron with ten rows of small punctures, the rows sufficiently distinct but the punctures partially concealed by scales; interstices flat or slightly rounded, much wider than punctures, nowhere costiform. *Pectoral canal* wide; anterior coxæ globular, scarcely, if at all, separated. *Mesosternal plate* almost flat, semicircular, apex scarcely emarginate, sides rounded. *Metasternum* (including episterna) densely and regularly punctate, punctures squamose; disc depressed. *Abdomen* densely and regularly punctate;

basal segment large, intercoxal process depressed; intermediates combined about equal to 2nd and decidedly shorter than apical; apical convex, a very feeble impression near apex. *Legs* rather slender, densely punctate; femora feebly dentate; posterior just extending to apical segment of abdomen; tibiæ feebly outwardly curved; claws very feeble. Length $3\frac{1}{2}$, rostrum $1\frac{1}{6}$; width 2 (vix) mm.

Hab.—N.S.W.: Sydney.

A peculiar species, having narrow rows of punctures, semicircular mesosternal plate and large apical segment of abdomen; the eyes are almost perfectly circular and, compared with others of the genus, finely faceted; the long 2nd joint of funicle is perhaps worthy of note.

MELANTERIUS AMPLIPENNIS, n.sp.

Ovate, opaque, moderately convex. Brownish-red; rostrum slightly darker at apex than base. Rather densely clothed with ochreous setose scales, slightly paler on prothorax than on elytra, on the prothorax there is a spot of paler scales in the middle of the base and the lateral scales are longer than those on disc; scutellum nude; elytra with rows of punctures clearly visible. Under surface, legs, and head with paler, shorter, and more regular scales than on upper surface; the three apical segments of abdomen with denser and longer scales: a few scales in the pectoral canal.

Head with a shallow depression between eyes, these separated for the width of rostrum and almost exactly the same as in the preceding. Rostrum long, thin, shining, curved; rather finely punctate except at extreme base; not carinate; a very feeble groove running above and parallel with scrobe. Antennæ slender; scape inserted about two-fifths from apex of rostrum, which it considerably passes; two basal joints of funicle elongate, 1st as long as 2nd-3rd combined, 3rd-6th feebly, 7th somewhat more noticeably transverse; club elongate, almost the length of four preceding joints. *Prothorax* feebly transverse, not much narrower at apex than base, base distinctly bisinuate; ocular lobes absent;

densely punctate, punctures partially concealed; no median line. *Scutellum* granuliform, punctate. *Elytra* distinctly wider than prothorax, base trisinuate, shoulders squared; each with ten rows of punctures; interstices rounded, slightly wider than punctures. *Pectoral canal* wide, between anterior coxæ a triangular excavation, their bases feebly separated. *Mesosternal plate* flattened, punctate and squamose, apex emarginate, sides rounded, base almost truncate. *Metasternum* densely punctate, disc very feebly convex; episterna each with about two rows of punctures, each containing a comparatively large scale. *Abdomen* rather densely and regularly punctate and squamose; two basal segments large, slightly convex, 1st not much larger than 2nd; intermediates large, their combined length slightly more than that of 2nd and distinctly more than that of apical. *Legs* rather long; femora distinctly dentate, teeth sharp and almost equal; tibiæ curved outwardly, scarcely grooved, intermediates strongly arcuate at base; claw-joint comparatively short, claws very feeble. Length 4, rostrum $1\frac{3}{5}$; width $2\frac{1}{5}$ mm.

Hab.—N.S.W. : Sydney.

A specimen differs from the type in being larger, in having the punctures smaller, the anterior femoral teeth more obtuse, and the clothing much less regular and sparser (especially on the under surface); it is perhaps a female, but I cannot detect any distinctly masculine features in the type.

Melanterius uniseriatus, n.sp.

Ovate, opaque, feebly convex. Brownish-red. Moderately clothed with golden-yellow setose scales, sparse on prothorax except about middle and sides of disc, on the elytra arranged in very irregular spots and bands leaving partially bare spaces, punctures nearly always visible, scutellum nude. Sterna and legs with paler and shorter scales than above, two basal segments of abdomen with golden lanceolate scales set in punctures, the three apical segments with sparser and very short scales; pectoral canal nude; head with small scales.

Head with a feeble impression between eyes; eyes large, almost circular, moderately faceted, separation slightly less than width of rostrum. Rostrum long, thin, slightly curved, almost parallel: rather densely punctate, the punctures arranged in rows and causing five very feeble carinæ to appear on basal half. Antennæ slender, inserted about two-fifths from apex of rostrum, passing apex; funicle closely articulated, two basal joints moderately elongate, subequal: club not the length of three preceding joints. *Prothorax* subquadrate; ocular lobes obtuse; base bisinuate; densely and regularly punctate, punctures sometimes concealed by clothing; no median line. *Scutellum* small, punctate. *Elytra* cordate, distinctly wider than prothorax and not much more than twice its length; shoulders square; each with ten rows of oblong punctures set in shallow grooves and partially concealed by clothing; interstices rather wide, flattened or slightly rounded, 3rd and 5th feebly raised on posterior declivity. *Pectoral canal* rather wide, shallow at apex, deepening to middle; anterior coxæ rather distinctly separated. *Mesosternal plate* greatly depressed, concave, sides strongly incurved, base truncate, about half the width of apex. *Metasternum* not very densely punctate, transversely feebly convex; episterna each with a row of rather distant, squamose, rounded punctures. *Abdomen* smooth, convex, with rather sparse squamose punctures; basal segment as long as 2nd-3rd combined; intermediates combined as long as 2nd and noticeably longer than apical, each with a feeble row of punctures. *Legs* rather long; posterior femora strongly dentate, the anterior rather feebly so, posterior extending to apical segment of abdomen; tibiæ thin, very finely grooved, the four posterior feebly curved outwardly; claw-joint long, claws moderately separated. Length $3\frac{1}{4}$, rostrum $1\frac{1}{6}$; width $1\frac{2}{5}$ mm.

Hab.—New South Wales.

Resembles the preceding species to a certain extent, but besides colour and clothing differs in the largely sunk mesosternal plate and sparsely punctate abdomen, which has a softly polished appearance.

The following species are unknown to me:—

MELANTERIUS PICEIROSTRIS, Er.; *l.c.* No. 5398. *Hab.*—"Neuholland" (Erichson).

MELANTERIUS FUGITIVUS, Pasc.; *l.c.* No. 5397. *Hab.*—"Swan River" (Pascoe).

NEOMELANTERIUS, n.g.

Head small, not concealed; ocular fovea not traceable. Eyes rather large, reniform, moderately close above, almost touching below, coarsely faceted. *Rostrum* long and thin, feebly curved, continued beyond mesosternum. *Antennæ* slender; scape inserted much closer to apex than base of rostrum; two basal joints of funicle elongate; club small, ovate. *Prothorax* convex, transverse, sides rounded, apex feebly produced and about half the width of base, base bisinuate; constriction feeble; ocular lobes obtuse. *Scutellum* round. *Elytra* subcordate, feebly convex, considerably wider than and more than twice the length of prothorax, shoulders and apex rounded. *Pectoral canal* shallow, narrow in front of anterior coxæ, these feebly separated. *Mesosternal plate* slightly lower than coxæ, feebly transverse, not concave. *Metasternum* slightly shorter than basal segment of abdomen; episterna of moderate size. *Abdomen* moderately large, sutures distinct; 1st segment slightly longer than two following combined, truncate at apex, intercoxal process moderately rounded; intermediates moderately large, their combined length greater than that of 2nd or apical. *Legs* moderately long; femora stout, clavate, not grooved, strongly dentate, posterior terminated before apex of abdomen; tibiæ compressed, rather thin, almost straight, terminal hook moderately large; tarsi rather thin, 3rd joint almost as long as wide, deeply bilobed; claw-joint long, increasing in width to apex; claws small, widely separated. Subovate, feebly convex, punctate, winged.

The first species here described was sent to me by Mr. Masters as *Euthebus troglodytes*, which species it probably resembles to a certain extent; but as Mr. Pascoe describes the rostrum of that genus as being straight, the anterior legs as being the larger, the claws as approximate and the metathoracic episterna as being wide (amongst other discrepancies), I am compelled to think Mr. Masters mistaken; the species is certainly not *troglodytes*, the following characters mentioned by Mr. Pascoe being at variance with it:—"Fuscus; capite . . . leviter punctato; rostro ferrugineo . . . apice vage punctulato; prothorace rufo-fusco; . . . elytris rufo-ferrugineis, nitidis, sulcato-punctatis, punctis oblongis, interstitiis . . . granulatis." No mention is made of clothing, and in the specimen I have under examination the clothing is very distinct, and is of such a character that I do not think it liable to be at all easily abraded.

NEOMELANTERIUS LONGIROSTRIS, n.sp.

♂. Black, subopaque; rostrum, antennæ, tibiæ and sides of elytra dark reddish-brown. Moderately densely clothed all over (except on apical half of rostrum) with straw-coloured, elongate (almost setiform) scales; scales longer and thinner on sterna and femora than elsewhere.

Head strongly punctate. Rostrum much longer than prothorax; with three acute ridges from base to antennæ; in front of antennæ rather coarsely punctate. Funicle with the 1st joint slightly longer than 2nd. *Prothorax* densely and strongly punctate, punctures in places feebly confluent. *Elytra* about once and one-half the width of prothorax, shoulders obliquely rounded; striate-punctate, punctures round and deep, each in the centre of a shallow depression; interstices narrow and all (except the suture) rather acutely ridged. *Under surface* densely and rather coarsely punctate, metasternal episterna and intermediate segments of abdomen each with a single row of punctures. *Femora* densely, tibiæ seriately punctate. Length $5\frac{2}{3}$, rostrum $2\frac{1}{6}$; width 3 (vix) mm.

Hab.—Q.: Pine Mountains (Mr. G. Masters).

Since the specimen described above was returned to Mr. Masters, I have received a female from Cooktown (sent by Mr. French) evidently belonging to the species. It differs in having the rostrum more noticeably curved, much less distinctly ridged, and with finer punctures; in colour it is of a dark chocolate-brown, the elytra, rostrum, and antennæ being brownish-red.

NEOMELANTERIUS CARINICOLLIS, Pasc.; *l.c.* No. 5394

(*Melanterius carinicollis*, Pasc.)

Broad, ovate, subdepressed, feebly shining. Dull reddish-brown; antennæ (club excepted) paler. Upper surface with rather sparse, elongate, yellow, curved setæ, condensed on shoulders and forming a small spot on each side of scutellum. Legs rather densely, the sides of head and rostrum rather feebly clothed.

Head somewhat obsoletely punctate; eyes reniform, almost touching beneath. Rostrum long, thin, and cylindrical, curved throughout; punctate to apex, the punctures in grooves, leaving five elevated ridges of which the median is rather wide. Scape almost as long as funicle and club combined, inserted one-fourth from apex of rostrum; two basal joints of funicle equal in length, the 7th with a little of the club's sensitised pubescence. *Prothorax* slightly transverse; sides about middle and the base rounded; disc with numerous carinæ as long as but less elevated than a very distinct median carina which is terminated just before base and apex. *Scutellum* narrow and oblong. *Elytra* subcordate, across shoulders (which are slightly rounded) almost twice the width of prothorax; seriate-punctate, punctures large, suboblong, not approximate, feebly connected by shallow grooves; alternate interstices shining and acutely ridged. *Metasternum* and two basal segments of *abdomen* with large, perfectly round punctures; episterna each with a single row of small punctures; intermediates combined the length of 2nd or apical, each with a row of small seta-bearing punctures; apical segment densely punctate. *Femora*, especially the posterior, strongly dentate, each with a small tooth in emargination; posterior not extending to apex of abdomen; tibiæ thin, compressed, seriate-punctate, curved at base. Length $5\frac{1}{2}$, rostrum $2\frac{1}{6}$; width 3 mm.

Hab.—Q.: "Cape York" (Pascoe), Port Denison (Macleay Museum).

A very distinct and easily recognisable species.

Genus LYBÆBA, Pascoe.

Ann. Mag. Nat. Hist. (4), xi., 1873, p. 186.

Head small, not concealed by prothorax; ocular fovea small, seldom traceable. *Eyes* ovate or subelliptic, not distant, rather coarsely faceted. *Rostrum* long, thin, parallel-sided, or decreasing from base to apex, especially in front of the antennæ, curved, continued beyond mesosternum. *Antennæ* slender; scape the length of or shorter than funicle, insertion variable; two basal joints of funicle elongate; club of moderate size, joints distinct. *Prothorax* convex, subconical, apex feebly produced, much less than the width of base, base strongly bisinuate; constriction feeble; ocular lobes obtuse. *Scutellum* usually slightly raised and longer than wide. *Elytra* convex, subcordate, considerably or not much wider than prothorax, shoulders and apex rounded. *Pectoral canal* wide in front of anterior coxæ; these somewhat excavated above and but feebly separated. *Mesosternal plate* strongly transverse, feebly concave, emargination very feeble, base truncate. *Metasternum* large, shorter than basal segment of abdomen; episterna large. *Abdomen* large, sutures distinct; 1st segment the length of three following combined, intercoxal process moderately wide and rounded; intermediates small, their combined length slightly shorter than that of 2nd or 5th. *Legs* moderately long; femora stout, clavate, not grooved, strongly and acutely dentate, the four anterior sometimes rather feebly dentate, posterior extending to apex of abdomen or not; tibiæ somewhat rounded, straight or feebly bisinuate beneath, terminal hook very small; tarsi stout, 3rd joint wide, deeply bilobed; claw-joint thin, exsertion variable, claws feeble. Ovate, convex, squamose, punctate, winged.

Allied to *Melanterius*, but with the 2nd abdominal segment smaller and the femora not grooved, and with a shorter and less convex form. I do not believe that both *Lybæba* and *Enide** can be retained, and, acting in that belief, have united the species

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* Pascoe, Ann. Mag. Nat. Hist. 1873, p. 187.

under *Lybæba.* This genus was supposed by Mr. Pascoe to have the three intermediate segments of the abdomen (but especially the 2nd) curved at the sides, and a parallel-sided rostrum; *Enide* to have straight (or almost straight) abdominal sutures and subulate rostrum: but an examination of nine species convinces me that these features are of specific importance only. In *inæqualis* the rostrum is more decidedly subulate than in any species with which I am acquainted, and yet the three intermediate segments are drawn backwards at the sides; in several of the species having parallel-sided rostra the abdominal sutures are almost straight. In *Storeus (Emplesis)* the abdominal segments are subject to considerable variation as regards their curvature, and *Lybæba* resembles that genus in many other features. In *Apion* there are species having subulate and others having parallel-sided rostra.

The sexual differences are usually very pronounced. In ♂ the scape is inserted nearer the apex of the rostrum than in ♀, and is usually the length of the funicle; in ♀ it is almost invariably shorter; the rostrum of the ♀, in the species in which it is subulate, is very decidedly lessened both in width and depth, in some of the species appearing remarkably thin when viewed from the side; in the ♂, possibly owing to the shorter distance between the antennæ and the apex, the subulation is much less noticeable. The apical segment of the abdomen in the ♀ is transversely depressed, sometimes very distinctly so. Following is a table of the species :—

Elytral interstices, or at least the 3rd, acutely ridged.	
Metasternal episterna densely clothed, scales large and soft...	*porphyrea*, Pasc.
Episterna less densely clothed, scales thinner and sublinear in arrangement.	
Claw-joint strongly exserted.....................................	*æstuans*, Pasc.
Claw-joint feebly exserted.	
Scape longer than funicle..........................	*consanguinea*, n.sp.
Scape shorter than funicle..........................	*nigrovaria*, n.sp.
Elytral interstices not ridged.	
Sides of 4th abdominal segment slightly embracing the 5th.	

A small polished space behind and at sides of scutellum* .... *parvicollis*, n.sp.
Elytra not glabrous in vicinity of scutellum.
Apical segment of abdomen considerably longer than intermediates combined .... *famelica*, n.sp.
Apical segment about equal to intermediates combined.
Anterior femora acutely dentate.
First joint of funicle distinctly longer than 2nd. .... *acutidens*, n.sp.
Two basal joints almost equal in length... *repanda*, Pasc.
Anterior femora edentate. .... *picta*, n.sp.
Sides of 4th not embracing the 5th.
Rostrum slightly increasing in width from antennæ to apex.......... *mollis*, n.sp.
Rostrum parallel-sided.
Size very small.......... *tantilla*, n.sp.
Size larger.......... *subfasciata*, Pasc.
Rostrum decreasing in width from antennæ to apex.
Feebly so.......... *majorina*, n.sp.
Very decidedly so.
Derm black; scales conspicuously variegated *concinna*, n.sp.
Derm red, scales scarcely variegated.......... *inæqualis*, n.sp.

LYBÆBA PORPHYREA, Pasc.; *l.c.* No. 5154.

(*Enide porphyrea*, Pasc.)

Pale red; apex of rostrum and club slightly infuscate; under surface usually darker than upper; scutellum blackish, elytral suture more or less tinged with black, occasionally the whole elytra of a rather dark reddish-brown. Head with ochreous scales; continued but sparser on rostrum, almost to antennæ in ♂, at base only in ♀. Prothorax and elytra with ochreous or yellow, or pale whitish-yellow scales, obscurely or very distinctly variegated with patches of darker or ochreous-red scales. Under surface and legs uniformly clothed, the scales varying on different individuals from a pale creamy-yellow to a clear lemon-yellow.

* Not due to abrasion.

Rostrum in ♂ parallel-sided to antennæ, with three acute ridges terminating before them and with punctures between ridges, from antennæ to apex feebly decreasing in width and with fine punctures; in ♀ sides feebly decreasing to antennæ and strongly to apex, basal ridges feeble, apical portion impunctate. Scape in ♂ the length of funicle, inserted one-third from apex of rostrum and passing apex; in ♀ shorter than funicle, inserted nearer base than apex of rostrum and terminated before apex; funicle with two basal joints equal in length. *Prothorax* with punctures almost concealed. *Elytra* considerably wider than prothorax; striate-punctate, punctures not very large and rather distant; interstices considerably wider than punctures, the alternate ones ridged, very acutely in ♂, feebly in ♀. Three intermediate segments of *abdomen* feebly drawn backwards at sides; the apical transversely impressed in ♀. Posterior *femora* terminated before apex of abdomen; claw-joint exserted for more than half its length. Length 4, rostrum $1\frac{2}{3}$; width $2\frac{2}{3}$ mm.

Hab.—"Western Australia" (Pascoe), Geraldton (Lea).

The clothing has a peculiarly soft appearance, especially on the females. The variegation of the elytra is sometimes caused by the scales being sparser in some places than in others.

LYBÆBA ŒSTUANS, Pasc.; *l.c.* No. 5153.

(*Enide œstuans*, Pasc.)

Bright red (almost scarlet); sterna black, abdomen blackish at base, paler towards apex; scutellum either black or concolorous with elytra; club no darker than funicle, sometimes not so dark. Head and rostrum with scales concolorous with derm but with spots of yellowish scales; rostrum rather sparsely clothed, the scales extending almost to antennæ in ♂, at base only in ♀. Prothorax and elytra with scales concolorous with or slightly paler or darker than the derm, and with numerous small spots (larger on prothorax than on elytra) of pale yellow scales. Scutellum almost glabrous. Under surface with scales varying from a pale to a rather dark yellow and more or less tinged with pink.

Rostrum in ♂ parallel-sided to antennæ, feebly diminishing thence to apex and finely punctate, on base with three acute ridges; in ♀ slightly diminishing in width from base to apex, a little more noticeably in front of than behind antennæ, basal ridges feeble. Scape in ♂ the length of funicle, inserted one-third from apex of rostrum and passing apex; in ♀ shorter than funicle, inserted two-fifths from apex, thinner than in ♂ and less of it passing apex; funicle with 1st joint very slightly longer than the 2nd. *Prothorax* densely punctate, punctures moderately distinct. *Elytra* almost twice the width of prothorax, striate-punctate, punctures not very large; alternate interstices acutely ridged. Three intermediate segments of *abdomen* straight. *Claw-joint* exserted for more than half its length. Length 3, rostrum $1\frac{1}{8}$; width $1\frac{2}{5}$; variation in length $2\frac{1}{2}$-$3\frac{3}{4}$ mm.

Hab.—W.A.: "Swan River, Albany" (Pascoe), Swan River, Karridale, Boyanup (Lea).

The spots on the prothorax and elytra are variable both in size and number I have a specimen in which the rostrum and prothorax are almost black, the latter with two patches of reddish scales, each patch with a pale spot in its middle, the median line marked with pale scales; in another specimen the red scales form a large trident shaped patch.

Lybæba consanguinea, n.sp.

♂. Red; sterna more or less tinged with piceous. Clothed with pale yellowish scales, longer and denser on under than on upper surface; the rostrum clothed to antennæ; the elytra appearing to be feebly spotted in places owing to the partial absence of scales

Rostrum parallel-sided to antennæ and with three acute ridges; feebly diminishing in width and rather strongly punctate from antennæ to apex. Scape slightly longer than funicle, inserted one-third from apex of rostrum; 1st joint of funicle, if anything, slightly shorter than 2nd. *Prothorax* densely punctate; with a very feeble median carina which is traceable only at apex. *Elytra* considerably wider than prothorax; striate-punctate, punctures moderately large and not very distant; interstices wider than punctures, the alternate ones acutely ridged. Three intermediate segments of *abdomen* straight. Posterior *femora* scarcely passing penultimate segment; claw-joint exserted for less than half its length. Length 3, rostrum 1; width $1\frac{3}{5}$ mm.

Hab.—W.A.: Geraldton.

Much the build of the preceding species, but with a shorter claw-joint and different clothing.

LYBÆBA PARVICOLLIS, n.sp.

Red; sterna in places feebly tinged with piceous. Clothed with ochreous-yellow and creamy-white scales, the shades of which, especially on the prothorax, insensibly run into each other. Scutellum, and a small space surrounding it on the elytra, glabrous. Elytra with two distinct, but narrow and very irregular transverse chocolate-brown fasciæ, interrupted at suture, the 1st moderately close to base, the 2nd beyond middle; suture with ochreous-yellow scales, scarcely interrupted; the creamy spots rather larger between fasciæ than elsewhere. Under surface and legs with whitish scales.

Rostrum parallel-sided and highly polished, punctured at sides of base only. Scape inserted nearer base than apex of rostrum, considerably shorter than funicle; of the latter the 1st joint is slightly but noticeably longer than 2nd. *Prothorax* densely punctate. *Elytra* about once and one-third the width of prothorax; punctate-striate, punctures apparently oblong; striæ narrow; interstices considerably wider than striæ, neither alternately raised nor ridged. Three intermediate segments of *abdomen* drawn backwards at sides. Posterior *femora* terminated almost level with apex of penultimate segment; claw-joint exserted for less than half its length. Length $3\frac{1}{2}$, rostrum $1\frac{1}{3}$; width 2 mm.

Hab.—W.A.: Swan River.

In this species the head and prothorax are smaller and the elytra larger than is usual. My unique specimen was captured by means of the sweep-net.

LYBÆBA ACUTIDENS, n.sp.

Testaceous-red; under surface in places tinged with piceous. Head and extreme base of rostrum with ochreous scales. Prothorax and elytra with ochreous scales, the former with about six very small spots of chocolate-brown scales; elytra with two transverse and much interrupted chocolate-brown fasciæ, the first and largest just behind base, the 2nd just beyond middle and very feeble towards suture. Under surface and legs with whitish scales.

Rostrum parallel-sided, shining and almost impunctate. Scape shorter than funicle; 1st joint of the latter distinctly longer than 2nd. *Prothorax* densely punctate. *Elytra* about once and one-third the width of prothorax; striate-punctate, punctures feeble; interstices considerably wider than striæ, rather densely punctate but the punctures concealed, feebly convex, the 3rd, 5th and 7th feebly raised but not ridged. Three intermediate segments of *abdomen* drawn backwards at sides. Posterior *femora* terminated before apex of abdomen; claw-joint exserted for about half its length. Length $3\frac{1}{3}$, rostrum 1; width $1\frac{2}{3}$ mm.

Hab.—W.A : Swan River.

The femoral teeth are unusually large and are very acute.

LYBÆBA REPANDA, Pasc.; *l.c.* No. 5144.

Red; under surface concolorous with or slightly darker than elytra. Clothed with chocolate-brown or reddish scales and with spots of whitish scales. Under surface and legs with whitish scales.

Rostrum feebly and regularly diminishing in width from base to apex; sides before antennæ punctate. Scape inserted slightly nearer apex than base of rostrum, slightly shorter than funicle; the two basal joints of the latter almost equal in length *Prothorax* at apex more than half the width of base; strongly punctate, punctures usually distinct. *Elytra* about once and one-fourth the width of prothorax; striate-punctate, punctures apparently moderately large and oblong; interstices feebly convex, considerably wider than striæ, rather strongly punctate, neither ridged nor alternately elevated. Three intermediate segments of *abdomen* drawn backwards at sides, but especially the 2nd. *Femora* less strongly dentate than usual, the posterior terminating level with apex of abdomen; claw-joint exserted for about half its length. Length $2\frac{1}{3}$, rostrum 1; width $1\frac{1}{3}$ mm.

Hab.—W.A.: "Swan River, Albany" (Pascoe), Swan River (Lea).

I have six specimens under examination, in no two of which are the scales alike. On the head there is usually a transverse patch of dark scales, more or less triangularly encroached upon by the basal scales; these are usually white, but on one specimen are decidedly yellow. Of one specimen the disc of the prothorax is entirely covered with dark chocolate-brown scales except for a longitudinal spot at the base; in others there are numerous spots both at the base and apex as well as on the sides. On the elytra the darker scales usually prevail, and there is generally a wide basal unspotted space with paler scales, with sometimes also a somewhat similar but feebler space towards the apex; the pale spots may be either transverse or longitudinal and united more or less angularly together or solitary.

Lybæba concinna, n.sp.

Black; the elytra sometimes testaceous-red or very dark red; rostrum, antennæ and legs red. Head with yellowish-red or red scales; eyes margined with whitish scales; rostrum with whitish scales to antennæ. Prothorax and elytra variegated with whitish and red or yellowish-red scales, the spots of both colours variable both in size and extent, but never very large. Under surface and legs rather densely clothed, the scales having a very slight pinkish tinge.

Rostrum parallel-sided and feebly ridged to antennæ; in ♂ punctate and slightly diminishing in width to apex; in ♀ impunctate and strongly diminishing to apex. Scape in both sexes shorter than funicle; in ♂ inserted two-fifths from apex of rostrum and just passing apex; in ♀ inserted in exact middle and scarcely extending to apex; funicle with 1st joint slightly longer than 2nd. *Prothorax* rather wider at apex than is usual; densely punctate, punctures partially visible. *Elytra* about once and one-third the width of prothorax; punctate-striate, punctures apparently small and close together, but more or less concealed; interstices considerably wider than punctures and flat. Three intermediate segments of *abdomen* straight. *Femora* rather feebly dentate, posterior level with apex of abdomen; claw-joint moderately strongly exserted. Length 3 (vix), rostrum 1; width $1\frac{2}{3}$ mm.

Hab.—N.S.W.: Gosford.

A pretty species and the first of the genus to be recorded from Eastern Australia. I have recently had under examination some South Australian specimens (Macleay Museum) which evidently belong to this species. They differ from the types in having the clothing more of a brick-red with the white spots less conspicuous and the basal half of the rostrum almost black.

Lybæba inæqualis, n.sp.

Red; scutellum and sterna usually darker. Rather densely and almost uniformly clothed with ochreous scales, rather paler on prothorax and legs than on elytra and under surface, elytra in places very feebly variegated with paler scales, usually most noticeable along suture and apex.

Rostrum almost parallel-sided to antennæ, and with feeble ridges and moderately strong punctures; from antennæ suddenly lessened both in width and thickness, shining and impunctate. Scape considerably shorter than funicle, insertion distinctly nearer base than apex of rostrum; funicle with 1st joint just perceptibly longer than 2nd. *Prothorax* strongly punctate, punctures almost concealed. *Elytra* almost twice the width of prothorax; striate-punctate, punctures oblong, not close together; interstices considerably wider than punctures, almost flat, feebly granulate, none ridged. Three intermediate segments of *abdomen* straight. Posterior *femora* terminated before apex of abdomen;

claw-joint exserted for more than half its length. Length 3, rostrum 1⅓; width 2¼ mm.

Hab.—W.A.: Geraldton.

I have eight specimens under examination, but they are all females.

LYBÆBA SUBFASCIATA, Pasc.; *l.c.* No. 5145.

Red or testaceous-red; under surface usually darker than elytra. Clothed with ochreous-yellow scales; the head with darker scales except between eyes; prothorax with a more or less Λ-shaped patch of dark scales; elytra with three feeble transverse fasciæ of dark scales. Under surface and legs with whitish scales.

Rostrum parallel-sided; rather strongly punctate throughout, punctures elongate. Scape shorter than funicle, inserted slightly nearer apex than base of rostrum in ♂, slightly nearer base in ♀; two basal joints of funicle subequal in length; club rather larger than usual. *Prothorax* densely punctate, punctures almost concealed. *Elytra* not much wider than prothorax; punctate-striate, both striæ and punctures rather feeble; interstices punctate and considerably wider than striæ, the alternate ones feebly raised but not ridged. *Abdomen* less narrowed towards apex than usual, the three intermediate segments straight. Posterior *femora* terminated before apex of abdomen; claw-joint moderately exserted. Length 2½, rostrum ¾; width 1⅓ mm.

Hab.—W. Australia (Sydney Museum), Swan River and Albany (Pascoe and Lea), Boyanup, Vasse (Lea).

I have two specimens which differ from the normal form in having the clothing composed of more or less regular spots of white, ochreous, and sooty scales, the prothorax without a Λ-shaped patch of scales, and the elytra without fasciæ; the alternate interstices of the elytra are also but very feebly elevated.

LYBÆBA NIGROVARIA, n.sp.

Derm black, rostrum, legs and antennæ red; or under surface and scutellum black; or entirely red; or red with the exception of the scutellum. Clothed with golden and whitish scales; the pale scales arranged in spots which are rather numerous on the elytra and on the prothorax are usually five in number, one along median line towards base (sometimes extending to apex) and two on each side in front. Under surface and legs with whitish scales sometimes tinged with yellow.

Rostrum long and thin, moderately curved, scarcely visibly diminishing in width (just visibly dilated between antennæ) from base to apex, acutely ridged to antennæ; with elongate punctures between antennæ, smaller thence to apex. Scape inserted two-fifths from apex of rostrum, slightly shorter than funicle. *Prothorax* transverse, apex about half the width of base, base strongly bisinuate; densely punctate but punctures almost concealed. *Scutellum* small, round, glabrous, punctate. *Elytra* subcordate, considerably wider than prothorax, shoulders square; punctate-striate, punctures narrow and oblong; interstices much wider than striæ, 3rd, 5th and 7th triangularly ridged. *Mesosternal plate* widely transverse, feebly depressed. *Metasternum* and basal segments of *abdomen* rather coarsely punctate; intermediates straight, their combined length slightly more than that of 2nd or 5th. *Femora* stout, anterior feebly, the others acutely dentate; tibiæ rounded, feebly curved, dilated at apex. Length $2\frac{2}{3}$, rostrum 1; width $1\frac{1}{4}$ mm.

Hab.—W.A.: Swan River.

The colour of the derm is very variable individually. The pale scales on the prothorax are sometimes dingy and not at all maculate in appearance; sometimes the maculæ are nine in number.

LYBÆBA FAMELICA, n.sp.

Black; elytra, legs, rostrum and antennæ of a dingy reddish-brown in ♂; in ♀ the rostrum and antennæ (club excepted) are of a rather bright red. Almost uniformly clothed all over with greyish scales, on the elytra and sometimes on prothorax feebly speckled with sooty ones; head with two distinct sooty spots; rostrum clothed half way to antennæ in ♂, at extreme base only in ♀.

Rostrum moderately long, rather wider than usual, very feebly diminishing from base to apex; in ♂ acutely ridged to antennæ and rather densely punctate to apex, in ♀ thinner, polished, without ridges, and very finely punctate. Scape in ♂ inserted one-third from apex of rostrum and slightly shorter than funicle, in ♀ inserted in exact middle and noticeably shorter than funicle. *Prothorax* feebly transverse, apex more than half the width of base, base rather feebly bisinuate; punctures concealed. *Scutellum* small, round, glabrous, punctate. *Elytra* cordate, at base not much wider than prothorax, shoulders rounded; punctate-striate, punctures narrow and oblong; interstices flat, much wider than striæ. *Metasternum* with a depression continued on to basal segment of abdomen; the latter with only the 1st and 5th segments distinctly visible, the others being greatly depressed; the 5th is rounded and slightly embraced by the 4th and is much larger than the intermediates combined. Anterior *femora* edentate, the others feebly dentate; tibiæ almost straight. Length 2, rostrum $\frac{5}{6}$; width $1\frac{1}{6}$ mm.

Hab.—S. Australia (Macleay Museum).

The abdomen is very peculiar, the three median segments being so depressed that their lengths can only be seen from the sides; all three are very short, but the 2nd is almost the length of the 3rd and 4th combined.

LYBÆBA PICTA, n.sp.

Red. With whitish and ochreous scales continued on to base of rostrum; prothorax, under surface and legs with greyish-white scales, in places with a golden lustre; elytra with chocolate-brown and whitish-grey (more or less tinged with ochreous) scales, more or less fasciate in arrangement; the dark scales in larger masses than the others, but very irregular towards suture.

Rostrum flat, moderately curved, parallel-sided, without ridges; basal third and sides rather coarsely punctate, elsewhere finely punctate. Scape inserted in middle of rostrum, half the length of funicle and club combined. *Prothorax* moderately transverse, about half the width of base, base strongly bisinuate; densely punctate, punctures round and clearly cut but almost concealed. *Scutellum* small and round, punctures concealed. *Elytra* subcordate, considerably wider than prothorax, base trisinuate; punctate-striate, punctures narrow and suboblong; interstices flat, much wider than striæ. *Mesosternal plate* strongly depressed. *Metasternum* with a depression which is continued on to basal segment of abdomen, the latter almost the length of the three following; intermediates combined slightly longer than 2nd or 5th; 3rd and 4th slightly embracing 4th and 5th at the sides. *Femora* rather thinner than usual, rather distinctly grooved, edentate; tibiæ slightly compressed and almost straight. Length 4, rostrum $1\frac{1}{3}$; width 2 mm.

Hab.—S. Australia (Macleay Museum).

The sinuation of the base of the prothorax is accentuated by darker scales. Near the suture the elytral interstices are about four or five times the width of the striæ, but towards the sides they are only about two or three times as wide. The specimen described is probably ♂ despite the position of insertion of scape and the absence of rostral ridges; a smaller and more brightly coloured specimen (also from S. Australia and the Macleay Museum), which I believe to be the ♀, differs in having the rostrum impunctate except at extreme base, and with the scape inserted about one-third from base of rostrum and less than half the length of the funicle alone.

LYBÆBA MOLLIS, n.sp.

Red; scutellum and under surface reddish-brown. Clothed with round, dingy, sooty-grey or testaceous scales, very slightly variegated, but paler below than above.

Rostrum long, curved and shining; incurved to middle, feebly in ♂, decidedly in ♀; rather feebly punctate except at base and sides in both sexes; ♂ with an obscure median ridge on basal third. Scape in ♂ inserted slightly nearer apex than base of rostrum, in ♀ *vice versa;* slightly shorter than funicle. *Prothorax* moderately transverse, apex about half the width of base, base moderately bisinuate; with dense, round, cleanly cut punctures almost entirely concealed. *Scutellum* small and round, punctures concealed. *Elytra* subcordate, considerably wider than prothorax, shoulders rounded; punctures and interstices as in the preceding species. *Mesosternal plate* rather larger and less depressed than usual. Intermediate segments of *abdomen* straight, their combined length more than that of 2nd or 5th; 5th with a distinct circular impression. *Femora* stout, all acutely dentate. Length $3\frac{1}{2}$, rostrum $1\frac{1}{3}$; width 2 mm.

Hab.—S. Australia (Macleay Museum).

The scales have a peculiarly soft, round appearance on both the under and upper surfaces.

Lybæba tantilla, n.sp.

Of a rather pale red. Head with yellowish scales continued on to basal third of rostrum, vertex with an obscure sooty spot; prothorax and elytra with yellowish scales, the latter with a distinct but very irregular basal fascia of chocolate-brown scales, behind which is a much smaller and less distinct fascia of white scales; scutellun with white scales. Under surface and legs with sparser and paler scales than on upper surface.

Rostrum parallel-sided, moderately curved; rather densely punctate; with a moderately distinct median ridge to antennæ. *Prothorax* transverse, apex more than half the width of base, base feebly bisinuate; punctures almost concealed. *Scutellum* small and round. *Elytra* wide, cordate, considerably wider than prothorax, shoulders squared; punctate-striate, punctures narrow and scarcely traceable; interstices wide, flat and very much wider than striæ. *Metasternum* and basal segments of *abdomen* feebly depressed; intermediates straight, their combined length slightly more than that of 2nd or 5th. Anterior *femora* edentate, the others acutely dentate. Length $1\frac{3}{4}$, rostrum $\frac{1}{2}$; width $\frac{4}{5}$ mm.

Hab.—S. Australia (Macleay Museum).

The smallest Australian species of the subfamily hitherto described.

LYBÆBA MAJORINA, n.sp.

Red; coxæ and club darker; metasternum and abdomen darker or not. Upper surface clothed with scales of a dingy yellow variegated with spots of paler yellow. Under surface and legs with pale yellowish scales.

Rostrum long, shining, very feebly diminishing in width from base to apex; coarsely punctate only at extreme base and in lateral grooves; without distinct median ridge. Scape inserted two-fifths from apex of rostrum, the length of six basal joints of funicle. *Prothorax* moderately transverse, apex about half the width of base, base almost truncate; densely punctate, punctures partially concealed. *Scutellum* small, round, punctate. *Elytra* subcordate, base almost straight, shoulders somewhat rounded; punctate-striate, punctures moderately round; interstices wide and flat, not much more than twice the width of striæ. *Mesosternal plate* not depressed. Basal segment of *abdomen* not depressed, slightly longer than metasternum and shorter than 2nd-3rd combined; intermediates large, straight, their combined length noticeably more than that of 2nd or 5th. *Femora* grooved and all (but especially the posterior) acutely dentate; tibiæ compressed and rather strongly arched at base. Length 4, rostrum $1\frac{1}{3}$; width 2 mm.

Hab.—S. Australia (Macleay Museum), Eyre's Peninsula (Rev. T. Blackburn, No. 692).

I have three specimens under examination, but can detect no sexual variation in them; they are probably ♀. The difference in intensity of colour of the scales on the upper surface is not very pronounced, but owing to their arrangement the spots (especially on the elytra) are distinct; on the head they are uniform in colour and are continued on to the basal third of rostrum and slightly longer at the sides.

LYBÆBA SANIOSA, Pasc.; *l.c.* No. 5155.

(*Enide saniosa*, Pasc.)

Hab.—"Fremantle" (Pascoe). I do not think that I have seen this species. The description of its clothing would almost fit *acutidens*, but in that species the rostrum is not subulate and the femora are strongly dentate.

Genus Psydestis, Pascoe.

Ann. Mag. Nat. Hist. (4), xiii., 1874, p. 412.

Head small, not concealed by prothorax; ocular fovea not traceable. *Eyes* moderately large, subovate, finely faceted. *Rostrum* short, scarcely the length of prothorax, moderately stout, almost parallel-sided, feebly curved. *Antennæ* slender; scape inserted nearer base than apex of rostrum, slightly shorter than funicle; two basal joints of funicle elongate; club of moderate size, joints distinct. *Prothorax* convex, transverse, apex scarcely produced and more than half the width of base, base truncate; constriction feeble; ocular lobes obtuse. *Scutellum* small, subquadrate. *Elytra* convex, subcordate, not much wider than prothorax, shoulders and apex rounded. *Pectoral canal* extremely short in front of anterior coxæ, these moderately separated. *Mesosternal plate* strongly transverse, very feebly concave, apex slightly wider than base. *Metasternum* large, shorter than basal segment of abdomen; episterna large. *Abdomen* moderately large, sutures distinct; 1st segment longer than the three following combined, intercoxal process widely rounded; intermediates combined longer than 2nd or apical. *Legs* moderately long; femora stout, clavate, posterior strongly, intermediate feebly dentate, anterior edentate, posterior extending to apex of elytra; tibiæ somewhat rounded, feebly bisinuate beneath, the four anterior each terminated by a small but strongly recurved hook, terminal hook of posterior scarcely visible; tarsi stout, 3rd joint wide, bilobed for half its length; claw-joint thin, scarcely half its length exserted, claws feeble. Widely ovate, convex, squamose, punctate, winged.

Resembles *Lybæba* in many features, but may be distinguished on account of the rostrum, eyes, and very short 2nd abdominal segment. *Diethusa** appears to be very close, but as Mr. Pascoe describes the two basal segments of the abdomen as "ampliatis" it may be distinct; his description of the tibiæ, however, exactly

* Pasc., Ann. Mag. Nat. Hist. (4) xi. 1873, p. 185.

applies to the two specimens which I think are females of *P. affluens.*

PSYDESTIS AFFLUENS, Pasc.; *l.c.* No. 5404.

Reddish-castaneous; head, scutellum and suture of elytra piceous, a few elytral punctures stained with piceous; under surface piceous, legs paler; antennæ pale red, club slightly darker. Head with scales at base, rostrum glabrous. Prothorax with ochreous scales leaving five dark spots across the middle; of these the three median are connected across middle, the median also with apex and the two others with base. Elytra with numerous small patches of yellowish scales. Under surface with ochreous scales, moderately dense at sides of middle of basal segment of abdomen, apical segment glabrous on apical half. Legs moderately densely clothed.

Head densely punctate. Rostrum parallel-sided to antennæ, feebly incurved between antennæ and apex; densely punctate, punctures not much smaller near apex than at base. Funicle with the 1st joint slightly longer than 2nd. *Prothorax* densely punctate, punctures more or less concealed. *Elytra* striate-punctate, punctures rather large but shallow; interstices raised and all acutely ridged in middle. *Under surface* rather densely and strongly punctate; a depression on metasternum and basal segment of abdomen, the depression bordered by rather large scales; the three intermediate segments slightly curved at sides. Length 4, rostrum $1\frac{1}{6}$; width $2\frac{3}{4}$ mm.

Hab.—" Western Australia " (Pascoe), Geraldton (Lea).

I have described the clothing as I found it, but it is probably not at all constant.

Two specimens under examination are probably females. They differ in having the rostrum more rounded and less coarsely punctate; thinner antennæ with a shorter scape (but inserted at the same place); the prothorax is feebly clothed with ochreous scales and with a few sooty spots; the elytra are feebly clothed with ochreous scales and with two very feeble transverse sooty fasciæ; the metasternum and basal segment of abdomen are not depressed in middle and the scales are larger there than elsewhere; the apical segment is transversely depressed; all the tibiæ have the terminal hook feeble and in addition are supplied with a small subapical tooth, both in the posterior being very indistinct.

MELANTERIOSOMA, n.g.

Head moderately convex, not concealed; ocular fovea indistinct. *Eyes* rather narrowly ovate, coarsely faceted. *Rostrum* moderately long, not very thin, not passing mesosternum, feebly curved, slightly dilated in front of antennæ. *Antennæ* thin; scape the length of funicle, inserted nearer apex than base of rostrum; two basal joints of funicle moderately elongate; club small, ovate, free. *Prothorax* slightly transverse, subconvex, sides rounded, apex feebly produced and much narrower than base, base feebly bisinuate; ocular lobes obtuse. *Scutellum* suboblong. *Elytra* cordate, considerably wider than and not thrice the length of prothorax, shoulders and apex rounded. *Pectoral canal* wide and rather deep in front of anterior coxæ, these excavated and distinctly separated. *Mesosternal plate* depressed, transverse, slightly concave, apices raised and slightly produced, base truncate *Metasternum* shorter than basal segment of abdomen; episterna moderately large. *Abdomen* large, sutures distinct; 1st segment not twice the length of 2nd, intercoxal process rounded and rather wide; intermediates not depressed, their combined length more than that of 2nd or 5th. *Legs* rather long; femora moderately stout, feebly grooved, and all rather acutely dentate: posterior terminated near apex of abdomen; tibiæ bisinuate beneath; tarsi narrow except the 3rd joint which is rather wide and deeply bilobed; claw-joint long and thin, strongly exserted, claws feeble. Ovate, moderately convex, punctate, squamose, winged.

Allied to *Melanterius* but separated on account of the rostrum not passing the mesosternum; from *Psydestis* it differs in the coarsely faceted eyes and larger 2nd abdominal segment.

MELANTERIOSOMA COSTATUM, n.sp.

Black, subopaque; rostrum, antennæ, legs, abdomen and elytra dull brownish-red, suture of the latter black. Upper surface with ochreous scales, sparse on head between eyes and almost absent on forehead; prothorax with moderately elongate scales sparsely distributed; elytra with small and almost regular spots of smaller scales than those of prothorax. Under surface with sparse whitish scales; legs rather more densely clothed, the scales white except on the outer apex of femora, where they are ochreous.

Head and rostrum rather coarsely punctate, the punctures on the latter running in rather feeble grooves to base. *Rostrum* wider in front of than behind antennæ, more coarsely punctate at sides than along middle. Two basal joints of funicle equal in length, 4th-7th feebly transverse. *Prothorax* densely and strongly punctate. *Elytra* about once and two-thirds the width of prothorax; striate-punctate, punctures deep and oblong; interstices punctate, considerably wider than striæ, the 3rd, 5th and 7th acutely ridged, the suture flat. *Under surface* densely and strongly punctate. Metasternal episterna each with a row of large punctures. Intermediate segments of abdomen each with an irregular row of rather small punctures. *Femora* densely, tibiæ seriately punctate. Length 3, rostrum 1; width $1\frac{2}{3}$ mm.

Hab.—N.S.W.: Sydney.

MELANTERIOSOMA INCONSPICUUM, n.sp.

Piceous-black, subopaque; head, rostrum, antennæ, legs and elytra very dull reddish-brown, suture of the latter blackish. Upper surface sparsely clothed with either grey or ochreous scales, on the elytra having a tendency to cluster in small spots. Under surface and legs with whitish scales.

Head moderately densely but not coarsely punctate. *Rostrum* slightly wider in front of than behind antennæ; behind antennæ with several subacute ridges; rather coarsely punctate. Funicle with 1st joint slightly longer than 2nd, 4th-7th transverse. *Prothorax* densely and strongly punctate. *Elytra* scarcely once and one-half the width of prothorax; striate-punctate, punctures deep and oblong; interstices densely punctate, considerably wider than striæ, feebly convex, none ridged. *Under surface* and *legs* with punctures much as in the preceding species but rather smaller in size. Length $2\frac{3}{4}$, rostrum 1 (vix); width $1\frac{1}{2}$ mm.

Hab.—N.S.W.: Glen Innes, Gosford (Lea), Newcastle (Macleay Museum).

A smaller species than the preceding, the elytral interstices not at all ridged and the shoulders less prominent.

PSEUDOSTOREUS, n.g.

Head feebly convex, not concealed; ocular fovea indistinct. *Eyes* rather small, ovate, lateral, rather coarsely faceted. *Rostrum* moderately long and rather thin, almost parallel-sided, feebly convex, terminated at mesosternum. *Antennæ* thin; scape inserted much closer to apex than base of rostrum, the length of funicle and club combined; two basal joints of funicle moderately long; club small, ovate, free. *Prothorax* scarcely transverse, sides narrowed in front, apex moderately produced and about half the width of base, base bisinuate; ocular lobes feebly rounded. *Scutellum* small and round. *Elytra* elongate-cordate, not much wider than prothorax, shoulders and apex rounded. *Pectoral canal* wide and rather deep, scarcely narrowed between intermediate coxæ, these excavated. *Mesosternal plate* transverse, depressed but scarcely concave, sloping from base to apex. *Metasternum* large, longer than basal segment of abdomen; episterna rather narrow. *Abdomen* moderately large, gently convex throughout, sutures distinct; 1st segment longer but not much larger than 2nd, intercoxal process rounded and rather narrow; intermediates combined slightly longer than 2nd or apical and, with the 2nd, curved at sides. *Legs* moderately long; femora stout, feebly grooved, the four posterior feebly dentate, the anterior edentate, the posterior terminated before apex of abdomen; tibiæ scarcely bisinuate beneath; tarsi rather short and stout, 3rd joint moderately wide, deeply bilobed; claw-joint rather short, considerably wider at apex than at base; claws rather strong and widely separated. Oblong-elliptic, subdepressed, punctate, squamose, winged.

Allied, but not very closely, to *Melanterius;* in the tabulation it is placed with *Melanteriosoma*, to which it is even less closely allied. The anterior coxæ are perhaps more widely separated than in any of the allied genera. In habit it strongly resembles a number of species belonging to *Storeus*.

PSEUDOSTOREUS PLACITUS, n.sp.

Black, somewhat shining; antennæ, tibiæ and tarsi reddish, sides and apex of elytra tinged with red. Clothed with rather short scales; on head between eyes and on base of rostrum dense and pale yellow, diminishing in density to and terminated just before antennæ; prothorax with whitish elongate scales, rather thickly sprinkled about but almost invisible to the naked eye. Scutellum densely clothed with snowy-white scales. Elytra with white and sooty scales, and with a large and very distinct patch of pale ochreous scales on apex and a similar patch on each shoulder. Under surface and legs with whitish scales, on the tibiæ, tarsi (including claw-joint) and apex of femora more or less yellowish.

Head indistinctly punctate. Rostrum no longer than prothorax; coarsely but (on account of clothing) indistinctly punctate; and with several ridges, moderately distinct in ♂, feeble in ♀. Funicle with 1st joint stouter and noticeably longer than 2nd. *Prothorax* with moderately large, round and rather deep punctures, not at all confluent. *Elytra* scarcely once and one-fourth the width of prothorax; striate-punctate, striæ very feeble, punctures moderately large, subquadrate and distinct on basal half, where each contains a large scale which scarcely rises to the general level, towards apex indistinctly punctate; interstices feebly convex, regular, wider than punctures, towards apex much wider *Under surface* apparently not very coarsely punctate. Punctures of *tibiæ* not running in grooves. Length $3\frac{1}{4}$, rostrum $\frac{4}{5}$; width $1\frac{1}{3}$ mm.

Hab.—N.S.W.: Armidale (McDonald and Lea), Queanbeyan (Lea).

The apical and humeral patches of ochreous scales should render this species very distinct.

THE SPEAR-BECKET, OR "DOIGTIER" OF NEW CALEDONIA, THE NEW HEBRIDES AND OTHER PACIFIC ISLANDS.

By R. Etheridge, Junr., Curator of the Australian Museum.

(Plates xvi.-xix.)

The methods of spear propulsion in use by the South Pacific Islanders must be a subject of much interest to all, accustomed as we are on this Continent to see it performed by the aid of the well-known wooden spear-thrower, or womerah, in one or other of its modifications, when any mechanical contrivance is made use of.

A leathern thong or strap known as the *Amentum* was in use amongst the ancients as a means of propelling javelins. It was "used by the Greeks and Romans, and is mentioned by Virgil, Ovid, Cicero, Livy, Pliny, and other ancient writers, and is figured on Etruscan vases; it was called ἀγκύλη by the Greeks."* The amentum was fastened to the javelin shaft.

It is known to but comparatively few that both the New Caledonians and the inhabitants of at least three of the New Hebridean Islands employed a similar device to aid in the propulsion of their spears. Such, however, is the case. The object of the present paper is to describe the *Ounep*, *Ounede*, or "Doigtier" of New Caledonia, a cord or "becket" used for the purpose in question, with a passing reference to the similar implement of the New Hebrideans, and also to bring under notice what I believe may possibly be a degenerate representative from

* O. T. Mason, Origin of Invention, 1895, p. 380, quoting Gen. Lane-Fox's "Catalogue," 1877, p. 40.

New Ireland. Between the *Ounep* and the *Amentum* there is this difference—the former remains in the hand of the thrower, whilst the latter was attached to the javelin.

The name *Ounede* was obtained by Mr. Chas. Hedley when in New Caledonia, that of *Ounep* I find given by Mr. J. Edge-Partington* to this implement, whilst "Doigtier" is that applied to it by the French colonists. The only other illustrations with which I am acquainted are those of Cook, Labillardière, and the Rev. G. Turner.

It is to the wonderfully close and accurate observation of that great man James Cook, R.N., that we owe our introduction to the *Ounep*. He first met with it in the Island of Tanna, where he had a good opportunity of becoming acquainted with its capabilities, and again saw it at Ballade, in North-east New Caledonia. He remarked†—"They use a becket in the same manner as at Tanna in throwing the dart." On one of the plates (the latter are not numbered) attached to the Account of Cook's 'Second Voyage' is the head of a New Caledonian man, surmounted by the peculiar chimney-pot hat or head-covering, and attached to this with string is an *Ounep*, not as an ornament probably, but simply as a means of carrying it.

To render the above extract clear, it is necessary to anticipate a little by quoting Cook's description of the Tanna implement. On this he remarks‡ that the Tannese "make use of a becket, that is a piece of stiff plaited cord, about six inches long, with an eye in one end and a knot at the other. The eye is fixed on the forefinger of the right hand, and the other end is hitched round the dart, where it is nearly on an equipoise. They hold the dart between the thumb and remaining fingers, which serve only to give it direction, the velocity being communicated by the becket

* An Album of the Tools, Ornaments, Articles of Dress, &c., of the Natives of the Pacific Islands, 2d ser., t. 67, f. 11.

† Voyage Towards the South Pole, years 1772-75 (2nd Voyage), 1777, ii. p. 121.

‡ *Ibid.*, p. 81.

and forefinger. The former flies off from the dart the instant the velocity becomes greater than that of the hand, but it remains on the finger ready to be used again." This is precisely the method employed in New Caledonia, as may be seen in Pl. xviii., fig. 14, which is from a drawing made at Panie by Mr. Chas. Hedley. The only other authors who mention the New Caledonian implement known to me are Labillardière, the Rev. George Turner, Mr. T. H. Hood, and, as before mentioned, Mr. J. Edge-Partington.

Labillardière,* who during the French expedition in search of La Pérouse landed in New Caledonia, says he "admired the ingenious method they had invented to accelerate the motion of those javelins when they throw them: for that purpose they employ a piece of very elastic cord, made of the covering of the cocoa nut and fish skin, one extremity of which they fix to the end of the forefinger, and the other, which ends in a sort of round button, is twisted round the end of the dart in such a manner as to quit its hold as soon as that weapon is thrown into the air." Labillardière also figures a New Caledonian in the act of using the "doigtier."

Turner refers to the "doigtier" in connection with mortuary ceremonies.† "They set up spears at the head of a chief when they bury him, and fasten a spear-thrower on to his forefinger, and lay a club at the top of his grave."

Hood describes‡ the dress of the natives at Port de France as consisting of a "turban of scarlet cloth, if possible; if not, of white, with a plume of feathers; a little string with a knot at the end of it, made of the fur of the Rousette, tied round the first finger of the right hand, used in throwing their spears, one of which they generally carry."

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* Voyage in Search of La Pérouse, &c. Translated from the French, 1800, ii., p. 255.

† Nineteen Years in Polynesia, 1861, p. 452.

‡ Notes of a Cruise in H.M.S. "Fawn" in the W. Pacific in the Year 1862, 1862, p. 215.

Dr. Victor de Rochas in a small work* dealing with New Caledonia, states that the natives project the spears "with dexterity to a distance of forty or fifty paces by means of a small *lanière* fixed to the index finger, and which is twisted round the spear at its centre of gravity." A New Caledonian is portrayed in another work† by Mr. G. L. Domeny de Rienzi in the act of spearing the beautiful New Caledonian *Kagou*, (*Rhynochetos jubatus*, V. & M.). His spear is fitted with a "doigtier."

In Mr. Edge-Partington's work one example of the becket is shown,‡ and in miniature the method of slipping it on a spear.§

Lastly, the subject of the "doigtier," according to Dr. J. B. N. Vincent,‖ of the French navy, is to give a rotary movement to the spear.

From these extracts it would appear that the becket was made of cocoa-nut fibre and fish skin, or the fur of the New Caledonian Flying-fox or "Rousette" (*Pteropus vetulus*, Jouan).

The Australian Museum possesses twelve examples of this spear-thrower or becket, all on the same principle, but no two of which agree in details of manufacture. Of these, three form a part of the "Cook Collection," and there is every reason to believe were obtained by Cook himself. Two of the others were obtained by Mr. Hedley.

To all intents and purposes the *Ounep* consists of a plaited cord, varying in length from six to thirteen inches, having an "eye" at one end and an "over-hand" knot or a "grummet-head" at the other, but the details of manufacture and the materials used are very varied.

The Cord.—This is plaited either on the plan of "square-sinnet" or "flat-sinnet," *i.e.*, in the first the cord is so constructed as to have four angles, the sides either flat or hollowed, and in cross-

* La Nouvelle Calédonie et ses Habitants, 1862, p. 185.

† Océanie, ou cinquième partie du Monde, &c., 1863, iii., pl. 253.

‡ Album, *loc. cit.*, 2d ser. t. 67, f. 11.

§ *Ibid.*, 1st ser., t. 127, f. 5.

‖ Les Canaques de la Nouvelle Calédonie, 1895, p. 87.

section would be roughly quadrangular (figs. 2 and 5); in the second the plaiting is such that the cord is flat above and below, top and bottom, but running along one of the flat faces is an extra median ridge (figs. 7 and 9). The material used for the strands seems to be tightly-twisted rush or grass, more commonly seen in the square-sinnet gaskets, or a less tightly twisted beaten-bark string, the latter having the greater flexibility. In some of them there may possibly be an admixture of coco-nut fibre,* as described by Labillardière, but I have not seen one entirely composed of the Rousette fur spoken of by Mr. Hood.

The Eye is formed by returning the cord on itself, and in all but three instances the two parts are held together by a thimble, the free ends of the returned portion being plaited into three, and always three, projecting tags (fig. 8) which are invariably more or less highly ornate. Of the three exceptions, two are Cook's specimens, in which the free ends of the returned plaits are allowed to remain in a frayed condition (fig. 2). In the third example a much more ingenious contrivance is made use of, the free end of the plait being divided into two tags, which are again plaited under and over one another round the main cord and their ends knotted for security (fig. 1).

The Thimble.—I have used the term thimble to designate the band that holds the two portions of the plait together to form the eye (figs. 3, 6 and 9). It is also very variable both in width and material. In its simplest form it is broad and consists of red trade wool, which is used in three of the gaskets (figs. 4, 8 and 10), in one instance being confined purely to the thimble (fig. 4); in a second tightly wound a short distance up the cord as well (fig. 8), whilst in the third example two lengths of the wool are continued from the thimble and wound loosely over and under for half the length of the cord from the thimble proper (fig. 10). In five specimens this encircling band is composed either of the fur or woolly hair of the Rousette or Flying-fox (*Pteropus vetulus*, Jouan) or the latter mixed with beaten bark string. In the remaining specimens the thimbles are made of plaited rush or grasswork, similar to the cords themselves (fig. 3).

The Tags.—The tags terminating the returned portions of the cords are whipped, or not, with other material. When so, then in one case by fibre string, in others by the Rousette fur string, but in every case, whether whipped or not, are beautifully and most ingeniously ornamented by longitudinal short lengths of very narrow bright yellow grass, presenting at first sight the appearance of minute beading, and on the whole producing a very pleasing effect.

The Overhand Knot and Grummet.—The outer or distal ends of the cords, the ends that lap round a spear, are invariably terminated by an overhand knot (figs. 1, 2, 3, 6, 8, 10), or a grummet (figs. 4, 5, 7, 9, 11), and in both instances great ingenuity is displayed in their make. In the former case the end of a cord is first whipped with red trade wool or Rousette fur and then passed through a loop of its own part to form the knot, but the actual termination is often ornamented with bright yellow rush-work similar to the tags already described, and is curved upon itself so as to form a crest (figs. 6 and 8). In the two specimens previously referred to as having the free ends of the cord at the eyes left ragged (fig. 2), the overhand knots are simply tied and devoid of ornament of any kind.

The grummets seem to be made by covering the overhand knots with a cross-lacing of either Rousette fur string pure and simple, or a string partly of this and partly of fibre. They are hard and compact, and very much resemble the string-coated head of a life preserver (figs. 4, 5, 7 and 11).

The Collar.—The only other object on the gaskets remaining to be described is what, for the want of a better term, I have called the collar. It occurs on six out of the twelve specimens, and is placed on the main cord of each gasket immediately below the tags of the eye (figs. 4, 5, 6, 7, 9, 11). It can be best described by comparing it to the butt or body of an ordinary window blind tassel. The simplest form consists of Rousette fur string wound round and round (fig. 6), but in other instances (figs. 4, 5, 7, 9, 11) it resembles the butt referred to, and is variously ornamented with bright yellow rush or grass string similar to that on the tags. The patterns are interlaced vertical lines or conjoined rhombs.

Suspended Ornaments.—The finest gasket in the collection is without doubt the large flat-sinnet thrower obtained by Cook (fig. 11). The end of one of the tags has a couple of twisted strands of the Rousette fur string binding left free as a small terminal loop. Suspended to this by fibre string are three objects, consisting of two thick beads of Kauri gum and a carved bone ornament. Three reasons may be advanced for believing these to be genuinely a part of the gasket in question—1st, the presence of the loop at the end of the tag, ostensibly provided for some purpose or another; 2nd, the fact that the beads resemble in shape certain stone beads on New Caledonian necklets at present in the Museum; and 3rd, that Labillardière states that the New Caledonians carved bone ornaments, which were suspended to necklets. On the other hand, against this last point is Labillardière's statement that bone ornaments of this kind were "indifferently carved." That on the Cook gasket is by no means so, and therefore it is quite within the range of possibility that this appendage may have been subsequently added. Personally I do not think so, for the whole appearance of the suspended objects seems to be genuine.

The only deviation from the structure of these New Caledonian spear-throwers that has so far come under my notice is the figure given by Mr. J. Edge-Partington, representing one with a grummet at both ends, instead of a loop at one and a grummet or overhand knot at the other.*

We may now pass on to a brief consideration of the occurrence of a spear-becket on other South Pacific islands, but at the outset I regret to say that the information at my command is very limited.

The first reference is to the island of Tanna, in the New Hebrides. Cook's statement has already been referred to, but the Rev. G. Turner, a New Hebridean missionary, figures† a

* Album, *loc. cit.*, 2d ser., t. 67, f. 11.

† Nineteen Years in Polynesia, 1861, p. 81.

square-sinnet implement, with five tags to the eye and a thimble, but no collar, whilst the overhand-knot has a free end instead of being incurved to form a crest. Mr. Turner, speaking of coco-nut shell armlets, says—"They wear one, two, three, and sometimes half-a-dozen of these on either arm, close above the elbow, and from them they suspend their spear-thrower and sling." Mr. Hedley has been good enough to reproduce Mr. Turner's illustration (fig. 12).

The spear-becket is also known on Aneiteum, another of the New Hebridean Islands, judging in the first instance from the following remarks of a second missionary, the Rev. A. W. Murray, who in describing the death of a native of that island says*—"As soon as life was extinct the body was laid out on a mat and a spear and a club placed by its side; also, the small noose which is used in throwing the spear was placed on the forefinger of the right hand."

I am under obligations to the Rev. J. H. Lawrie, late of the Free Church of Scotland Mission in the New Hebrides, for the loan of a spear-becket he obtained whilst residing on Aneiteum, represented in fig. 13, also drawn by Mr. Hedley. It is of very simple construction, nine inches long, of a round cord made of plaited rush or grass, a knot at the distal end, and an eye at the proximal, the plait of the latter being more or less flattened, and without any collar, thimble, or tags. It will be observed that the Tanna becket figured by Mr. Turner and that lent me by Mr. Lawrie from Aneiteum differ greatly in construction.

Yet a third island of this group seems to have possessed a spear-becket, for in referring to Vate, Efate, or Sandwich Island, Mr. J. E. Erskine remarks†—"From a village . . . a canoe pushed off to intercept us as we were working in, one of the three men occupying it handing up a becket of plaited cord, such as we had seen in the hands of the Tannese for throwing their spears."

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* Missions in Western Polynesia, 1863, p. 51.

† Journal of a Cruise among the Islands of the W. Pacific, 1853, p. 323.

The Rev. J. Watt Leggatt, of the Amy Gertrude Russell Mission at Aulua, Mallicollo, says his natives do not use a spear-thrower. (Letter to Mr. S. Sinclair, Ap. 27, 1899).

I have now traced the occurrence of this remarkable implement from New Caledonia to three of the New Hebridean Islands, or *vice versâ* as the case may be, for in the present state of our knowledge it is impossible to say on which it originated.

The spear-becket does not appear to be in use in the Solomon Islands, Dr. H. B. Guppy, R.N., having failed to find any trace of it in that group. He says*—"None of the contrivances for assisting the flight of the spear, such as the throwing-stick or the amentum, were employed by the natives of the islands we visited."

Whether or no it occurs in the Admiralty Group is still an open question, for I am unable to find any published evidence of the fact; on the contrary, such as does exist is in the negative. In the "Challenger Narrative"† it is said—"Their only weapons are lances or spears of several kinds, which are thrown with the unaided hand, not even with a cord as in New Caledonia." It must not be forgotten, however, that the "Challenger" Expedition remained but a brief period off the Admiralty Islands, and the members may have failed to notice so small an implement. On the other hand, Mr. R. Parkinson, of Ralum, Blanche Bay, New Britain, a well known contributor to German Ethnological literature, and a traveller of wide range in the South Pacific, assures me that some contrivance of a cord or sling-like nature for spear propulsion does exist amongst these islanders, although he is not acquainted with details of its construction.

A form of spear-thrower was in existence amongst the Maoris. Mr. W. P. Reeves in a recent work‡ says, "With help of a throwing-stick, or rather whip, wooden spears could be thrown in the sieges [of pahs] more than a hundred yards." Confirmation

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* Solomon Islands and their Natives, 1887, p. 72.

† Challenger Narrative, i., Pt. 2, p. 718.

‡ The Long White Cloud, *Ao-tea-roa*, 1898, p. 48.

of this statement is to be found in a paper* by Dr. von Luschan, who quotes Professor Bastian† to the effect that a specimen of the hurling implement of the Maoris was deposited in the South Kensington Museum, London. It is, however, in a paper by Mr. Coleman Phillips‡ and through the labours§ of Mr. A. Hamilton, of Otago, that we gain a fuller knowledge of a spear-propelling medium in New Zealand. The *Kotaha*, as it was called, consisted of a sling-stick "with a hole at one end, through which was passed a dog-skin thong, knotted at both ends." The distal end of the thong with its knot was passed round the arrow, or dart, much in the same way as the New Caledonian *Ounep* was round the spear. "The darts were stuck loosely in the ground . . . at a proper inclination before the thong was attached"; this attachment "was necessarily such as to give a strong strain, or pull, during the throw, whilst admitting of instant release when the arrow was ready to commence its free flight." It may be likened to the *Fustibalus* or staff-sling of olden times, "a common sling attached to the end of a shaft and used for heavier stones."|| Mr. Phillips points out that the New Zealand implement has now degenerated into a toy.

Just as that sacred and venerated implement the "Bull-roarer" or "Whirler" of the Australian black is represented in the boyhood games of Britain, so, strange as it may appear, is the becket of the South Pacific. Mr. E. R. Waite informs me that amongst boys in Yorkshire a somewhat similar sling is used for the propulsion of sticks and reeds. A young friend of Mr. Waite's, Master Allan McCulloch, has called my attention to a short article on "Throwing Sticks" by Mr. S. Gibney in the "Boy's Own Paper"¶ in which this very child's amentum is described.

* Das Wurfholz in Neu-Holland und in Oceanien. *Bastian-Festschrift*, 1896, p. 131, note 1.

† Inselgruppen in Oceanien, p. 199.

‡ Trans. N.Z. Inst. for 1877 (1878), x., p. 97.

§ Illustrations of Maori Art, Pt. 3, 1898, p. 244, f. 2.

|| Mason, *loc. cit.*, p. 381.

¶ The Boy's Own Paper, 1892, xiv., p. 574.

Mr. Gibney says—"The string should be of medium thickness, firmly twisted but not stiff. Take a piece of this, a little over a foot in length, and make a knot at one extremity, and your throwing apparatus is ready. When you wish to make a throw, twist the knotted end of your string round the wand, some inches from the end, winding some of the other end of the string round your hand until the string being tight, you can hold the wand about the middle. By adjusting the string, as shown in fig. 3,* placing the long end over the knot, you will make it grip the wand perfectly tightly as long as you keep the string taut. But the moment it is slackened, as it is when that part comes over your hand in its discharge, it comes undone and leaves the wand of itself. The string acts the part of the throwing stick."

I now pass on to a subject of equal importance, but of a rather speculative nature, and would guard the reader against accepting the following suggestion as anything more than a statement of opinion, as I am not in possession of any positive evidence to support it. Three spears in the Museum Collection, made of a fine palm wood and beautifully ornamented towards the butts with string lashing, are provided at or about the point of equipoise with a number of free hanging strings (figs. 16-18), terminating in small tassels. The spears are respectively seven and a half feet and six and a half feet long, and the longer are butted with the tibias of the Island Cassowary or Mooruk (*Casuarius Bennettii*, Gould); the shorter one is all wood. The tassel strings are three, four and five inches long, but the first has obviously been much worn. Above the butts all three spears are elegantly ornamented with string lacing, which in each case projects forward in two sharp points, one on either side of a spear, with v-shaped indents between. These portions are all highly ruddled. Mr. J. Edge-Partington figures† one of these spears with a tassel, purporting to come from New Britain, but in all probability it is from the same neighbourhood as the present weapons. He does

* Fig. 15 of this Paper.

† Album, *loc. cit.*, Ser. 1, t. 252, f. 9.

not make any particular reference to it. The point I wish to emphasise is that the tassels are at the point of equipoise, and on grasping either of them by certain of the fingers, its strings and tassels, when held between or around the remaining fingers, would, it seems to me, enable a much stronger and steadier impulse to be given to the spear in its flight. If my assumption should prove to be correct, it is then naturally followed by the question which of the two, the string and tassels or the *Ounep*, is the more archaic? The former I suspect. On showing these spears to Mr. R. Parkinson, already favourably referred to, he at once said that they came either from the northernmost part of New Ireland or New Hanover, and authorised me to say that the suggested use of the string and tassel is probably the correct one.

Mr. Parkinson further described to me another contrivance, probably intended to assist in spear propulsion, that he had seen on the islands off Dalman Harbour, German New Guinea. This consisted of a short spike or peg fastened to a spear at the point of equipoise, and directed obliquely backwards, *i.e.*, towards the butt of the spear. Although not seen in actual use, he supposes this to have been a finger catch, or cleat, to enable the thrower to obtain a secure and at the same time a lighter grip of the spear than would be given by grasping it in the usual way.

DESCRIPTION OF A NEW PARDALOTE, ITS NEST AND EGGS FROM VICTORIA.

By Robert Hall.*

(Communicated by the Secretary.)

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* Paper withdrawn, as a comparison of the specimens of the supposed new species with a series of specimens of *P. assimilis*, Ramsay (*P. affinis*, Temm., subsp. *assimilis*, Ramsay, according to Dr. Sharpe) in the Australian Museum, showed it to be a phase of this bird, not previously recorded from Victoria.—Ed.

NOTES AND EXHIBITS.

Mr. Percy E. Williams exhibited the stalked and ribbed cocoon of Lewin's Case-Moth (*Clania lewinii*, Westw., fam. *Psychidæ*) found on an Angophora, to the ribbed capsules of which the cocoon bears in many respects a striking resemblance.

Mr. W. W. Froggatt showed specimens of similar cocoons affixed to twigs of a Eucalypt whose capsules do not resemble the cocoons; so that the association of species noticed by Mr. Williams is probably accidental and without special significance.

Mr. Froggatt also exhibited a collection of 25 species of Termites from Borneo, Sarawak, and Africa, named and described by Mr. G. D. Haviland (Journ. Linn. Soc. Zoology, Vol xxvii., 1898), and received from Dr. D. Sharp, Curator of the Zoological Museum, Cambridge, where the types are deposited.

Mr. Rainbow exhibited a small quantity of silk spun by spiders of the genus *Nephila*, Leach, and drew attention to its great strength. Native birds, like *Zosterops*, are often caught in the webs of these spiders, and hang there until the wind and weather have reduced them to absolute skeletons.

Mr. Edgar R. Waite communicated the following

Notes on the Range of *Crocodilus* and *Brachylophus*.

Having recently written to Mr. Boulenger with reference to the inclusion of Fiji in the habitat of *Crocodilus porosus*, Schn., (Boulenger, Cat. Chel. & Crocod. in the Brit. Mus., p. 285), Mr. Boulenger replies that he had simply accepted Strauch as his authority. I learn, however, that crocodiles are unknown in Fiji, and though negative evidence is the least satisfactory, yet in the case of such a large and dangerous reptile, native testimony can safely be accepted. The only evidence I have of a crocodile having occurred there is that supplied by Mariner ("Natives of the Tonga Islands," i. 1817, p. 334), who, from hearsay, describes how an *enormous lizard*, which he supposed must have been a crocodile, had destroyed nine people before being captured. "It was the first animal of the kind the natives had ever seen or ever heard of." I have not access to Strauch's work (Syn. Crocod., pp. 52 and 99, 1866), but it seems probable that both Lesson (Ann. des Sci. Nat. v. 1825, p. 184, footnote) and Strauch had included Fiji on the authority of the account mentioned, the latter writer surmising that the species must have been *C. biporcatus* (= *C. porosus*). Mariner's account was supplied (to Martin) in 1811, and the reported occurrence took place probably years before that date; since when no crocodile has ever been heard of. The status of the crocodile in Fiji is that, not of a resident but of a single accidental visitant; we are therefore, I submit, scarcely justified in continuing to include it as a member of the fauna of that group. At the same time I inquired of Mr. Boulenger his authority for referring *Brachylophus* to the Tongan or Friendly Islands (Boulenger, Cat. Lizards, Brit. Mus. ii., p. 192). Inasmuch as the Tongan Islands are of coral formation, and consequently the seat of an oceanic fauna, and since *Brachylophus* would appear to be a continental type, its occurrence there would not have been anticipated. Mr. Boulenger's reply was completely satisfactory, for he mentions that the British Museum had received a specimen, obtained by Mr. J. J. Lister at Tongatabu. It would, however, be interesting to ascertain if the Tongans were in the habit of bringing the lizard from Fiji, as we know they used to carry other Fijian articles, such as parrots, pottery, and produce of all sorts. In this way the suggested anomaly might be explained, or indeed it might be that the lizards or their eggs had found passage by natural conveyance; perhaps much after the manner of *Amblyrhynchus* and *Conolophus* in the Galapagos Islands, creatures which have apparently died out in their ancestral home. The question I would raise is—Is *Brachylophus* found wild, feral, or as a pet only, in Tonga?

Mr. Hall sent for exhibition, to illustrate his paper, a photograph of the nest and eggs, and five skins (♂, ♀, adult, and immature) of the Victorian Pardalote described therein; and skins of *P. ornatus* and *P. affinis*.

Mr. Lucas stated that in a carefully gathered collection of lizards which he had received from Tonga, *Brachylophus* was not represented, and the species was not known to him from that locality. Mr. Lucas also offered some remarks on the flora and fauna of the Kosciusko Plateau; and on behalf of Mr. Guy Thornton of New Zealand, who was present, he exhibited a large collection of the New Zealand Cordyceps or Vegetable Caterpillar.

Mr. Fred. Turner showed specimens of, and communicated the following

Note on, *Chloris truncata*, R.Br.,
The "star-" or "windmill-grass," with abnormally developed inflorescence:—

When botanising on the Macquarie River, near Dubbo, early in the present month (May), I found many plants of *Chloris truncata*, R.Br., in bloom, several of which had developed an abnormal inflorescence of an interesting character. The spikes were arranged in two series; the lower ones exhibited the normal number—from six to ten—but one of them was distinctly bifurcated. The upper series had developed from four to six spikes. The secondary peduncle, which was produced from the apex of the principal one, was from half to one and a half inches long. So far as I am aware, the only other recorded instance of this grass developing abnormal inflorescence was furnished by some specimens the Rev. F. E. Haviland, of Gulgong, sent to me for identification in 1893. The secondary peduncles of Mr. Haviland's specimens were about two and a half inches long, but the number of spikes was about the same as on those I collected near Dubbo.

Mr. Stead exhibited pieces of Hawkesbury sandstone from the neighbourhood of Sydney, tunnelled in a remarkable manner by Hymenoptera (*Saropoda* sp.?) as some observers suppose, or by Termites, as Mr. Froggatt believes.

Mr. Maiden exhibited a pot-plant of the Indian *Ceropegia elegans*, Wall., sometimes mistaken for Aristolochia. Mr. Maiden also took the opportunity of mentioning that the new orchid-house at the Botanical Gardens was on the point of completion, and that he would be glad to receive specimens of Australian orchids with a view to a more systematic cultivation of this section of the flora.

Mr. Etheridge exhibited a collection of spears, throwing-cords, and photographs in illustration of his paper.

Mr. Palmer exhibited portion of the trunk of a Eucalypt and a quantity of chips torn therefrom, to show to what purpose the Black Cockatoos can use their enormously powerful mandibles when engaged in the search for boring longicorn larvæ. The stem of the tree exhibited had been ripped up and almost severed, and was one of a number more or less similarly treated at Lawson, Blue Mountains.

The President exhibited a specimen of the Sydney Bush-Rat (*Mus arboricola*, W. S. Macleay, or *M. rattus* according to Mr. Oldfield Thomas) from a garden at Double Bay, together with the gnawed branches of a Bougainvillea, which was threatened with destruction. He also remarked, in reference to Mr. Palmer's exhibit, that in his grounds at Springwood the Black Cockatoos had succeeded in ring-barking some trees of one of the Manna Gums one foot in diameter, in pursuit of boring grubs.

WEDNESDAY, 28TH JUNE, 1899.

The Ordinary Monthly Meeting of the Society was held at the Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesday evening, June 28th, 1899.

The Hon. James Norton, LL.D., M.L.C., President, in the Chair.

Dr. Wilhelm Finselbach, 9 George-street West; Mr. Albert E. Flavelle, Concord; Mr. Arthur A Hamilton, Centennial Park, Sydney; Dr. John Hay, North Sydney; Mr. Esca Morris Humphery, Elizabeth Bay; Dr. Charles MacLaurin, Sydney; Mr. Harold Sutcliffe Mort, Woollahra; Mr. James Douglas Stewart, M.R.C.V.S., Sydney; and Mr. Walter G. Woolnough, B.Sc., Demonstrator of Geology, Sydney University, were elected Ordinary Members of the Society.

DONATIONS.

Department of Agriculture, Brisbane—Queensland Agricultural Journal. Vol. iv. Part 6 (June, 1899). *From the Secretary for Agriculture.*

Four Botanical Pamphlets (from Queensland Agricultural Journ. Vol. iv. Parts 1, 3, 4: Jan.-April, 1899). By F. M. Bailey, F.L.S. *From the Author.*

Department of Agriculture, Sydney—Agricultural Gazette of New South Wales. Vol. x. Part 6 (June, 1899). *From the Hon. the Minister for Mines and Agriculture.*

Royal Geographical Society of Australasia, New South Wales Branch—Proceedings. Vols. ii -iv. (1885-88): Journal. Vols. v. and vi. Nos. 1-6 (1893-98). *From H. S. W. Crummer, Esq.*

Royal Society of New South Wales—Abstract of Proceedings, June 7th, 1899. *From the Society.*

The Surveyor, Sydney. Vol. xii. No. 6 (June, 1899). *From the Editor.*

University of Sydney—Calendar for the Year 1899. *From the Senate.*

Wealth and Progress of New South Wales, 1897-98. Eleventh Issue (1899). *From the Government Statistician.*

Australasian Journal of Pharmacy, Melbourne. Vol. xiv. No. 162 (June, 1899). *From the Editor.*

Field Naturalists' Club of Victoria—Victorian Naturalist. Vol. xvi. No. 2 (June, 1899). *From the Club.*

University of Melbourne—Examination Papers: Matric. May, 1899. *From the University.*

Department of Mines and Water Supply of Victoria—Annual Report for the Year 1898. *From the Secretary for Mines.*

American Academy of Arts and Sciences, Boston—Proceedings. Vol. xxxiv. Nos. 2-7 (Nov.-Dec., 1898). *From the Academy.*

American Geographical Society, New York—Bulletin. Vol. xxxi. No. 2 (1899). *From the Society.*

American Museum of Natural History, New York—Bulletin. Vol. x. (1898): Vol. xii. Art. v. (pp. 81-107: May, 1899): Memoirs. Vol. ii. Part ii., (Anthropology i.) (Nov., 1898). *From the Museum.*

Field Columbian Museum, Chicago—Report Series. Vol. i. No. 4 (Oct., 1898). *From the Museum.*

The American Naturalist (Cambridge). Vol. xxxiii. No. 389 (May, 1899). *From the Editor.*

Denison University, Granville, Ohio—Bulletin of the Scientific Laboratories. Vol. x. Memorial Volume (Aug., 1897); Vol. xi. Articles i.-iii. (pp. 1-73: March-Nov., 1898). *From the University.*

Missouri Botanical Garden, St. Louis—Ninth Annual Report, 1898. *From the Director.*

Smithsonian Institution, Washington—Annual Report of the Board of Regents to July, 1896. *From the Secretary.*

U.S. Department of Agriculture, Washington: Division of Biological Survey—North American Fauna. No. 14 (April, 1899): Division of Vegetable Physiology and Pathology. Circular No. 17 (1899); Farmers' Bulletin, No. 91 (1899); Report, No. 59 (1899): Yearbook, 1898. *From the Secretary of Agriculture.*

Wagner Free Institute of Science, Philadelphia—Transactions. Vol. iii. Part iv. (April, 1898). *From the Institute.*

Washington Academy of Sciences—Proceedings. Vol. i. (pp. 1-110: April-May, 1899). *From the Academy.*

Wisconsin Academy of Sciences, Arts and Letters, Madison—Transactions. Vol. xi. (1896-97). *From the Academy.*

Wisconsin Geological and Natural History Survey, Madison—Bulletin No. 1. (Economic Series, No. 1; 1898); Bulletin No. 2. (Scientific Series, No. 1; 1898). *From the Director.*

Zoological Society of Philadelphia—Twenty-seventh Annual Report, 1899. *From the Society.*

Museu Paraense de Historia Natural e Ethnographia, Pará—Boletim. Vol. ii. No. 4 (Dec., 1898). *From the Museum.*

British Museum (Nat. Hist.), London—Catalogue of Birds. Vol. xxvi. (1898): Catalogue of Welwitsch's African Plants. Parts ii.-iii (1898): List of the Types and Figured Specimens of Fossil Cephalopoda (1898): Catalogue of the Lepidoptera Phalænæ. Vol. i., text and Plates (2 vols., 1898). *From the Trustees.*

Geological Society, London—Quarterly Journal. Vol. lv. Part 2 (May, 1899): Geological Literature during the Year 1898. *From the Society.*

Manchester Literary and Philosophical Society—Memoirs and Proceedings. Vol. xliii. Part 1 (1898-99). *From the Society.*

Royal Microscopical Society, London—Journal, 1899. Part 2 (April). *From the Society.*

Royal Society, London—Proceedings. Vol. lxiv. Nos. 412-413 (April-May, 1899). *From the Society.*

Zoological Society of London—Abstract, 18th April; 2nd and 16th May, 1899. *From the Society.*

Royal Physical Society, Edinburgh--Proceedings. Vol. xiv. Part 1 (Session 1897-98) *From the Society.*

Société Royale de Géographie d'Anvers—Bulletin. Tome xxii. 4e Fasc. (1898); Tome xxiii. 1er Fasc. (1899). *From the Society.*

Société Royale Linnéenne de Bruxelles—Bulletin. 24me Année No. 6 (Avril, 1899). *From the Society.*

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ON THREE NEW SPECIES OF EUCALYPTUS.

By R. T. Baker, F.L.S., Curator, Technological Museum, Sydney.

(Plates xx.-xxii.)

Eucalyptus Smithii, n.sp.

(Plate xx.)

A tall tree sometimes attaining a height of 150 feet and a diameter of from 2 to 4 feet. Bark on old trees deeply furrowed and dark grey to blackish, standing between a Stringybark and an Ironbark, but smooth above 10 or 12 feet from the ground to the branches. Young leaves *sessile*, lanceolate or rounded at the base. resembling *E. viminalis*, 5 or 6 inches long, not glaucous. Mature leaves narrow, lanceolate, acuminate, of an equal colour on both sides, not shining, venation not very distinct; lateral veins fine, numerous; intramarginal vein close to the edge; petiole about an inch long. Oil glands very numerous. Peduncles axillary, flattened, about as long as the petiole, with numerous flowers, from 3 to 15. Calyx turbinate, narrowing into a short petiole, the whole 3 to 4 lines long. Operculum hemispherical, shortly acuminate. Stamens all fertile. Anthers kidney-shaped. Ovary flat-topped.

Fruits inclined to hemispherical, occasionally pyriform, 2 to 3 lines in diameter; rim domed, sometimes expanding into a flange; valves exserted, obtuse.

Hab.—Sugar Loaf Mountain, Monga and Irish Corner Mountain. Braidwood (W. Bäuerlen).

This tree as at present known is restricted to a few localities in the south-eastern district of the Colony, and occurs as far as seen on high, steep mountain sides, where it attains its maximum height, 200 feet. The bark is usually smooth except for about 10 feet of the trunk, and peels off in long narrow ribbons as in the case of *E. viminalis*, Labill., and other Eucalypts. The colour of the smooth bark is bluish or various shades of grey; that of the *persistent* bark is of a rich brown or chocolate colour on very old trees and is grey to black like Ironbark and at times nearly as deeply furrowed, approaching in that respect old trees of *E. Sieberiana*, from which, however, in other respects it is quite different. The base bark is very thick and hard. In aspect this tree much resembles *E. fraxinoides*, Deane et Maiden, but the rough bark runs somewhat higher than in that species, is often more grey in colour and of about the same thickness. It is easily known from *E. fraxinoides* by its foliage, buds, fruits, timber, oil, and kino. This tree never has the insect markings so conspicuous as on *E. fraxinoides*.

In none of its aspects would this tree ever be regarded as any of the "Stringybarks." Some of the younger trees have quite smooth bark, which on older trees is even rougher than that of *E. Sieberiana*, F.v.M., and from this feature might be called an "Ironbark," but never a "Stringybark."

It differs from *E. Sieberiana*, F.v.M., in the venation of the leaves, and in the buds, fruits, timber and oil.

The bark has a peculiarly strong, pleasant odour. In making a cross section it has a very peculiar appearance, having a number of streaks or rays of a pithy substance, yellow in colour, radiating from the sapwood outwards to the circumference of the bark (W. Bäuerlen).

In botanical sequence it probably should be placed between *E. Bäuerleni*, F.v.M., and *E. viminalis*, Labill., as in the young state the leaves belong to what may be called the "Viminalis Group" and are quite different from those of the "Stringybark Group."

The venation and shape of the mature leaves, and the fruits distinguish it at once from *E. amygdalina*, Labill., from which also it differs in timber and oil. The presence of manna on this tree shows it also to have no connection with the "Stringybarks." The renantherous anthers in this species are an anomaly.

Timber.—The wood is very hard, close-grained, and of a pale brown colour and can be placed amongst the pale hardwoods of the colony. There are no data as to its durability or seasoning qualities, but it probably ranks with "Blackbutt," *E. pilularis*, Sm.

Kino.—The kino gives a turbid solution in cold water and contains eudesmin but not aromadendrin. This is an instance of a turbid kino produced by a tree whose anthers are kidney-shaped or belong to the section Renantheræ of the Eucalypts. *E. microcorys*, F.v.M., was previously the only exception to the apparent rule that Eucalypts with kidney-shaped anthers gave a kino free from eudesmin or aromadendrin, or in other words were not turbid kinos. The turbidity or otherwise of a kino is therefore no criterion as to the botanical classification of the Eucalypts on the anthereal system (H. G. Smith.)

Manna.—In the chemistry of the oil and kino this tree approaches *E. punctata*, DC., and a further resemblance is shown in that manna has been obtained from it: this differs in no respects from the manna of *E punctata*.

Oil.—The oil is very rich in eucalyptol, and it also contains eudesmol in small quantities. From several distillations the average yield was 1·354 per cent., and when the quality of the oil is considered this yield is very gratifying. The oil is one of the richest in eucalyptol yet distilled at this Museum, being even richer in that constituent than the oil of the Sydney *E. punctata*, DC. No phellandrene is present, the oil consisting almost entirely of dextro-pinene and eucalyptol. Being free from constituents having a high specific gravity, the specific gravity of the oil is comparatively low, although containing over 70 per cent. of eucalyptol.

This species is named in honour of my colleague, Mr. H. G. Smith, F.C.S., whose labours in the field of organic chemistry have added much to the knowledge of the economics of the genus *Eucalyptus*, and have so materially assisted me in diagnosing the new species described by me.

Eucalyptus Dawsoni, sp.nov.

(Syn. *E. polyanthema*, Schau., var. (c), mihi, Proc. Linn. Soc. N.S.W., 1896, p. 448.)

"Slaty Gum."

(Plate xxi.)

A tall tree with a smooth bark, the foliage, branchlets, buds and fruits glaucous. Young leaves broadly lanceolate, 6 inches long and over 3 inches wide, on a petiole over an inch long, very obtuse, glaucous on both sides, venation distinct. Mature leaves mostly short, oblong-lanceolate, very obtuse, rarely acuminate, occasionally reddish in colour, venation fairly distinct, lateral veins not distant, intramarginal vein close to the edge. Peduncles axillary but mostly in large terminal corymbs, exceeding the leaves. Buds on *young trees* 3 lines long, 1½ lines in diameter, sessile or on short pedicels; operculum hemispherical, obtuse; on mature trees 4 to 5 lines long, 1 line in diameter, the calyx tapering into a filiform pedicel, operculum conical, acute. Ovary domed at the summit. Stamens all fertile, inflexed in the bud, filaments thick in proportion to the diameter of the anthers. Anthers very small, cylindrical, rounded at the base and truncate at the top, opening by terminal pores.

Fruit small, turbinate, pedicel almost filiform, mostly a line in diameter and under 2 lines long, rim thin, capsule sunken, valves not exserted.

This species is one of the finest representatives of the genus Eucalyptus, whether from a picturesque or an economic point of view. On the whole watershed of the Goulburn River it grows to a great height with a splendidly straight, branchless trunk, and always occurs under the ridges, never being found on the summit nor at the base; and owing to its glaucous leaves it can easily be detected from the dark green foliage of its congeners—the Stringy-barks in this particular instance.

I was at one time (*loc. cit.*) inclined to class this species as a variety of *E. polyanthema*, Schau., owing to the similarity of fruit and colour of timber, but a further examination of the various parts of the tree and the aid of chemistry have led me to alter my earlier opinions.

The sucker and mature leaves of both species are different as well as the venation. The leaves of "Slaty Gum" are almost always glaucous as well as the buds and fruits, a feature rarely found in *E. polyanthema*, Schau. The timber is of excellent quality and equal to Ironbark in durability; in fact I half suspect that this species is the "Grey Gum-tree" of W. Hill referred to by Baron von Mueller (Eucalyptographia, Decade iv.) and placed under *E. crebra*, F.v.M. The fruits and the timber of the two species certainly are similar, but they agree in no other character and therefore should not be confounded.

The differences between it and *E. largiflorens*, F.v.M., are found in the venation, shape of fruits, *anthers*, size and habitat of tree, and quality of timber, as well as the chemical constituents of the oil.

According to Bentham's anthereal system, this species is placed in the section Porantheræ of the Eucalypts. The shape of the leaves allies it with *E. largiflorens*, F.v.M., and the fruits to *E. crebra*, although this latter species belongs to the section Parallelantheræ of Eucalypts. The smooth bark and reddish timber give it some affinity with *E. polyanthema*, but it differs from this species in other characters and products. It is, however, more closely allied to *E. polyanthema* and *E. largiflorens* than to any other species, and in botanical sequence is placed after the former.

Timber.—The timber varies in colour from pinkish to the dark red shade of the "Broad-leaved Ironbark," *E. siderophloia*, Benth., from which timber it is often impossible to distinguish it either macroscopically or microscopically. It is a very hard, close, straight-grained timber, possessing all the qualities of our most durable and valuable "Ironbarks."

"In lower ground, or the valleys between hills where the rock appears more decomposed, it rises to 100 or 120 feet, and is a fine tree. The wood of the Slaty Gum is considered by practical men to be as good and durable as Ironbark. It is red in colour, easily worked, and exceedingly strong, being well adapted for weather-boards, fencing, wheelwrights' work, railway sleepers, rough carpentry, and bridges. I saw in the neighbourhood of Mudgee several bridges which had been constructed of Slaty Gum, and, as they had stood for many years without any apparent decay, there was certainly a good proof that the wood bears exposure to all weathers." (Rev. Dr. W. Woolls).

Oil.—The yield of oil is poor, averaging only ·172 per cent. Its specific gravity is ·9414 at 15° C. This oil is a remarkable one and distinctly different from any other Eucalypt oil yet distilled at this Museum. It contains no eucalyptol, but a fair percentage of phellandrene is present. The principal constituent appears to be a sesquiterpene. Although at present apparently useless for commercial purposes, yet it has great scientific interest, and further inquiries are now being undertaken respecting it.

Kino.—This exudation gives a turbid solution in cold water, and it was found to contain eudesmin but not aromadendrin. The anthers opening by pores point to the fact that Eucalypts having these anthers do not necessarily exude a kino free from eudesmin and aromadendron, or, in other words, may give turbid kinos. Fresh material and some that had been in the Museum for 10 years gave exactly the same chemical results (H. G. Smith).

Pathological Note.—A remarkable entomological feature in connection with this species is perhaps worthy of note. At certain seasons of the year the leaves of this tree alone are affected by a species of *Psylla*; the insects eat off the cuticle of the leaves, giving the whole country side an appearance in the distance as if a bush fire had passed over it.

The species is named after Mr. James Dawson, L.S., of Rylstone, who was the first to draw my attention to the qualities of the timber of this species, and who aided me in procuring botanical and other material for its diagnosis.

Hab.—Ridges on the watershed of the Goulburn River, (R.T.B.) across the main "Divide" at Cassilis and north-west to Pillaga (Prof. Warren).

It occurs probably at or near Yass, as I have some fruits of this species with that locality queried.

Eucalyptus camphora, sp.nov.

"Sallow" or "Swamp Gum."

(Plate xxii.)

A rather small tree, about 20 to 30 feet high, with a black decorticating bark. Young leaves ovate, obtuse, under 6 inches long, $3\frac{1}{2}$ inches broad, on angular petioles of $\frac{1}{2}$ inch, coriaceous, glaucous. Mature leaves ovate-elliptical, abruptly acuminate, under 4 inches long, or lanceolate, acuminate and 6 inches long; thinly coriaceous, glaucous, venation distinct, particularly so in young leaves, intramarginal vein removed from the edge. Peduncles few, axillary, flattened, bearing 5 or 6 shortly pedicellate or sessile buds. Calyx turbinate, inclining to hemispherical, 1 line long, 1 line broad; operculum acuminate, about 2 lines long. Ovary domed. Anthers parallel, opening by longitudinal slits.

Fruits small, turbinate, 3 lines long, 2 lines in diameter, rim flat, valves exserted.

It is a very umbrageous tree, attaining a height from 30-60 feet and a diameter up to 3 feet, usually rather crooked and essentially a swamp or wet ground species. Occurs also on the banks of creeks or rivers, as for instance at Delegate on the banks of the Delegate River, usually associated with *E. stellulata* and *E. paludosa*. From the former it is quite easily distinguished by its leaves, although otherwise in appearance of growth, branches, bark, &c., the two resemble each other somewhat. Its branches never have, however, that yellow-green colour which distinguishes *E. stellulata* so readily, but are of an ashy-grey or brownish-grey colour, sometimes approaching even to a sooty-black. The persistent bark is also of a different texture, while in *E. stellulata* on very old trees it approaches almost that of an Ironbark. From *E. paludosa*, R.T.B., it is easily distinguished, especially in older trees, but the leaves are broader and rounder, often considerably broader than long, and the apex quite blunt, sometimes obcordate. The leaves on the higher branches approach more those of *E.*

melliodora than perhaps those of any other species. *E. paludosa* is not so essentially a swamp or wet ground species, as it occasionally occurs on dry ground; it also grows a larger tree and is more apt to be straight than this new species; the persistent bark is also quite different and decorticates in long flakes. When young trees of it and *E. paludosa* are seen growing in company the two are not likely to be confounded, as the young leaves and bark of each species are quite different.

Like *E. paludosa*, it has very probably been classified with *E. Gunnii*, Hook. f., but it differs from this latter species in leaves, fruits, timber, oil, &c. The colour of the bark and the disposition of the buds bear some resemblance to *E. stellulata*, but it does not resemble it in any other characters.

Timber.—The timber is blackish and of very little value, whilst that of *E. paludosa* is much harder and more durable and of a lighter colour. In botanical sequence it probably follows *E. paludosa*. Oil glands have been recorded as occurring in many parts of Eucalyptus trees, but it has probably never been found before to occur in the anther connective as in this species. This feature is shown in Plate xxi., fig. 6.

Oil.—The most important economic product of this tree is its essential oil. On rectification this oil was found to contain a fraction boiling between 280°-290° C., equalling 18 per cent. of the whole, and which consisted almost entirely of eudesmol, comparatively in a pure condition. The fraction wholly crystallised in less than one hour. This oil appears to be free from bodies, also of high boiling point, that have previously been found to interfere with and to make the purification of this stearoptene difficult. If eudesmol should be found eventually to be of medicinal value, or useful for other purposes, we have in this oil a most prolific source of the material.

The average yield of the oil is ·398 per cent. It consists of eudesmol, pinene and eucalyptol. No phellandrene was detected. The specific gravity of the crude oil is ·9167 at 15° C.

For the chemistry of this camphor see a forthcoming paper by H. G. Smith, F.C.S., in Proc. Roy. Soc. N.S.W. for 1899.

Kino.—No specimen of this body has yet been obtained.

Hab.—It was first discovered by me at Ganguddy Creek, Kelgoola, Rylstone, in 1895, and afterwards in 1897 at Narango. It has since been found at Delegate (Hayden's Bog; W. Bäuerlen). It also occurs near Tumut. As these latter localities are distant 300 and 200 miles respectively from where it was originally discovered, and the botanical and economic characters never seem to vary, it thus stands as a very constant species.

Pathological Note.—The leaves from the three above localities not only resemble each other exactly, but are all affected apparently by the same species of insect—evidenced by numerous uniform black spots.

EXPLANATION OF PLATES.

Plate xx.

Eucalyptus Smithii.

Fig. 1.—Sucker-leaves.
Fig. 2.—Twig, with mature leaves and buds.
Fig. 3.—Section of bud (enlarged).
Fig. 4.—Anther (enlarged).
Figs. 5-9.—Fruits.

Plate xxi.

Eucalyptus Dawsoni.

Fig. 1.—Young leaves.
Fig. 2.—Terminal twig, with buds.
Fig. 3.—Acuminate leaf (rare form).
Fig. 4.—Buds of a young tree 15 feet high.
Fig. 5.—Section of bud (enlarged).
Fig. 6.—Anthers (enlarged).
Fig. 7.—Fruits.

Plate xxii.

Eucalyptus camphora.

Fig. 1.—Twig, with buds and fruits.
Figs. 2-3.—Individual leaves.
Fig. 4.—Sucker-leaf.
Fig. 5.—Section of bud.
Fig. 6.—Back view of anther, showing oil globule in connective (enlarged).
Fig. 7.—Front view of anthers.

ON A MICRO-FUNGUS FROM MOUNT KOSCIUSKO; AND ON THE FIRST RECORD OF *UNCINULA* IN AUSTRALIA.

By D. McAlpine.

(Communicated by J. H. Maiden, F.L.S.)

Puccinia calthæ, Link.

(Plate xxiii., figs. 1-4).

Aecidiospores—Pseudoperidia distributed on upper surface of leaf and often confluent; white, margin laciniate, about $\frac{1}{3}$ mm. diam. Pseudoperidial cells pentagonal or hexagonal, margin finely streaked, 28-32 μ. Spores bright orange, angular to subglobose or oval, finely echinulate, average 22-23 × 17-20 μ.

On living leaves of *Caltha introloba*, F.v M.; January, 1899; Mt. Kosciusko, N S.W. (Maiden).

Greville* describes the Aecidium as hypophyllous and on the petioles, but here it was epiphyllous and only on the blade of the leaf. The spores and pseudoperidial cells quite agree with British specimens.

There is a special interest attaching to this fungus from its geographical distribution. The host-plant was found in a rocky creek, on eastern side of Mueller's Peak, Mt. Kosciusko, at a height of about 6,500 feet. This was the only micro-fungus found there by Mr. Maiden, and at that season of the year (January) only the Aecidium-stage occurred. This is the first record of the fungus in Australia. It occurs also in Europe and America. Hitherto it has only been found on the Marsh Marigold (*Caltha palustris*, L.)

* Flora Edinensis. p. 446, 1824.

UNCINULA AUSTRALIANA, n.sp.—**Australian Uncinula.**

(Plate xxiii., figs. 5-9).

On twigs and leaves and covering entire inflorescence with a greyish-fawn, firm, powdery mass, usually studded over with the minute, black perithecia.

Conidial stage—Hyphæ very slender, colourless, septate, branched, often only 1 μ broad and up to $2\frac{1}{2}$ μ. Conidia in chains, colourless, oblong, with finely granular contents, constant in size, $30 \times 13\text{-}14$ μ; (stained golden brown by potassium-iodide-iodine).

Perithecial stage—Perithecia intermixed with the conidia, densely gregarious, black, punctiform, dark brown by transmitted light, globular, with bulging boss-like polygonal markings on wall, 112-130 μ diam.; appendages rigid, radiating, occasionally forked, moderately numerous, hyaline, but basal portion brown, sometimes slightly swollen and marked off by a septum, rather longer than diameter of perithecium, average breadth 6 μ, apex involute.

Mature asci and sporidia not found. Immature asci (4) colourless, roughly pear-shaped, with finely granular contents, except at tapering end, 28×22 μ.

Immature sporidium colourless, elliptical, with finely granular contents, 13×10 μ.

On *Lagerstræmia ovalifolia*, Teys.; February-May; Botanic Gardens, Sydney. Received from Mr. J. H. Maiden, but first observed by his assistant, Mr. A Grant.

Although the perithecia are very numerous, mature asci were not distinctly found, and this is not because they have already burst and shed their spores, but that they are not yet formed, the contents of the perithecium usually consisting of formative material and oil globules. In apparently older perithecia, the contents are of a bright yellow colour.

Fresh specimens were obtained in both February and May, and the perithecia do not seem to mature their asci. The appendages were usually simple, but forking occasionally occurred, sometimes just at tip, sometimes almost at base. In some of the forks the apex was pointed instead of being coiled.

This is the first time the genus has been recorded for Australia, hence the specific name. Fungi are only recorded on *L. indica*, L., but no Erysipheæ.

I am indebted for the drawing of the perithecium (fig. 6) to Mr. C. C. Brittlebank.

EXPLANATION OF PLATES.

Puccinia calthæ, Link.

Fig. 1.—Dwarf plant shewing Aecidia on upper surface of leaf (× 2).
Fig. 2.—Aecidiospores (× 1000).
Fig. 3.—Aecidiospore from British specimen of *Caltha palustris* (× 1000).
Fig. 4.—Pseudoperidial cells shewing marginal streaks (× 540).

Uncinula australiana, n.sp.—Australian Uncinula.

Fig. 5.—Conidia in chains (× 540) and solitary (× 1000).
Fig. 6.—Perithecium with contents protruding (× 270).
Fig. 7.—Forked appendages.
Fig. 8.—Ordinary appendage (× 540) and coiled tip (× 1000).
Fig. 9.—Immature ascus with sporidium (× 1000).

CONTRIBUTION TO A KNOWLEDGE OF THE ARANEIDAN FAUNA OF SANTA CRUZ.

By W. J. Rainbow, F.L S.,
Entomologist to the Australian Museum.

(Plates xxiv.-xxv.)

During the latter part of 1897, Mr. John Jennings, formerly of the Australian Museum, paid a short visit to the Island of Santa Cruz, in the South Pacific, and whilst there made a small collection of Araneidæ. This he handed over to me shortly before his departure for Europe, with the request that I should draw up a list of the forms obtained, and describe and figure any that might prove to be new or of exceptional interest. The results of my investigation are enumerated below, by which it will be seen twenty-four species are recorded, ten of which are new to science. It has been necessary also to create two new genera—*Eunesiotes* and *Gnathopalystes*. With the type species of the former genus I have taken the liberty of associating Mr. Jennings' name as a permanent tribute to his endeavour to bring together a large and systematic zoological collection of an island, the fauna of which is absolutely unknown. Unhappily his effort in the direction referred to was marred by an attack of island fever, a malady so prevalent and distressing to new comers.

The present contribution, although a small one, is of more than passing value, seeing that it is the first systematic record of any branch of zoology from this island. Only one paper dealing with its conchological fauna has, so far, been published, and this from the pen of my colleague, Mr. Chas. Hedley.* Otherwise nothing is known of Santa Cruz, either as regards its Mammals, Reptiles, Birds—or its Botany. Here, then, is a field, close to home,

* "Description of a New Bivalve, *Lima alata*, from Santa Cruz." Rec. Aust. Mus., Vol. iii. No. 4. 1898, p. 84.

altogether unexplored; and who can say what it may bring to light, when systematically worked, that will prove of value and interest to the biologist?

Now that these South Pacific Islands have been brought under the British flag, it may not be out of place here to suggest that a more appropriate or distinctive name be chosen. This would have many advantages; in the first place it would remove the confusion that at present exists when the name of Santa Cruz is mentioned. On referring to an atlas it will be seen that there are three large islands bearing this name: one off the coast of California, a second in the West Indies (Caribbean Sea), and a third the island and archipelago in the South Pacific. The name Santa Cruz has been indiscriminately bestowed upon numerous occasions, having been used for towns, mountains, rivers, islands and an archipelago. In respect of the island under consideration, Nitendi was the old native name.

Family AVICULARIDÆ.

Subfamily AVICULARIINÆ.

Genus Ischnocolus, Auss.

1. Ischnocolus nebulosus, sp.nov.

(Plate xxiv., fig. 1.)

♀. Cephalothorax 4·6 mm. long, 3·9 mm. broad; abdomen 7·8 mm. long, 5 mm. broad.

Cephalothorax obovate, convex, glabrous, brown, pubescent. *Caput* sparingly pubescent, strongly arched, sloping forward, truncated in front, where it is margined with a broad, pallid band. *Clypeus* broad, moderately arched, pubescent, radial grooves distinct, junction of cephalic and thoracic segments indicated by a deep transverse indentation or cleft. *Marginal band* broad and of a pallid tint.

Eyes mounted on a transversely oval tubercle, and arranged in two rows consisting of three series of 4, 2, 2; the first series form a slightly procurved row, and of these the median eyes are somewhat the largest of the group; those constituting the posterior row are distributed in pairs, and of these the lateral eyes are somewhat the largest.

Legs yellow-brown, moderately long and strong, densely clothed with coarse yellowish hairs, and armed with long thin spines; metatarsi and tarsi furnished with scopulæ; tarsal claws long and strong. Relative lengths: 4, 1, 2, 3.

Palpi long, strong, similar in colour and armature to legs; each palpus terminating with a claw and scopula.

Falces long, strong, projecting well forward, yellow-brown, densely clothed with coarse yellowish hairs; fangs long.

Maxillæ long, narrow, divergent, yellowish-brown, densely clothed with long yellowish hairs.

Labium concolorous, arched, broader than long, truncated at apex.

Sternum concolorous also, longer than broad, shield-shaped, flat, densely clothed with coarse hairs or bristles.

Abdomen obovate, moderately projecting over base of cephalothorax, clothed with fine, yellowish hairs; colour yellow-brown with dark cloudy markings; the two superior spinnerets long and cylindrical.

Epigyne a simple transverse slit with a strongly arched overhanging lip.

Family PHOLCIDÆ.

Subfamily PHOLCINÆ.

Genus PHOLCUS, Walck.

2. PHOLCUS ANCORALIS, L. Koch.—Originally recorded from the islands of Upolu and Tonga.

Family ARGIOPIDÆ.

Subfamily ARGYROEPEIRA, Emer.

3. AROGYROEPEIRA CELEBESIANA, Walck.—This species is evidently of Malayan origin, and is widely distributed. From the Malayan region it ranges from the west in Burma, eastward into New Guinea, Australia, and the South Pacific Islands.

Subfamily NEPHILINÆ.

Genus NEPHILA, Leach.

4. NEPHILA MACULATA, Fab.

5. N. MACULATA, Fab., var. PENICILLUM, Dol.—Both widely distributed; ranging from Burma eastward to the South Pacific.

Subfamily ARGIOPINÆ.

Genus ARGIOPE, Aud. et Sav.

6. ARGIOPE ÆTHEREA, Walck.—Mr. Jennings obtained ten specimens of this species, no two of which agree in the scheme of colouration or ornamentation. This species is found in New Guinea, Australia, and many of the South Pacific islands. Dr. Willey collected it at Lifu, in the Loyalty Islands; Keyserling also recorded it from the Loyalty Group.

Genus CYRTOPHORA.

7. CYRTOPHORA MOLUCCENSIS, Dol.—Widely distributed over India, Ceylon, Malasia, Papua, and South Pacific Islands. Dr. Willey collected it at Lifu, Loyalty Islands.

Genus ARANEUS, Clerck.

(= *Epeira* of Authors.)

8. ARANEUS THEISII, Walck —Mr. Jennings obtained a number of this widely distributed and variable form. Comparing them with specimens obtained by Mr. Chas. Hedley at Funafuti, I can see no reason to modify my opinion in respect of species described and figured by me in "Memoirs of the Australian Museum," iii. Part 2. In reference to Mr. Pocock's criticism, I maintain that my species are specifically differentiated according to the ordinary standard, that even an extreme "lumper" would acknowledge some of them to be distinct, and the remainder varieties sufficiently distinct to require designation.

9. ARANEUS SUAVIS, sp.nov.

(Plate xxiv., figs. 2, 2*a*.)

♀. Cephalothorax 2 mm. long, 1·5 mm. broad; abdomen 3·8 mm. long, 2·8 mm. broad.

Cephalothorax longer than broad, sparingly hairy, yellowish. *Caput* high, arched, moderately hairy, normal grooves distinct, yellowish, with two dark, longitudinal lines running from median group of eyes to base of cephalic segment. *Clypeus* yellowish, strongly arched, moderately hairy, radial grooves and median depression distinct. *Marginal band* broad.

Eyes black, arranged in three groups; the median series are seated upon a somewhat quadrangular tubercular eminence: of these the anterior pair are separated from each other by a space equal to nearly twice their individual diameter, and the posterior by scarcely so much; the lateral eyes are minute, and seated obliquely upon small tubercles, but are not contiguous.

Legs long, strong, tapering, yellowish with dark brown annulations, clothed with pale yellowish hairs, and armed with short, strong, black spines. Relative lengths: 1, 2, 4, 3.

Palpi similar in colour, clothing and armature to legs.

Falces yellowish, strong, broad, arched, divergent at tips.

Maxillæ short, strong, broad, moderately arched, divergent, dark brown laterally, inner margins pallid.

Labium short, broad, rounded off at tip; the base dark brown, apex pallid.

Sternum shield-shaped, glossy, brown, moderately arched, sparingly clothed with short, hoary hairs.

Abdomen ovate, boldly projecting over base of cephalothorax, strongly arched, yellowish-brown; at the centre there are two dark brown spots widely separated, and below these again, at a considerable distance, there are two others, equally as dark, and in a line with them; somewhat further down there are two smaller spots, and these are seated closer together: commencing just above and between the first pair of spots a scheme of delicate tracery commences, and this consists of a median line running to the posterior extremity; near the second pair of spots two lateral lines branch out, and these, cutting right through the third pair of spots, continue to posterior extremity; below the third pair, again, two smaller lines branch out from the median line, and unite with the lateral lines just described; below the colour is somewhat darker.

Epigyne a small, dark brown, obtusely pointed, overhanging lip.

Genus GASTERACANTHA, Sund.

10. GASTERACANTHA HEBRIDISIA, Butl.—To his description Mr. Butler appends the following note :—"Somewhat intermediate in character between *G. tæniata* and *G. westringii*, and remarkable for the unique colouration of the ventral surface of the abdomen."*

Genus EUNESIOTES, gen.nov.

Closely allied to *Poecilopachys*, E. Sim.

Cephalothorax rather longer than broad, and strongly arched. *Caput* high, but sloping forward. *Clypeus* broad, arched, sloping posteriorly.

Eyes prominent, arranged in three groups of 2, 4, 2; lateral eyes minute and contiguous.

Legs short, slender, tapering. Relative lengths : 1 = 2, 4, 3.

Maxillæ short, broad, divergent.

Labium nearly twice as long as it is broad, moderately convex, and rounded off at apex.

Sternum shield-shaped, moderately arched, tuberculated laterally.

Abdomen obtusely triangular, broader than long, strongly arched, devoid of tubercles, the superior surface ornamented with cicatrose spots or depressions.

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* Trans. Ent. Soc. 1873. Mr. A. G. Butler's "Monographic List of Gasteracantha," p. 166.

11. Eunesiotes jenningsi, sp.nov.

(Plate xxiv., 3, 3*a*, 3*b*.)

♀. Cephalothorax 2·4 mm. long, 2·3 mm. broad; abdomen 5·1 mm. long, 6·8 mm. broad.

Cephalothorax slightly longer than broad, arched. *Caput* mahogany-brown, glossy, very finely punctured, high, convex, sloping forward, normal grooves distinct. *Clypeus* broad, arched, glossy, sides rather paler than *caput*, hinder extremity pale yellow, radial grooves indistinct. *Marginal band* narrow.

Eyes black; the four comprising the median group form a square, or nearly so, and are elevated on a slight tubercular eminence; the anterior pair comprising this group are separated from each other by a space equal to fully twice their individual diameter, and those of the anterior row by a space equal to nearly two diameters; the lateral eyes are widely removed from the median series, and seated obliquely upon small tubercles; they are minute and contiguous to each other.

Legs yellowish, short, slender, tapering, clothed with fine hairs and armed with moderately long spines; tarsal claws black, pectinated. Relative lengths: 1 = 2, 4, 3.

Palpi short, slender, similar in colour and armature to legs.

Falces yellowish, glossy, short, strong, arched, divergent at apex; the lower margins of the furrow of each falx are armed with a row consisting of two long and strong teeth and three smaller ones, and the upper margin with a row of three long teeth, and one small one; fangs short.

Maxillæ arched, short, strong, glossy, divergent, outer margins reddish-brown, inner margins pale yellowish.

Labium arched, broader than long, glossy, rounded off at apex; reddish-brown from base to near apex, thence pale yellowish.

Sternum shield-shaped, broad, moderately convex, pale yellowish, tuberculated laterally.

Abdomen obtusely triangular, boldly projecting over base of cephalothorax, broader than long, strongly arched; the anterior angle (where it is broadest) is moderately procurved; from thence the sides retreat sharply towards the posterior extremity, where it terminates in a blunt point; the superior surface is closely and numerously indented with very fine punctures; in addition to these there is a slightly waved row of seven large cicatrose spots or depressions running along the margin of the anterior angle; in front of these there is on each side a series of four smaller cicatrose depressions, and between these two series a group of three larger ones; immediately below the procurved series there are two smaller cicatrose depressions, but these are not close together; again, at the centre of the superior surface there are two other depressions larger than the preceding pair, and these are widely separated; immediately below the latter there are, yet again, two smaller depressions seated closely together; laterally, there is a large number of these depressions, all of which are small and geometrically arranged; the colouration of the superior surface is very variable: in some specimens it is entirely dark blue, whilst in others it is brown anteriorly, succeeded by a transverse band of yellow, the margins of which are uneven, then a broad band of dark blue, relieved by narrow pro- and re-curved bands of yellow, and thence to posterior extremity tawny; the inferior surface is furrowed, the furrows curving towards and around the spinnerets; above the spinnerets the colour is dark brown, and beyond them a dirty yellow (Fig. 3 illustrates one of the varieties).

Epigyne a rather elongated obtuse projection.

Family CLUBIONIDÆ.

Subfamily SPARASSINÆ.

Genus ISOPODA, L. Koch.

12. ISOPODA HERCULEA (?), Thor.—I think there can be little doubt as to the identity of this huge creature. Unfortunately Mr. Jennings only secured one example. The genus abounds, according to Simon, in Malasia, New Guinea, and Australia; it is only reasonable to expect, therefore, that representatives of it will be found in the islands of the South Pacific.

Genus HETEROPODA, Latr.

13. HETEROPODA VENATORIA, Linn.—The common house spider of the tropics. Two ♀ specimens were obtained.

Genus PRYCHIA, L. Koch.

14. PRYCHIA GRACILIS, L. Koch.—Originally recorded from the island of Viti. Mr. Jennings secured one immature example.

Genus PALYSTES, L. Koch.

15. PALYSTES IGNICOMUS, ♂, L. Koch.—Originally recorded from New Ireland. Dr. Willey collected specimens of this species in New Britain. Mr. Jennings' specimen is a ♂, and unfortunately immature; nevertheless I do not think there can be any doubt as to its identity.

16. PALYSTES RETICULATUS, sp.nov.

(Plate xxiv., fig. 4.)

♀. Cephalothorax 4·9 mm. long, 4 mm. broad; abdomen 6 mm. long, 4 mm. wide.

Cephalothorax longer than broad, moderately convex, hairy. *Caput* moderately arched, sloping forward, thickly clothed with yellowish hairs, narrowest in front, yellowish. *Clypeus* yellowish, moderately arched, hairy, radial grooves indistinct, median groove a distinct longitudinal cleft or furrow.

Eyes arranged in two transverse rows; of these the first is the shorter of the two, and forms a straight line, whilst those comprising the second row are very slightly procurved; of the first row the median pair of eyes are the smallest of the group, and those constituting the second row are a little smaller than the anterior lateral eyes, and are separated from each other by a space equal to twice their individual diameter.

Legs yellowish, long, strong, hairy, armed with long, dark brown spines. Relative lengths: 1, 2, 3, 4.

Palpi long, similar in colour and armature to legs.

Falces yellow, long, robust, hairy, inferior margin armed with three teeth.

Maxillæ normal.

Labium rather longer than wide, truncated at tip.

Sternum yellow, shield-shaped, hairy.

Abdomen obovate, yellowish, reticulated, hairy.

Mr. Jennings secured three ♀ specimens of this species, all of which were immature. One of these, when taken, was in the act of moulting; in this example the reticulation was very distinct; moreover there was exposed a long, broad median furrow terminating just below the middle, and from which three pairs of short, narrow, lateral grooves proceed; from the tip of the furrow a long, thin line extends, terminating near the spinnerets. The furrow, although obscured, can be clearly traced in the other two specimens.

GNATHOPALYSTES, gen.nov.

This genus should fall between *Palystes*, L. Koch, and *Tychicus*, E. Simon. It differs from the former principally by the chelicers being subporrected and by the dentition of the inferior margins, *Palystes* having three teeth and *Gnathopalystes* four; and from *Tychicus* by the tarsal scopulæ, which although dense are not nearly so long.

Cephalothorax longer than broad, attenuated in front, arched, densely pilose.

Eyes eight, arranged in two rows of four each; the anterior row is considerably the shorter of the two, slightly procurved, and the two median eyes the smallest of the series; the posterior row forms a straight line, and the eyes comprising it are of equal size and equidistant; the anterior lateral eyes are considerably the largest of the entire group.

Legs long, robust, densely pilose, armed with long, strong, adpressed spines; tarsi armed with long claws and furnished with scopulæ.

Palpi long, robust, similar in armature to legs.

Falces robust, long, densely pilose, subporrected, the inferior margins armed with four teeth.

Maxillæ robust, arched, lateral angles constricted near the centre.

Labium rather longer than broad, constricted laterally near the base, apex obtusely truncated.

Sternum shield-shaped, smooth, hairy.

Abdomen obovate, densely pilose.

Mammillæ moderately long, densely pilose.

17. GNATHOPALYSTES FEROX, sp.nov.

(Plate xxv., figs, 5, 5*a*, 5*b*, 5*c*.)

♀. Cephalothorax 8·4 mm. long, 7·1 mm. broad: abdomen 12·7 mm. long, 9 mm. broad.

Cephalothorax broad, arched, densely pilose, yellowish. *Caput* arched, attenuated, truncated in front, yellowish at base, ocular area tawny, densely pilose. *Clypeus* broad, arched, median depression a deep, elongated longitudinal cleft, radial grooves visible, densely pilose, yellowish. *Marginal band* broad, of a pale colour, and fringed with long, pale, yellowish hairs.

Eyes distributed over two rows, of which the anterior is the shortest; of the four comprising this row, the median pair are much the smallest, and these are separated from each other by a space equal to once their individual diameter, but are only just separated from their lateral neighbours, which are by far the largest of the eight; those of the posterior row are of equal size and form a straight line, and are slightly larger than the anterior median eyes; they are separated from each other by a space equal to fully twice their individual diameter, whilst the space that intervenes between the two rows is equal to about three times the diameter of one of the posterior eyes.

Legs yellowish, long, robust, densely pilose, armed with long, strong, closely adpressed dark brown spines; tarsal claws long, armed near their base with a row of strong teeth: each tarsus furnished with scopula. Relative lengths: 1, 2, 4, 3.

Palpi long, robust, similar in colour and armature to legs.

Falces long, robust, subporrected, divergent at tips, densely clothed with coarse yellowish bristles; the base is yellowish, deepening to tawny, apices dark brown; superior margin of each falx armed near base with one moderately long and one small tooth; inferior margin armed with four teeth, and of these the two near the apex are the largest, the third one about half the size of the latter, and the fourth smaller still.

Maxillæ moderately long, robust, arched, glossy, clothed with yellowish hairs, outer angles constricted near the middle.

Labium concolorous, rather longer than broad, convex, glossy, constricted near the base, obtusely truncated at apex, moderately hairy.

Sternum shield-shaped, smooth, glossy, moderately pilose, somewhat convex, yellow, sides and apex surrounded with a broad pallid band.

Abdomen obovate, slightly projecting over base of cephalothorax, densely pilose, yellowish, ornamented near anterior extremity with two large dark brown spots, widely separated from each other; below these, and at about the centre, there are two other dark brown spots, equally as larger but wider apart; below these again there are two others, smaller, less distinct, and equally as wide apart; between the latter two, a prominent dark line commences, and this terminates near the region of the spinnerets; it is broadest at its commencement, tapering, and uneven in outline; the sides have a number of indistinct brown markings and spots; beneath, laterally, the colour is yellowish, but the median region, commencing at the epigastric fold, is tawny, gradually softening into pale yellow as the spinnerets are approached.

Epigyne obscured with hairs, but the form is oblong, flat, grooved laterally and posteriorly, and somewhat U-shaped.

Family LYCOSIDÆ.

Genus Lycosa, Latr.

18. Lycosa cænosa, sp.nov.

(Plate xxv., fig. 6.)

♀. Cephalothorax 7·3 mm. long, 5·5 mm. broad; abdomen 10·1 mm. long, 6·7 mm. broad.

Cephalothorax obovate, arched, dark brown, with broad yellow median and lateral bands, the margins of which are uneven.

Caput dark brown in front, moderately clothed with rather long, coarse hairs; ocular area almost black. *Clypeus* broad, arched, pubescent, radial grooves distinctly marked, median depression long, narrow, dark. *Marginal band* moderately broad, fringed with yellowish hairs.

Eyes in three series of 4, 2, 2; those of the anterior row are small, slightly procurved, equidistant; the pair comprising the second row are the largest of the eight, and are separated from each other by a space equal to fully twice their individual diameter; those of the third row are large, but sensibly smaller than the preceding and are widely separated from each other.

Legs moderately long, strong, yellowish, with dark brown annulations, armed with long, strong, dark spines; metatarsi and tarsi dark brown, nearly black. Relative lengths: 1, 2, 4, 3.

Palpi moderately long, similar in colour and armature to legs.

Falces robust, dark brown, thickly clothed with coarse brown hairs or bristles; superior margin of each falx armed with two strong teeth, the inferior with three.

Maxillæ strong, club-ended, converging inwards, dark brown, densely clothed with coarse dark brown hairs.

Labium concolorous, longer than wide, apex truncated.

Sternum somewhat shield-shaped, yellowish, glossy, moderately convex, hairy.

Abdomen obovate, moderately projecting over base of cephalothorax, hairy; superior surface of a dirty yellowish-brown tint, with an obscure dark brown median patch, margined laterally and in front with a rather broad pale yellowish band; sides somewhat lighter in colour than superior surface; inferior surface pale yellowish.

Epigyne as in figure, broad at base, rounded in front, dark brown laterally and in front, median ridge glossy, yellowish.

19. Lycosa obscœna, sp.nov.

(Plate xxv., fig. 7.)

♀. Cephalothorax 4·5 mm. long, 3·5 mm. broad; abdomen 7·4 mm. long, 4·4 mm. broad.

Cephalothorax obovate, arched, dark brown with broad median and narrow lateral yellow bands, the margins of which are uneven. *Caput* dark brown laterally, ocular area black, truncated in front, sparingly hairy. *Clypeus* broad, arched, pubescent, radial grooves distinctly marked, median depression long, narrow, dark. *Marginal band* moderately broad, black, fringed with yellowish hairs.

Eyes similar to *L. carnosa.*

Legs long, moderately strong, tapering, yellowish with dark brown annulations, numerously spined and clothed with yellowish hairs.

Palpi similar in colour and armature to legs.

Falces robust, reddish-brown, apices divergent, clothed with coarse hairs or bristles, apices and inner margins especially so; superior margin of each falx armed with two teeth, and the inferior with three.

Maxillæ pale yellowish, club-ended, converging inwards, pubescent.

Labium concolorous, longer than wide, apex truncated.

Sternum shield-shaped, flat, of a dirty yellowish tinge, hairy.

Abdomen obovate, projecting over base of cephalothorax, pubescent, of a dirty yellowish-brown colour; commencing at anterior extremity and continuing for about half the length there are two fine obscure black lines; these are placed rather closely together, are united in front by a curve, and meet at their posterior extremity; within these black lines, and surrounding them, the colour is somewhat paler.

Epigyne as in figure, longer than broad, surrounded with a slightly elevated ridge; within, the median ridge is broadest at the base and narrowest at apex, and of a bright shining yellowish tint.

Family ATTIDÆ.

Genus ICIUS, E. Simon

20. ICIUS EXIMIUS, sp.nov.

(Plate xxv., figs. 8, 8*a*, 8*b*.)

♂. Cephalothorax 2·4 mm. long, 1·5 mm. broad; abdomen 3·3 mm. long, 1·7 mm. broad.

Cephalothorax long, narrow, moderately high, sides parallel, furnished with a few rather long white hairs, and thickly set with short iridescent scale-like hairs. *Caput* flat, slightly sloping forward, rather thickly set with iridescent scale-like hairs. *Clypeus* has the anterior half sloping gently and the posterior half precipitately; colour black, clothed with iridescent scale-like hairs. *Marginal band* fairly broad and clothed like the foregoing.

Eyes: anterior row moderately curved, and of these the median pair are much longer than their lateral neighbours; the pair comprising the second row are minute, and are seated slightly nearer to the posterior than to the anterior row; the posterior eyes are equal in size to the lateral eyes of the anterior row, they are widely separated and are seated well back on the lateral angles of the cephalic segment; anterior eyes surrounded with iridescent hairs; quadrangle about one-third wider than long.

Legs short, slender, the first and fourth pairs much the darkest, the second and third yellowish; each is clothed with long, fine hairs and armed with slender spines. Relative lengths: 1, 4, 2, 3.

Palpi short, yellowish, genital bulb broad.

Falces rather long, arched, yellowish, apices slightly divergent.

Maxillæ short, divergent, apices rounded, black, broadly margined with yellow at inner and outer margins and tips.

Labium short, truncated, black at base, yellowish at apex.

Sternum shield-shaped, longer than broad, black, clothed with hoary hairs.

Abdomen oblong, arched, dark brown, nearly black, clothed in parts with iridescent scale-like hairs, and surrounded with a rather broad band of white scale-like hairs; there are also a few of the latter scattered over the upper surface; just above the spinnerets there is a transverse bar of silvery scales, and a little above this again two other slightly curved transverse bars of concolorous scales, the curvature directed forwards; inferior surface is also very dark brown, thinly clothed with white pubescence; laterally there are large patches of ashy-coloured scales, and immediately in front of spinnerets a broad transverse bar of the same.

Genus J o t u s, L. Koch.

21. Jotus formosus, sp.nov.

(Plate xxv., fig. 9.)

♂. Cephalothorax 2·4 mm. long, 1·8 mm. broad; abdomen 2·1 mm. long, 1·7 mm. broad.

Cephalothorax dark brown, pubescent, high. *Caput* flat, broad, bulging laterally, sloping forward, of a golden-brown tint, clothed with yellowish and golden-brown hairs. *Clypeus* retreating laterally, sloping abruptly to posterior angle, dark brown, glossy, pubescent. *Marginal band* broad.

Eyes: anterior row curved, and of these the median pair are much larger than their anterior neighbours; the pair comprising the second row are minute and are seated slightly nearer to the posterior than the anterior row; the posterior eyes are scarcely as large as the lateral eyes of the anterior row, but they are prominent and bulging; anterior eyes surrounded with long golden-brown hairs; quadrangle wider than long.

Legs moderately strong, tapering, hairy, armed with strong spines, dark brown with exception of lower joints, which are yellow with dark brown annulations; tarsal claws and scopulæ dark brown. Relative lengths: 1, 4, 3, 2.

Palpi long, reddish-brown, similar in clothing and armature to legs; genital bulb small.

Falces short, rounded at sides, flat in front, dark, apices reddish-brown.

Maxillæ long, broad, convex, yellowish, apices rounded off.

Labium short, broad, apex truncated; base dark brown, apex yellowish.

Sternum ovate, slightly convex, dark brown, hairy.

Abdomen rounded in front, acuminated behind, longer than wide, hairy: colour in front dark brown followed by a broad, transverse band of bright yellow, then a narrow transverse bar of dark brown, succeeded by another of golden brown; apex dark brown relieved by a curved row of three white spots; inferior surface dark brown, clothed with hoary hairs.

Genus HABROCESTUM, E. Simon.

22. HABROCESTUM PECKHAMI, sp.nov.

(Plate XXV., fig. 10.)

♀. Cephalothorax 2 mm. long, 1·5 mm. broad; abdomen 1·5 mm. long, 1·5 mm. broad.

Cephalothorax convex, high, rather short, glossy, brown, clothed with hoary hairs. *Caput* yellow, sloping forward, sparingly clothed with long dark hairs, but thickly so with yellowish and white pubescence. *Clypeus* sloping gently backwards, sides sloping outwards, glossy, brown, furnished laterally with long hoary hairs.

Eyes: anterior row slightly curved, and of these the medians are twice as large as their lateral neighbours; the pair comprising the second row are minute, and are seated about midway between anterior and posterior rows; the posterior eyes are equal in size to the lateral eyes of the anterior row: anterior eyes surrounded with yellowish hairs; quadrangle of eyes one-third wider than long.

Legs stout, yellowish with brown annulations, densely hairy, and armed with strong spines. Relative lengths: 3, 4, 1, 2.

Palpi short, similar in colour and armature to legs.

Falces dark brown, apices yellowish, weak, short, vertical.

Maxillæ broad, convex, apices rounded, yellowish.

Labium broad, dark brown at base, apex round, yellowish.

Sternum shield-shaped, yellowish, glossy, clothed with hoary hairs.

Abdomen arched, rounded off in front, acuminate behind, densely clothed with long, coarse hairs; the colour is black in front, followed by a broad transverse band of yellowish-grey, then a narrow, curved bar of yellow, succeeded by a broad transverse bar of black and one of yellow; the curvature of each of the bars described is directed backwards; the remainder of the surface to the spinnerets is black; spinnerets yellow and projecting; inferior surface dark brown, densely clothed with long, hoary hairs.

Epigyne large, transversely oval, yellowish.

I have named this species in honour of my esteemed correspondents and co-workers, Dr. G. W. and Mrs. Elizabeth Peckham, of Milwaukee, Wisconsin, U.S.A., to whom I am indebted for much valuable information and assistance.

Genus Bavia, E. Simon.

23. Bavia calvipalpis, L. Koch.—Originally recorded from Upolu.

24. Bavia dulcinervis, L. Koch.—Originally recorded from Pelew Island.

EXPLANATION OF PLATE.

Plate xxiv.

Fig. 1. —*Ischnocolus nebulosus*, ♀.
Fig. 2. —*Araneus suavis*, ♀.
Fig. 2a.— ,, ,, epigyne.
Fig. 3. —*Eunesiotes jenningsi*, ♀ (illustrating one of the varieties).
Fig. 3a.— ,, ,, eyes.
Fig. 3b.— ,, ,, anterior leg.
Fig. 4. —*Palystes reticulatus*, ♀.

Plate xxv.

Fig. 5. —*Gnathopalystes ferox*, ♀.
Fig. 5a.— ,, ,, maxillæ and lip.
Fig. 5b.— ,, ,, lower ridge of falx.
Fig. 5c.— ,, ,, eyes.
Fig. 6. —*Lycosa venosa*, epigyne.
Fig. 7. — ,, *obscura* ,,
Fig. 8. —*Icius eximius*, ♂, cephalothorax, side view.
Fig. 8a.— ,, ,, abdomen.
Fig. 8b.— ,, ,, palpus.
Fig. 9. —*Jotus formosus*, ♂.
Fig. 10. —*Habrocestum peckhami*, ♀.

RESULTS OF AN EXPLORATION OF ABORIGINAL ROCK-SHELTERS AT PORT HACKING.

By Walter R. Harper.

That Port Hacking must have once been a favourite camping ground of the aborigines is proved by the number of "rock-shelters," or, as they are locally styled, " gunyahs," along its shores. And this is not surprising when one considers the advantages it offers, especially on the southern side. Abundant fresh water, splendid beaches upon which to draw the nets, great stretches of shoal water in which to use the fishing spear, shell-fish in endless numbers everywhere, native fruits plentiful, that favourite source of vegetable food, the cabbage tree palm, by no means scarce, and finally, wallabies, bandicoots and opossums even now to be met with on neighbouring ridges, seem combined to form a veritable aboriginal paradise.

Local tradition points to Tyreal Head and says that there was the great crossing-place of all the South Coast blacks on their visits to the north. Near at hand is a great cave, the roof of which fell in, "smothering a whole tribe." Further up the bay is a cave from which many tons of "dry-bankers" (shells used for making lime) have been removed, exposing dozens of complete skeletons in the process. And so on. Unhappily I was not fortunate enough to light upon such a treasure heap, and of the six shelters visited I need describe only three, because the others contained simply the usual beds of shells, separated here and there by ancient fire-places—bones, whether human or otherwise being markedly absent.

Of the three I purpose to describe, two contained hand impressions and the third human remains. The former are situated on the eastern bank of Cabbage Tree Creek, which empties itself into the bay a few hundred yards to the west of "Tyreal House" (Mr. W. Simpson). It would be useless for me to dwell upon the structure of these shelters, since similar places have already been frequently described;* it suffices to say that the floors apparently consisted of layers of shells divided by patches of greyish fireash, and at the bottom black soil. I say apparently, because the floors having been previously disturbed I did not attempt to explore them. An examination of the material thrown out showed only shells and ashes.

Concerning the hand impressions, too, I can say little beyond indicating the site of the shelters containing them, for no satisfactory explanation of their meaning has so far been given. To call them "wizards' hands" upon no reliable evidence does not solve the mystery.

Of the two methods practised by our aborigines of applying this symbol (for symbol I believe it originally was), viz., (1) the imposition of a hand previously covered with pigment, and (2) outlining an outspread hand on the rock surface by squirting the pigment between the fingers, the former only is represented in these shelters.

The pigments used are red and black, the great majority of the markings being red. All are left hands, and, I should think, all made by adult males with one exception afterwards to be noted. Many are very indistinct, the red having faded until nearly merged into the colour of the sandstone roof and the outlines of the black being obscured by the smoke-stains of the fires once built below them.

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* See, for instance, "Notes on Rock-Shelters at Dee-Why Lagoon," by R. Etheridge, Junr. Records of Aust. Museum. Vol. i. p. 171.

The shelter marked A on the map faces the west and is situated just beyond the southern end of "The Basin," immediately

FIG. 1.

behind a large red gum which there hangs low over the creek. It is approached on one side by a rather steep incline down which shell fragments have rolled, and on the other side the ground dips abruptly into the bed of a narrow and deep channel, along which the rain-waters drained from the ridges behind must at times rush with great force.

On the roof of this shelter, which is about 20 feet long, 9 feet 6 inches high and 11 feet 6 inches wide (greatest measurements) are six faded but on near inspection easily decipherable impressions of hands, and traces of several other paintings, the nature of which it was impossible for me to determine.

The shelter marked B is situated about a quarter of a mile further up the creek, near where the fresh water comes in. It faces the west and is much higher and longer than Shelter A, measurements (greatest) being: length 36 feet, height 20 feet and width 15 feet. It may easily be recognised by the clump of tall cabbage-tree palms growing in front.

The hands here number over thirty, irregularly disposed and of different degrees of distinctness, but all confined to one portion of the wall towards the northern end. Doubtless this was intentional, but why one portion was chosen rather than another is, by our present knowledge, inexplicable. All are faded, but I suppose we are justified in considering the faintest impressions as the most ancient and not the result of carelessness or faulty pigment. Yet even if this view is adopted, we cannot trace a long series of single impressions made at regular or irregular intervals of time, for I daresay that at the most only two or three gradations, depending on their present condition, could be formed from the whole of them, and these divisions would not depend upon their relative position.

None are placed so high as to be beyond the reach of a man of average statute; none so low as to necessitate stooping in the act of imposition; and none point directly downwards.

In addition to these single hands, a strange combination appears on the back wall about 18 inches from the floor, taking the form of two hands, one that of a very young child and the other that of a much older child, the palms of which are joined by a narrow semicircular band or loop of pigment. Where the impression ends and the painting begins I could not discover, as the figure is very faint and blurred by the smoke from a fire just below it.*

The third cave, marked C on the map, overlooks a small cove known as Little Jibbon or Gunyah Beach, lying between Bundeena and Jibbon Beaches. The Government wharf at the eastern extremity of Bundeena is almost within a stone's throw of this beautifully situated gunyah. At the top of a steep incline rising directly from the beach and protected on every side from the winds—for large trees shelter its opening to the north—it must have formed an ideal aboriginal dwelling. The roof is

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* For further information on the subject of the "red hands," see "Idiographic Drawings by the Aborigines at Weeny Creek," by R. Etheridge, Junr. Records Geol. Survey N.S.W. Vol. iii. p. 33.

very low (except at the extreme edge it is impossible to stand upright) and it is not so large as the second gunyah (B) on Cabbage Tree Creek, but the contents prove it to have been once a permanent camp—as far as any aboriginal dwelling can be considered permanent—and not, like the others examined, shelters used only whilst shell-fish were plentiful near at hand.

Not that shells are scarce in this Little Jibbon gunyah, for, on the contrary, a list of the shells heaped up here would, I think, be a list of all the edible shell-fish of Port Hacking. Shells which are extremely scarce in, or altogether absent from, the other gunyahs are here in abundance.

The floor of this shelter is further differentiated from the others in that it contains an immense number of bones of fish, birds, and small marsupials scattered amongst the shells. All the larger of these bones exhibit plainly the markings of teeth, and some also show cuts evidently made with some sharp instrument such as a stone knife, perhaps by the women in an effort to obtain a little meat from the usually well-picked bones thrown them by their partners. This floor, as the preceding two, had been disturbed.* That this first exploration was not thorough

* *Note.*—And I wish here to protest against the unsystematic way in which some explorers excavate these deposits. It is quite easy to open at one end of the shelter and work onwards, throwing the material back on the ground previously examined—or if the deposit be very large and the time at the disposal of the explorer short, then a face may be opened at the outermost edge in the most likely spot and a cutting reaching to the floor made right through to the back wall, the material removed being thrown well outside, so that two faces are left clear for future operations. Human remains are not to be expected in the lowest layer, but implements such as stone hatches, knives, &c., may be met with even on the rock floor. Neither of these methods was adopted by the first explorers of the shelter I now refer to, but holes a foot or two in diameter have been sunk here and there and shallow trenches run along the floor, the material rejected being heaped above the portions not examined. In addition to greatly increasing the work of the more thorough explorer, such a method as this has other serious disadvantages. For instance, it is always desirable to carefully uncover the whole skeleton and study the nature of the interment

will be seen, but it was sufficient to prevent me from obtaining a perfect knowledge of the floor structure and system of sepulture.

However, I should say that in the front part the top layer consisted of shells and greyish ash; next, shells, loose black soil and ashes; and last, hard black soil and shell fragments. At certain points below the top layer old fire-places occur, represented by large beds of almost pure ash, great handfuls of which may be lifted out. It was beneath one of these beds and above the hard black soil that I discovered the first human bones, probably those of a well-grown male. The skeleton was far from complete. One reason for this of course is that many of the missing bones had decomposed, but judging from those recovered, there are other bones which, I think, must have been removed as I have previously suggested. For instance, the malar bones, superior maxillary bones and teeth are perfect, but no trace was found of the remainder of the skull. The bones of the pelvis are missing, as also are one humerus, one radius, one clavicle, nearly all the vertebræ, the scapulas, and greater part of the ribs, together with nearly all the small bones of the hands and feet. In fact the bones recovered were principally the large bones of the limbs, and several of these even were broken.

Under such circumstances it was impossible for me to determine satisfactorily in what position the body had been interred, but as all the remains were found within a radius of about two feet, I believe the lower limbs must have been drawn up and the corpse buried in a bundle with the head to the east.

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before removing any of the bones, but where the ground has been disturbed the bones also are scattered. So in the case of the adult skeleton discovered by me right alongside a trench such as I have just described, important bones are missing which were probably thrown out in digging the trench without a well-directed effort being made to recover the remainder of the skeleton. The orientation of the body is likewise difficult to decide, and, where the old layers are disturbed by trenching and new layers formed by heaping up the rejected material over these beds, it is sometimes impossible to satisfactorily measure the depth of the interment.

The teeth present in the upper jaw are sound but very much worn. The right median and lateral incisors are missing and the alveolar process absorbed, no doubt the result of the custom of knocking out teeth at the initiation ceremony. Usually only one tooth is removed, and in almost every skull I have examined the one chosen is the right median incisor. Sometimes two are struck out, viz., the right and left median incisors. As far as my experience goes, the removal of two on the same side is unusual.

Near this skeleton and against the back wall of the shelter I discovered the remains of two children about 2 feet below the surface in damp black soil sparsely mixed with fish bones and shells. A little further along but towards the centre, I unearthed some remains of a third child from a depth of 12 inches, just above a layer of hard black soil; and less than a foot away I recovered the almost complete skeleton of a fourth child under a layer of hard greyish ash covered by a thin layer of shells and loose ash, the total depth of the interment being at the most only 4 inches. This child, and as well as I could judge, all the other children, were placed full length in the grave, faces downward. None of the four skeletons were perfect, and in two instances (2nd and 3rd) a mere handful of bones, principally larger bones of the limbs, was found. In one case only (the first and by far the eldest) was the entire skull recovered. The nearest approach to a complete skeleton was the fourth; and this, I think, was owing to the protection afforded by the cement-like layer of ash above it. All the bones of this child are scorched and discoloured by fire, which seems to prove one of two things—either for some superstitious reason a fire was lighted over the body, or that the shelter was subsequently used as a dwelling.

The latter theory is contrary to our well-founded impression that the aborigines carefully avoided burial places unless compelled to hurriedly revisit them for purposes of a new interment. The first explanation seems the more probable, and, allowing for the fact that bones buried a foot or more below the surface would not show very evident traces of the fires built above, it would certainly apply to three of the skeletons—the adult and 3rd and

4th children, over which well-defined patches of ash were found, but in a much lesser degree to the 1st and 2nd children buried against the back wall below a comparatively deep layer (2 feet) of loose black soil almost free from ash.

In addition to the five incomplete skeletons now mentioned, I am informed several others, all of children, were recovered from this shelter by its first explorers.

The present state of the bones, depending as it does to a great extent on the age of the child at death, the situation in the shelter chosen for the grave, and the depth of the interment, cannot well assist one in determining the intervals which elapsed between the burials, but I feel sure that the adult was buried long before any of the children.

The great number of the latter interred here is possibly the result of an epidemic fatal to its youngest members, visiting the tribe then inhabiting the district. The question whether this shelter was a well recognised and long established burial place, or only availed of on two occasions, viz., upon the death of the adult and later during the epidemic amongst the children, might have been decided if the floor had been thoroughly and orderly examined in the first instance.

Scattered amongst the remains at the back of the gunyah I discovered five stones used for breaking bones to extract the marrow or for opening shells, and six small shells* in the backs of which square holes had been cut. The "nappers" have not been worked in any way, and, if found under ordinary circumstances, would attract no special attention—yet it is evident they have been used for the purpose suggested. The shells, I believe, formed part of a necklet or some similar ornament.

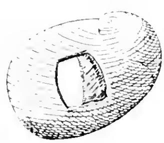

FIG. 2.

Between the remains of the first and second children, and leaning against the wall at a depth of about 15 inches, I discovered the curious bone ornament or implement now to be described.

* "*Nerita melanotragus.*" The cutting implement was probably an oyster shell or sharp flake. See accompanying drawing by Mr. Chas. Hedley.

It is made from the fibula of a kangaroo, is $9\frac{3}{4}$ inches in length, well polished, and somewhat triangular in section, the base being furrowed by a rather deep groove, and the ridge rounded. The epiphysis of one end has been broken off and that end ground to a gradually tapering, flat, blunt point. The signs of wear upon it are few and for the most part confined to the lower half of the back or convex portion of the bone. The point has been slightly fractured, and just below the centre on the back the bone has for about an inch been a little abraded in a horizontal direction. Between this abrasion and the tip are a number of tiny shallow cuts or scratches. However, these markings are so insignificant that it would be useless to base any theory as to the use of the bone upon them. The accompanying drawing, for which I am indebted to Mr. Charles Hedley, will convey an exact idea of its general appearance.

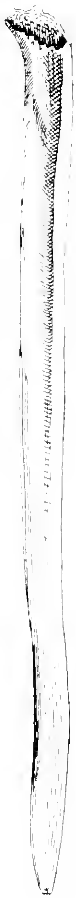

FIG. 3.

Three uses have been suggested for it, viz., netting needle, "death bone" or "pointer," and "nose bone." With reference to the first suggestion, I can find no record of the use of bone netting needles by the aborigines, but if it be allowed that sometimes bone was substituted for the usual wooden stick, the natives would, I think, certainly avoid a polished and pointed implement from which the cord would be so likely to slip—a contingency which even in the case of sticks they were forced to provide against. Roth says* :—"The wooden needle, over a foot long, with a small lump of cementing substance at either end, has no 'eye' in it, the twine being just wound on and off as required."

The second suggestion is more feasible, for although this bone bears but little resemblance to the elaborate

* W. E. Roth. "Ethnological Studies, &c." p. 94. See also Brough Smyth, "Aborigines of Victoria." Vol. i. p. 389.

"Munguni" so well described by Roth,* it is nevertheless somewhat similar to the 'Ngadhungi" of Taplin † or the "Irna" and "Ingilla" of Spencer and Gillen.‡ Probably at one time the "pointing of the bone" was a common form of sorcery in eastern N.S. Wales, but it is needless to build upon this probability, for a much simpler and surer explanation lies near at hand. The piercing of the nasal septum and the insertion in the hole thus formed of twigs, feathers, bones, pieces of wood, &c., is practised over all Australia. Sometimes it is part of, or at least a compulsory introduction to, the initiatory rites of males and females, but generally both sexes undergo the operation voluntarily and cheerfully in the belief that their personal appearance is improved thereby. Occasionally a superstitious dread prompts the use of the nose ornament.§

The bone unearthed by me I believe to have been put to this use, although in having only one end pointed it differs from the usual nose ornament, which is pointed or rounded at both ends. I cannot find an exactly similar nose bone described for the Eastern Colonies, but I may without hesitation claim this to be one on the authority of Spencer and Gillen, who in writing of the Central Australian natives, say,‖ "Nose bones, called 'Lakira,' are frequently worn, every native having his or her nasal septum pierced. The most common form is a bone, sometimes the fibula of a kangaroo, pointed at one end, and measuring as much as 40 cm. in length."

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* *Loc. cit.* pp. 152-158.

† "The Narrinyeri." Rev. Geo. Taplin in "Native Tribes of S. Australia," p. 24.

‡ "Native Tribes of Central Australia," p. 534.

§ Mitchell. "Exped. into Australia." Vol. ii. p. 339; and Brough Smyth, *loc. cit.* Vol. i. p. 274.

‖ *Loc. cit.* p. 574.

In dealing with a race so little advanced as the Australians, it is necessary to remember that each of their few implements, utensils, or ornaments, may have been at times put to several different uses. The wommera, for instance, is used not only for propelling spears, but sometimes as a fire stick, a music stick, with a piece of quartz fastened to one end as a knife or chisel, and even as a digging stick. So this bone may have once been useful as well as ornamental.*

* *Vide* A. W. Howitt in Brough Smyth, *loc. cit.* Vol. ii. p. 302.

Contributions from the Australian Museum.

THE "WIDOW'S CAP" OF THE AUSTRALIAN ABORIGINES.

By R. Etheridge, Junr., Curator of the Australian Museum.

(Plates xxvi.-xxxi.)

By no means one of the least interesting of the Mortuary Customs of the Australian Aborigines is the addition of white or black pigment to some part of the person of the mourner. One or other of these colours, but black only to a limited extent, was, and even is still in the more remote parts of the Continent applied either to the head, face, beard, chest or arms alone, or to a combination of any two or more of them. The most conspicuous of all is, without doubt, the head-covering known as the "Widow's Cap." "Mourning," says the Rev. J. Bulmer,* of the Aboriginal Mission Station at Lake Tyers, Gippsland, is, amongst the tribes of the Murray River, "a very laborious affair for the widows, as they had to make themselves caps of plaster for a long time after the death."

One of the first, if not actually the first, travellers to notice these peculiar coverings was Surveyor-General Mitchell during his "Second Expedition into the Interior of Eastern Australia" in 1835, on graves near Fort Bourke, Darling River, accompanied by white lenticular balls. He informs† us that beside the latter "were in some cases casts also in lime or gypsum of the upper part of the head, which had evidently been worn on a head where

* Journ. R. Geogr. Soc. Australasia (Vict. Branch), 1888, v., Pt. 1, p. 22.

† Three Expeds. Int. E. Australia, 1838, i. p. 252, figs.

the hair had been confined with a net, of which the impression and some hairs remained behind." During his "Third Expedition" in 1836, Sir Thomas again met with these caps near the confluence of the Murray and Darling Rivers, and speaking of the graves there says,* "On them lay the same singular casts of the head, which we had seen only at Fort Bourke." Confirmation of these statements was afforded by Governor E. J. Eyre, for many years Protector of the Aborigines in South Australia, who found† the practice a common one amongst the natives along the Murray River, at the same time remarking that the coverings were moulded to the women's heads over a piece of net-work. The explanation given by Mitchell and Eyre became perfectly intelligible on the appearance of Mr. G. F. Angas' beautiful work on S. Australia,‡ wherein a woman is depicted attired in a widow's cap, and otherwise whitened.

I have been favoured by Sir Joseph Abbott with the loan of a very excellent specimen of these head coverings. Mr. Charles Kilgour has presented to the Trustees another remarkable example, and with the aid of a third already in the Australian Museum I have been able to compile the following notes.

Sir Joseph Abbott's specimen (Plates xxvi.-xxvii.) is of an oval shape, ten inches long, eight inches wide, and five and a half inches high, the concave interior having a depth of four and a quarter inches, thus giving to the material of the crown a solid thickness of one and a quarter inches. The cap may be described in general terms as dish-cover-shaped, with the edges scarcely curved inwards, and wider at one end than at the other; the former I take to be the posterior. The exterior is comparatively smooth. At two inches from the narrow or anterior end, the opening is four and a quarter inches wide, and at the same distance from the posterior end the transverse measurement of the opening is five and a half inches, the length of the entire aperture

* *Ibid.*, ii. p. 112.

† Journ. Exped. Discovery in Central Australia, 1845, ii. p. 354, pl.

‡ S. Australia Illustrated, 1846, pl. 51, f. 20.

being seven and a quarter inches. The impression of the net, placed on the wearer's head previous to the operation of plastering, is beautifully preserved, and presents on an enlarged scale the engine-turned appearance of a watch-case cover, the thread impressions radiating from a vertex. The latter is nearer the anterior than the posterior end, three and a half inches from the front edge of the opening. The impressions of the radiating strings of the net are broad and deep, showing that a very coarse string was used in the manufacture of the latter; the mesh is rhomboidal and large. From the colour still remaining in the net impression, it is evident that the cap had been removed from a red sandy deposit. The weight is 7 lbs. $7\frac{1}{2}$ ozs.

The cap presented to the Museum by Mr. C. Kilgour (Plates xxviii.-xxix.) is conical, decreasing to an obtuse apex that is eccentric both longitudinally and transversely; it is more posterior than anterior in position. The length is eight inches, width seven and a quarter inches, and the height seven inches. The length of the head cavity is seven and a half inches, the general width six and a quarter, being slightly wider at the posterior than the anterior end, the depth four inches, thus allowing a thickness of three inches to the plaster in the crown, and is the most solid at that point of the three examples; the margin is broken, but so far as preserved there is no sign of the incurving of the edge seen in Sir Joseph Abbott's specimen, and still more marked in that remaining to be described. The interior of the crown is rather flattened, but the vertex of the net is not preserved. The impression of the net-mesh, on the other hand, is so, the ribbing of the net being simply radiate, not after the engine-turned pattern, the resulting mesh-holes being square. The grooves left by the net, as in the case of the first specimen, retain particles of a red sandy clay. The weight of this cap is 4 lbs. $8\frac{1}{2}$ ozs.

The third, or Museum specimen (Plates xxx.-xxxi.), is the least well preserved, exhibiting evidence of lateral pressure when in a plastic condition. It is a long-oval in outline and depressed. The length is eleven and a half inches, in width seven and a half inches, and in total height five and a half inches. The margin of the head aperture is much incurved from pressure, particularly at the sides, the width in consequence is ill-defined. The length of the aperture is nine and a half inches, and depth of the interior three and a half, allowing two inches for the thickness of the crown. The impression of the net, only partially preserved, exhibits a large rhomboidal mesh for which a coarse string had been used. In places the impressions of the latter are filled with actual casts of the string employed. This cap cannot be looked upon as a typical example by any means, from causes already explained. The weight is 7 lbs. 14 ozs.

Sir Joseph Abbott's cap is from Dunlop Holding, near Louth, Darling River.

Mr. Kilgour's specimen was found on the west bank of the Darling River, about twenty-two miles above Wilcannia, on the Mount Murchison Holding, on a sand-drift within fifty yards of high water mark (? flood mark).

The Museum example is from Rufus Creek, Lake Victoria, Murray River, N. S. Wales.

The name of these strange head-coverings no doubt differed according to tribe, and was as varied as that of most other articles used by the Aborigines. Eyre calls them *Korno*;* by Angas they are simply referred to† as "Widows' Caps," whilst Bulmer states‡ that in the Kulnine Tribe [? Kulkyne Tribe, Murray R., Co. Karkarooc, Victoria] they were called *Kopi*.

Sir Joseph Abbott's specimen may, I think, be accepted as a fairly good example of the form generally adopted. One of Angas' figures§ exhibits a cap with a good convexity of crown and a longitudinally elongated form, and the two figures‖ given by Mr. E. M. Curr are of a similar shape. The outline assumed by Mr. Kilgour's specimen is probably exceptional.

As a rule the caps were assumed by widows as a token of grief for the loss of a husband, but amongst the Darling River Tribes

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* Journ. Exped. Discovery in Central Australia, 1845, ii. Expl. pl. 1, f. 17.

† S. Australia Illustrated, 1846, Expl. pl. 30, f. 15.

‡ *Fide* Curr, Australian Race, 1886, ii. p. 238.

§ *Loc. cit.* pl. 30, f. 15.

‖ Australian Race, 1886, ii. pl. opp. p. 238.

the nearest female relative, other than the widow, assumed one, according to Mr. J. Bonney.* I have only met with one recorded instance of a cap being worn by a man. Mr. J Hawdon† during a "Journey from N.S. Wales to Adelaide in 1838" met with a man in the neighbourhood of the Goulburn River, in Victoria, whose "head was plastered with a coat of white clay, which is the mode in which these tribes wear mourning for their dead."

The preparation of the head to receive the cap appears to have been practically the same throughout the tribes wearing it. Angas informs‡ us that along the Murray the head to be covered is first shaven and then enclosed in a net; Bonney, referring§ to the Darling Aborigines, says, "fixed to the head by the hair and a small net, which is generally laid over the head before the cake is plastered on," and at Lake Bonney, or Nookamka, on the Murray River, Hawdon‖ observed a "network made of twine." Bulmer,¶ again, says of certain of the Murray Tribes, "In order to get the cap properly fitted to the head the woman had all her hair cut off, a net was put over the head, which enabled her to get the cap off easily." On the other hand, in certain Victorian tribes, but not specially named, singeing appears to have been resorted to, for Mr. W. Stanbridge remarks,** "Widows in some instances have the hair first cut off with a little fire stick close to the head, by the doctor or priest, before assuming the badge of woe."

Whether or no the actual operation of covering the head was always performed on her own head by the widow herself seems

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* Journ. Anthrop. Inst., 1884, xiii. p. 135.

† Proc. R. Geogr. Soc. Austr. (N.S.W. Br.), 1891, v. No. 2, p. 36.

‡ S. Australia Illustrated, 1846, Expl. pl. 30, f. 15.

§ Journ. Anthrop. Inst., 1884, xiii. p. 135.

‖ *Loc. cit.* p. 36.

¶ Journ. R. Geogr. Soc. Austr. (Vict. Br.), 1888, v. Pt. 1, p. 23.

**Trans. Eth. Soc., 1861, i. p. 298; Smyth, Aborigines of Victoria, 1878, i. p. 111.

doubtful, for according to the late Mr. T. Worsnop, of Adelaide,* the widow's head is plastered by female relatives of deceased.

The period of retention varied according to tribe. Bulmer mentions† a few days only, and speaks of renewal, but Worsnop is more explicit, assigning six months as the period of mourning. The Rev. R. W. Holden reports‡ that in the Marowera Tribe, at the junction of the Rivers Darling and Murray, the period of retention is twelve months. At any rate, the cap appears to have been generally retained for a lengthened period.

Other parts of the body besides the head were whitened by the cap-bearers. A figure§ of a woman in mourning, by Angas, exhibits in addition a whitened forehead and left side of the face, a streak across the upper lip, around the nose and chin. whitened breast, and a patch on the top of the upper left arm. This figure has been several times copied by authors. The supplementary plastering seems to have been wide spread, for Mr. F. Bonney informs|| us, amongst other writers, that the women of certain of the Darling River tribes smeared themselves over both the face and body.

The inconvenience caused by these caps, if from no other point of view than that of weight, must have been great, for it has been remarked¶ that "the poor woman generally complained of pain in the head during her mourning, but fashion must be followed at all risks." So completely was the head covered that of some of the Murray Natives Krefft says,** "the deeper they mourn, the more gypsum is laid on, so that sometimes nothing but the eyes, nose, and mouth remain uncovered." The actual weights recorded are as follows:—Eyre gives†† the weight of a

* Prehistoric Arts, 3rd Edit., 1897, p. 62.

† Journ. R. Geogr. Soc. Austr. (Vict. Br.), 1888, v. Pt. 1, p. 23.

‡ Taplin's Folklore, 1879, p. 27.

§ S. Australia Illustrated, 1846, pl. 51, f. 20.

|| Journ. Anthrop. Inst., 1884, xiii. p. 135.

¶ Bulmer, Journ. R. Geogr. Soc. Austr. (Vict. Br.), 1888, v. Pt. 1, p. 23.

** Trans. Phil. Soc. N.S. Wales, 1862-65 [1866], p. 373.

†† Journ. Exped. Discovery in Central Australia, 1845, ii. p. 354

Lower Murray cap as $8\frac{1}{2}$ lbs.; Bulmer records* one from the Murray-Darling country as "14 lbs. after it was dry"; according to E. M. Curr,† two examples from Yelta, Darling-Murray Junction weighed respectively 10 lbs. 7 ozs., and 5 lbs. 13 ozs.; and Worsnop has placed on record‡ one a little over 12 lbs., one 13 lbs., and another 14 lbs. The extraordinary weight of 30 lbs. mentioned by the Rev. R. W. Holden§ in the Marowera or Murray-Darling Junction Tribe must be an oversight. No woman could carry this for twelve months as he states. The weights of those now exhibited have already been given.

Little attention has been paid to the sizes of these caps, those who had entered into such details contenting themselves with mentioning the thickness of the coating only. Thus, Eyre mentions|| a thickness of two or three inches, and Angas says¶ nearly two inches thick. From the measurements given on a previous page, we may conclude that the material used varied in the crown of the cap from one and a quarter to three and a half inches.

The ultimate destination of the coverings was always the grave.** We have seen that it was reposing on such that Mitchell first found them, and we have similar evidence that a like disposal was practised by several other tribes, extending over a wide area. Police-trooper Ewens, of Blanchtown, S. Australia,†† says of the Moorundee Tribe, inhabiting the Murray River, from Mannum to Overland Corner, "when a man dies women wear clay on their heads and place it, when dry, in the shape of a basin on the grave." Corporal Shaw, of Overland Corner, S. Australia, relates‡‡

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* Journ. R. Geogr. Soc. Austr. (Vict. Br.), 1888, v. Pt. 1, p. 23.

† Australian Race, 1886, ii. p 238.

‡ Prehistoric Arts, 3rd Edit., 1897, p. 63.

§ Taplin's Folklore, 1879, p. 27.

|| *Loc. cit.* p. 354.

¶ S. Australia Illustrated, 1846, pl. 30, f. 15.

** Worsnop, Prehistoric Arts, 3rd Edit., 1897, p. 63.

†† Taplin's Folklore, 1879, p. 30.

‡‡ *Ibid.*, p. 29.

of the Rankbirit Tribe, at that place, that the "relatives make a pipeclay paste and place it on the head, and wear it till quite hard, when it is placed on the grave." Bulmer supplements these statements by saying* that in some of the Murray Tribes "the woman proceeded to the grave and after lying at full length on it for some time, she would deposit the cap, after which another one had to be made." The same observer, according to E M. Curr,† also adds the following interesting fact that in the Marowera Tribe, at the junction of the Murray and Darling Rivers, "after removal the cap was baked in the fire" before being laid on the grave.

From what I have been able to learn, this custom appears to have been common to the Aborigines inhabiting the Murray River Valley from near the mouth of the river to its junction with the Darling, thence up the latter certainly as far as Fort Bourke and possibly beyond. Returning to the junction, it is traceable along the Murray in N.S. Wales and Victoria, but how far it extended in that direction, there is not sufficient evidence to show.

In the preceding pages I have confined myself to a consideration of the "Widow's Cap" proper, but it was and is customary amongst tribes outside what may be termed the cap-bearing area to merely smear the head, or dress the hair, as well as other parts of the body with white pigment as a sign of mourning. The material so used in the Boulia District of West-Central Queensland by the Pitta-Pitta Tribe is called *Pa-ta*, or *Kopi*, and the mourner is called *Pa-ta-maro*, or "plaster-possessor."‡ In the Moorloobulloo Tribe, at the junction of King's Creek and the Georgina River, S.W. Queensland, it is again termed *Kopi*.§

The form this smearing or coating took was also varied. In the Boulia, Cloncurry, and Leichhardt-Selwyn Districts, amongst

* Journ. R. Geogr. Soc. Austr. (Vict. Br.), 1888, v. Pt. 1, p. 23.

† Australian Race, 1886, ii. p. 238.

‡ Roth, Ethnological Studies, 1897, p. 164.

§ J. O. Macarthur and J. S. Little in Curr, Australian Race, 1886, ii. p. 366.

the Pitta-Pitta, Mitakoodi and Kalkadoon Tribes respectively, the *Kopi* is put on in lumps, until the whole hair appears an irregular mass of this material.* In the Arunta Tribe, around Charlotte Waters, Central Australia, according to Dr. E. C. Stirling,† the hair is matted into coils with this white pigment. The widow is called *Inpirta*, or the "whitened one in reference to the pipeclay."‡ The peculiar ceremonies in the Arunta Tribe, accompanying the putting on of this pipeclay, described by Prof. Baldwin Spencer and Mr. F. J. Gillen are well worth perusal. The adoption of this form of pigmentation in the Central Queensland Tribes appears to have been more universal in the community than the mere wearing of a cap by specially afflicted individuals, for Dr. W. E. Roth says§ that in the Boulia District it is adopted by all, "whether the deceased be man, woman, or child," but is worn longer by a woman mourning for her husband.

This simpler form of an outward exhibition of grief extended quite into the south-east corner of the Continent, for Mr. R. Helms ascertained‖ that the members of the Omeo Tribe in North Gippsland "smear pipeclay over their head as a sign of mourning." This was "retained for some time, but as a rule much longer by the women than by the men."

This assumption of white by the men is also an interesting point, not only on the head but on the beard also. The latter in the Arunta Tribe, at Charlotte Waters, is matted into coils with the pigment;¶ the same treatment of the hair in this tribe has already been mentioned. In the Koombokkaburra Tribe, on the main range between the Belyando and Cape Rivers, East-Central Queensland, "the women plaster the heads,"** presumedly by

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* Roth, *loc. cit.* pp. 164-166.

† Anthropology Horn Exped., 1896, p. 137.

‡ Spencer & Gillen, Native Tribes of C. Australia, 1899, p. 500.

§ Ethnological Studies, 1897, p. 164.

‖ Proc. Linn. Soc. N.S. Wales, 1895, x. (2), p. 399.

¶ Stirling, Anthropology Horn Exped., 1896, p. 137.

** J. MacGlashan, in Curr, Australian Race, 1887, iii. p. 21.

themselves, but in the Nimbalda Tribe, around Mt. Freeling, in S. Australia, other members of the community, not necessarily relatives, "put a plaster on their head."* An analogous practice exists amongst the Antakaringas, near Charlotte Waters, the mourners in general, so says Mr. C. Giles,† smear their heads with white earth.

Precisely as in the case of the cap-wearers, so the head-plasterers also besmeared other parts of the body. The Aldolingas,‡ Aruntas,§ and Antakaringas|| placed white on their breasts; and the men of the first named a white bar over the forehead. In the Dieri Tribe, inhabiting the Cooper's Creek District, the women added two wide stripes on the arms.¶ Faces as well as heads were smeared in the Omeo Tribe in Gippsland.** The head plaster in its simpler form seems to have been retained longer than the more substantial cap, at any rate in some communities, for Roth states†† that the gin mourning for her husband in the Boulia District retained this outward and visible sign even up to six months. In the Antakaringas, on the other hand, the covering was occasionally renewed after the first month,‡‡ and ultimately placed on the grave, a practice we have already seen adopted in disposing of the caps.

The universality of this external method of displaying grief is particularly well exemplified by its extension into West Australia, where a very old writer§§ informs us it is the speciality

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* Police-Trooper Smith, in Taplin, Folklore, 1879, p. 88.

† Taplin, *loc. cit.* p. 90.

‡ Kirchauff, Journ. R. Geogr. Soc. Aust. (S.A. Br.), 1890 ii. p. 37.

§ Stirling, Anthropology Horn Exped., 1896, p. 137.

|| C. Giles, in Taplin, *loc. cit.* p. 90.

¶ Worsnop, Prehistoric Arts, 3rd Edit., 1897, p 62.

** Helms, Proc. Linn. Soc. N.S. Wales, 1895, x. (2), p. 399.

†† Ethnological Studies, 1897, p. 164.

‡‡ C. Giles, in Taplin, Folklore, 1879, p. 90.

§§ G. F. Moore, Descrip. Vocab. Language Aborig. W. Australia, 1842, p. 26.

of the women and was known as *Dardar*, and consisted of a streak of white across the forehead, down the sides of the cheeks, round the chin and each eye.

The material employed, whether as caps or head plasters only, displays a wonderful similarity of material over the entire Continent. Eyre,* speaking of the Murray tribes in general, calls it "carbonate of lime"; Angas† terms the material "pipe-clay"; a similar name is assigned to the pigment used by the Moorundee Tribe, from Mannum to Overland Corner, by Police-Trooper Ewens;‡ again by Corporal Shaw,§ in the Rankbirit Tribe, at Overland Corner; and white clay, or lime, in West Australia.‖ Stanbridge describes¶ the material used by some of the Central Victorian Tribes as a "white-talcy clay"; "clay and ashes" in the Koombokkaburra Tribe,** between the Belyando and Cape Rivers; "white pigment" in the Arunta Tribe around Charlotte Waters††; and pipe clay in the Omeo District of Victoria.‡‡ Mr. F. Bonney§§ is much more explicit when speaking of the Darling River Tribes; here we meet with "white plaster made of calcined selenite or gypsum." In the Nimbalda Tribe, around Mount Freeling, the same material is made use of;‖‖ the Antakarungas at Charlotte Waters are said¶¶ to use both "gypsum and pipe clay." Of the Murray Tribes, two interesting accounts are

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* Journ. Exped. Discovery in Central Australia, 1845, ii. p. 354.

† South Australia Illustrated, 1846, t. 30, f. 15.

‡ Taplin, Folklore, 1879, p. 30.

§ *Ibid.*, d. 29.

‖ G. F. Moore, Descrip. Vocab. Language Aborig. W. Australia, 1842, p. 26.

¶ Trans. Ethnol. Soc., 1861, i. p. 298.

** J. MacGlashan, in Curr, Australian Race, 1887, iii. p. 21.

†† Stirling, Anthropology Horn Exped., 1896, p. 137.

‡‡ Helms, Proc. Linn. Soc. N.S. Wales, 1895, x. (2), p. 599.

§§ Journ. Anthrop. Inst., 1884, xiii. p. 135.

‖‖ Police-Trooper Smith, in Taplin, Folklore, 1879, p. 88.

¶¶ C. Giles, *ibid.*, p. 90.

extant, for Mr. Bulmer states* that "they gathered kopice gypsum, which was very plentiful in the district; this they burnt in the fire, it was then made in a paste"; and at Lake Bonney, on the Murray, Hawdon remarks,† "we procured also a great number of singular sea shells and fossils embedded in the bank [of the river]. The natives who were with us told me they burned these shells in the fire and then made them into a plaster," with which they not only decorated themselves, but also made caps. Curr, on the testimony of Messrs. J. O. Macarthur and J. S. Little, says that the Moorloobulloo Tribe, at the junction of King's Creek with the Georgina River, plastered the head with wet gypsum, "which singularly enough is called *Kopi*, the name in use in the Marowera Tribe, which dwells at the junction of the Darling and Murray, 750 miles to the south-west, for those solid coverings of the head."‡ The word *Kopi* is also used in the Boulia District of West-Central Queensland, according to Roth,§ for a "sort of gypsum, which is first of all burnt, and subsequently immersed in a comparatively small quantity of water, so as to make a viscid mass which dries hard like plaster of Paris."

The use of white as a sign of mourning amongst ancient and aboriginal races might be enlarged on until it became unnecessarily wearisome, but one reference is worthy of note. Among the Andamanese,‖ the relatives on the death of an adult smeared themselves with a wash of an olive-coloured clay called *Og-* After shaving their heads the men placed a lump of this clay, termed *del. a-*, on their foreheads, the women on the top of the head, "where it hardens and is left, much to the individual discomfort, until the expiration of the days of mourning;" should it fall off in the meantime, it is renewed.

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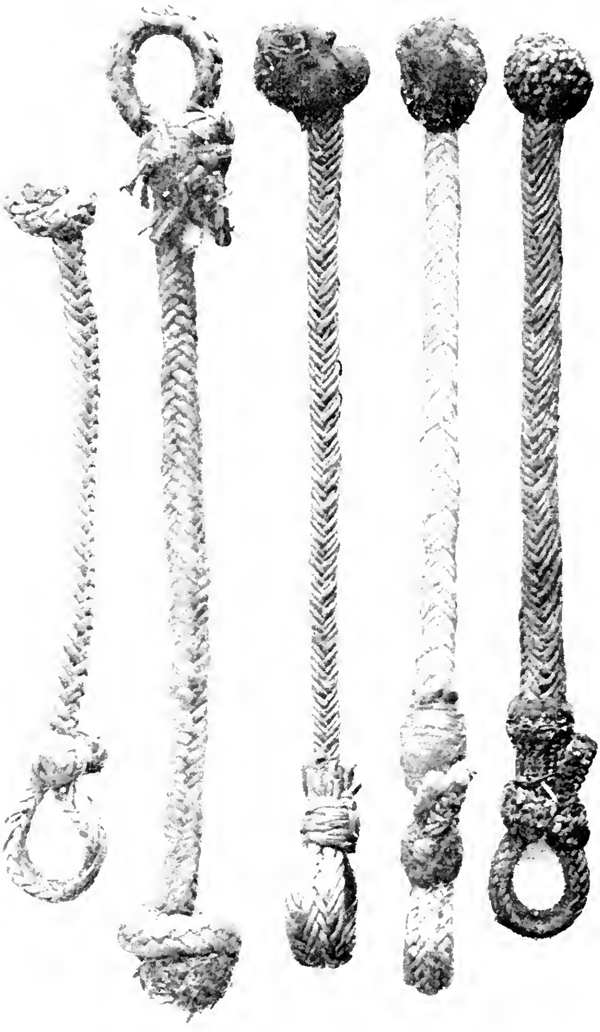
* Journ. R. Geogr. Soc. Austr. (Vict. Br.), 1888, v. Pt. 1, p. 22.

† *Ibid.* (N.S. Wales Br.), 1891, v. No. 2, p. 56.

‡ Australian Race, 1886, ii. p. 366.

§ Ethnological Studies, 1897, p. 110.

‖ E. H. Man, Journ. Anthrop. Inst., 1883, xii. pp. 141, 143.



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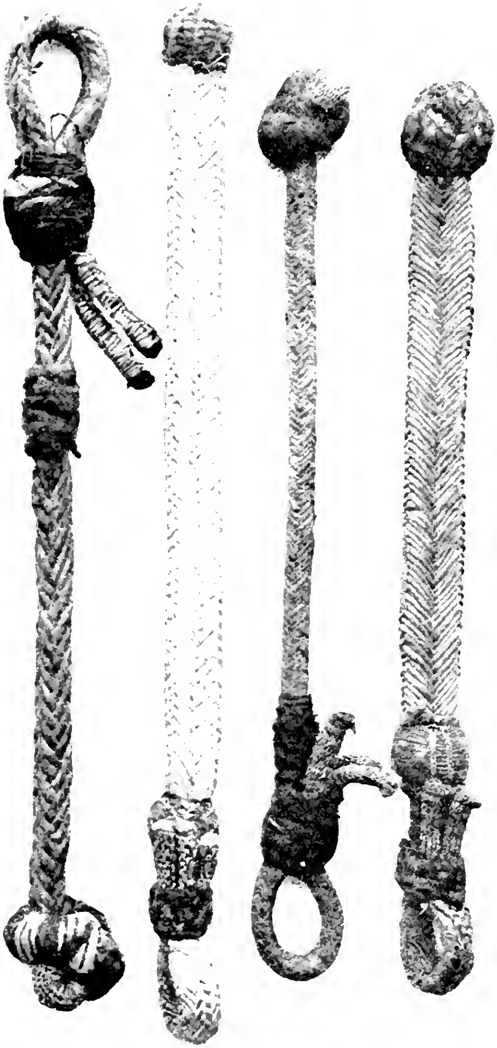

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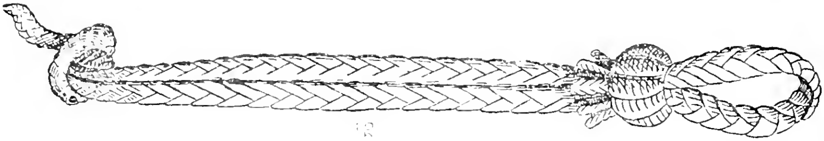

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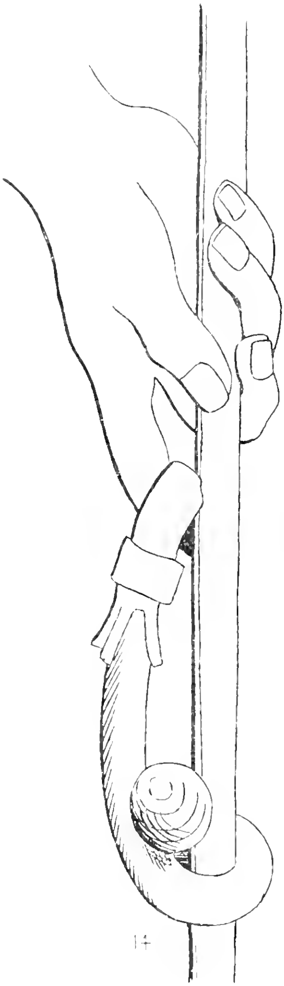

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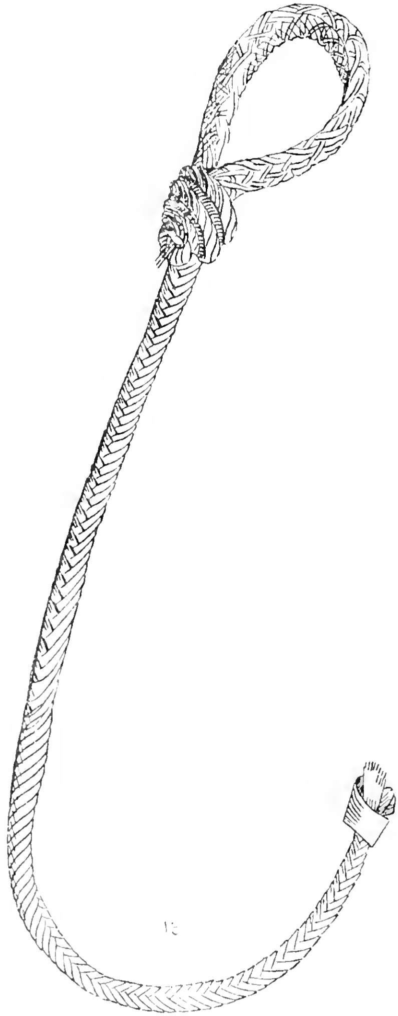

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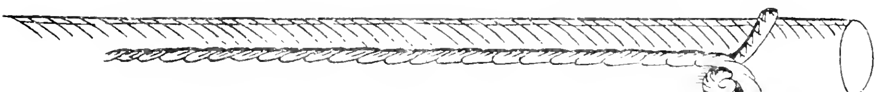

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C H del.

H. BARNES, JUNR., PHOTO.

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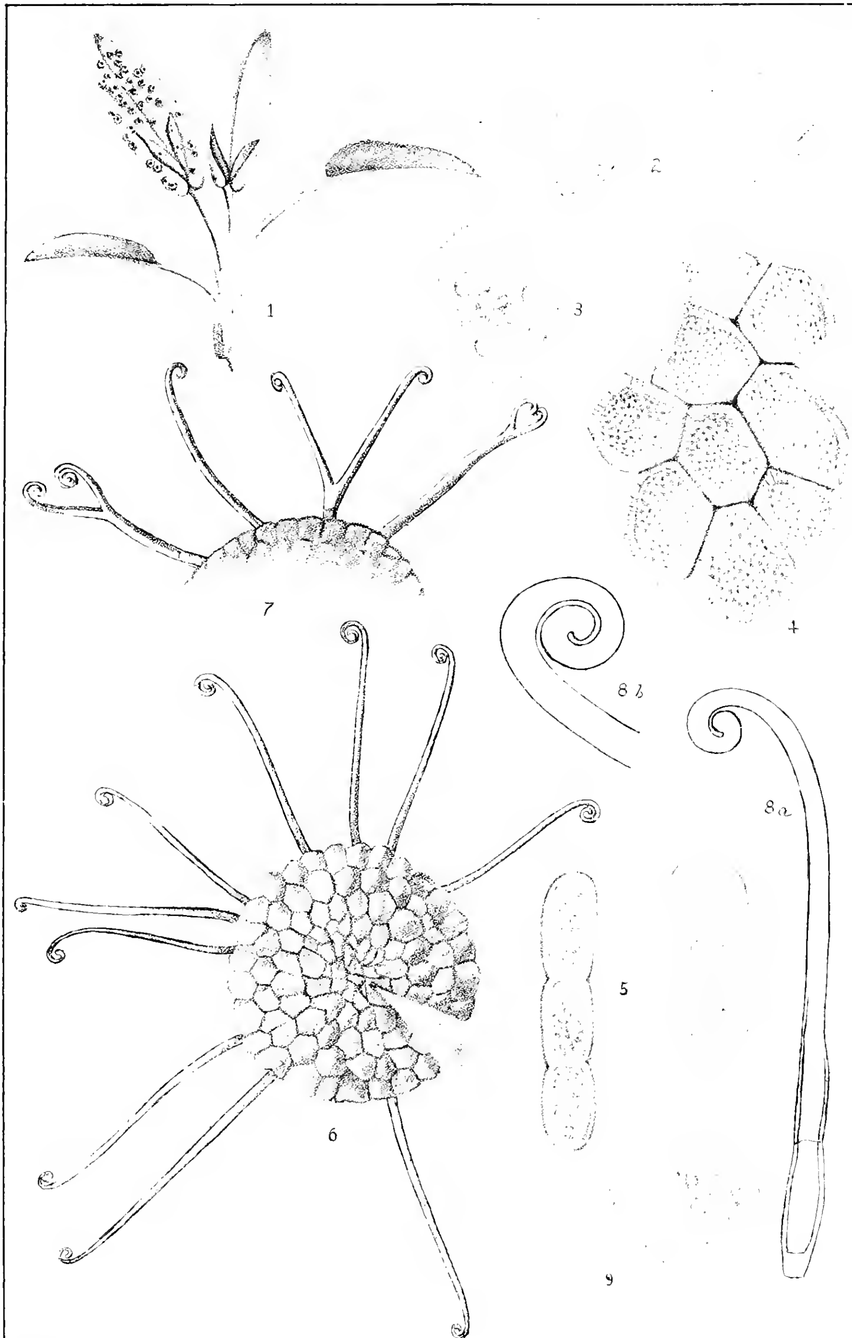
R.T.B. del. EUCALYPTUS SMITHII, R.T.B.

R.T.B. del.

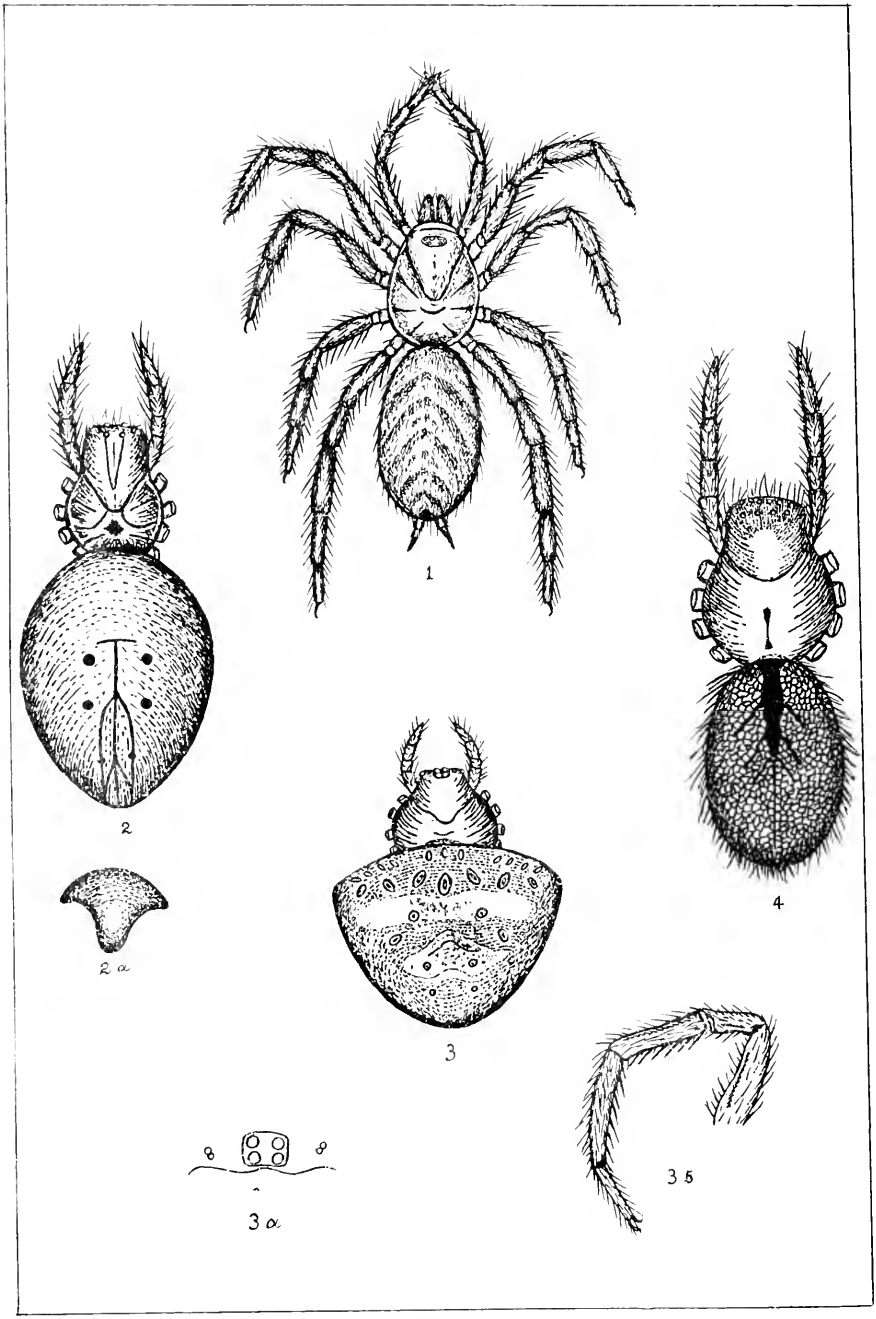
EUCALYPTUS DAWSONI, R.T.B.

EUCALYPTUS CAMPHORA, *R.T.B.*



D. McA. }
C. C. B. } del.

1-4 PUCCINIA CALTHAE, LINK; 5-9 UNCINULA AUSTRALIANA N. SP.



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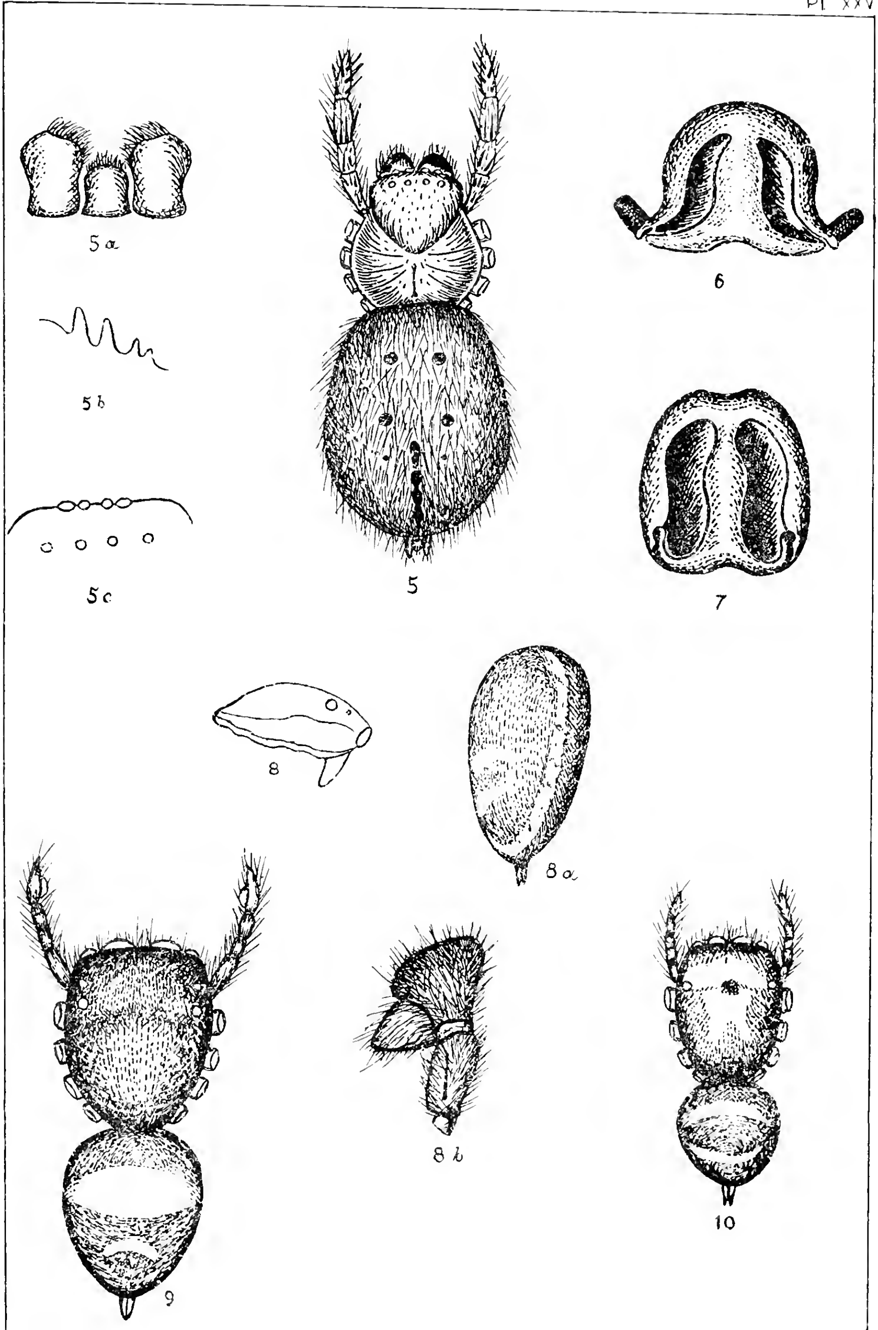
SANTA CRUZ SPIDERS



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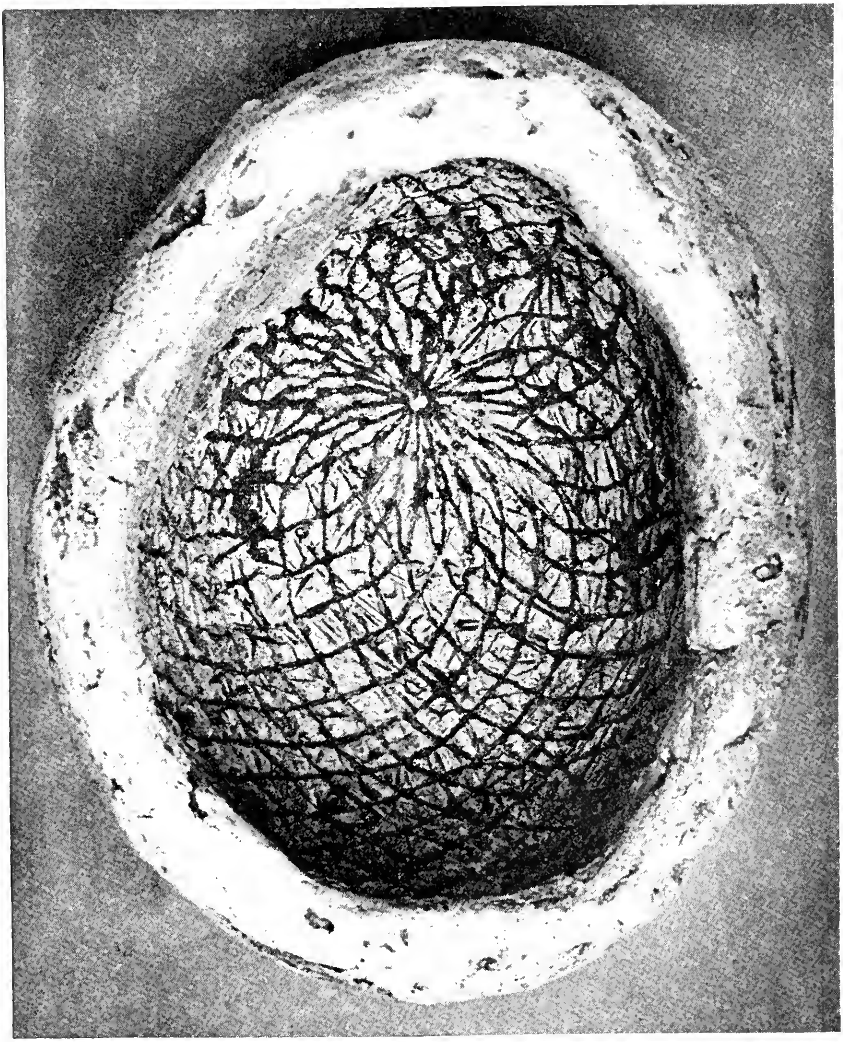
SANTA CRUZ SPIDERS

H BARNES, JUNR., PHOTO. AUSTRALIAN MUSEUM.

ABORIGINAL WIDOW'S CAP.



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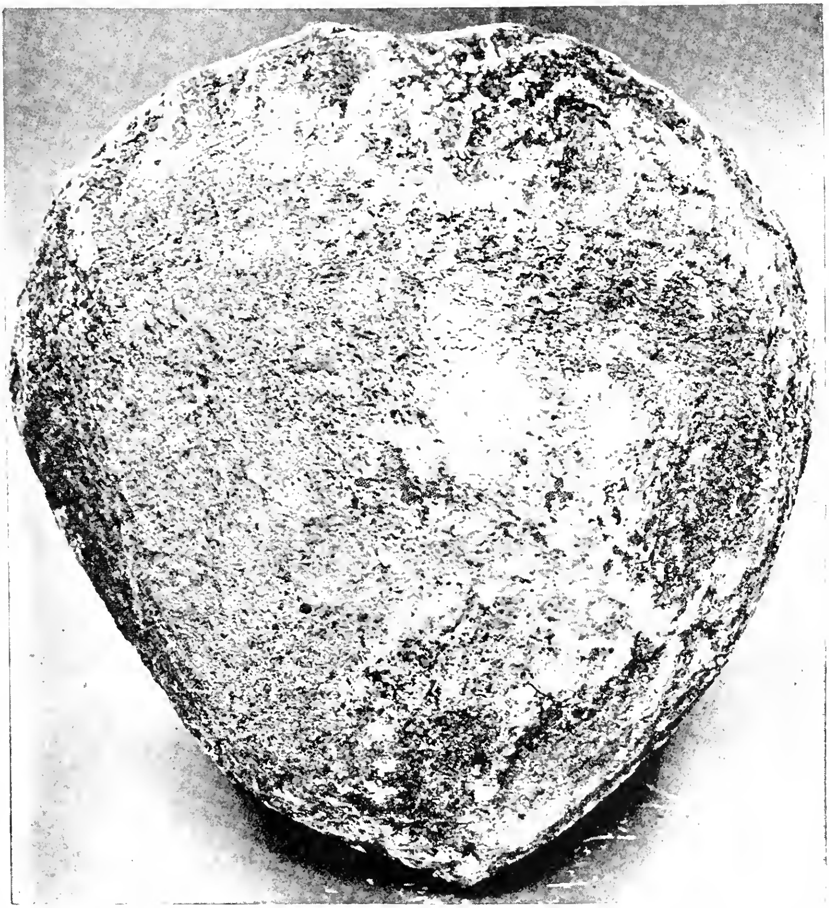
ABORIGINAL WIDOW'S CAP.



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ABORIGINAL WIDOW'S CAP.

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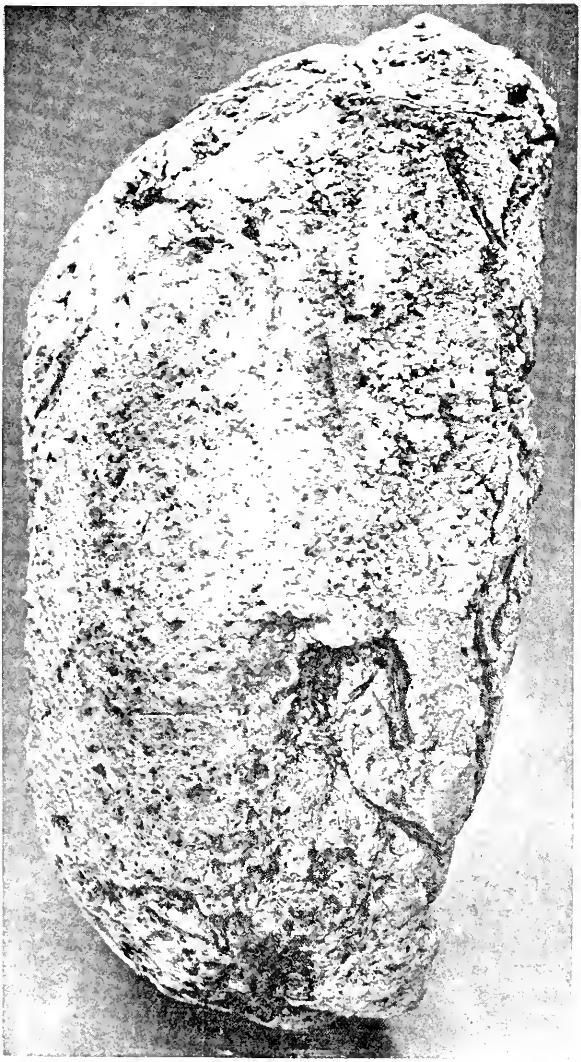
ABORIGINAL WIDOW'S CAP.



H. BARNES, JUNR. PHOTO. AUSTRALIAN MUSEUM.

ABORIGINAL WIDOW'S CAP.

H. BARNES, JUNR., PHOTO. AUSTRALIAN MUSEUM.

ABORIGINAL WIDOW'S CAP.

Previous to Mr. Man's Ethnological researches in the Andaman Islands, Major-General Lane-Fox had also remarked* on the close resemblance this "particular mode of covering the head and parts of the face with white when in mourning, *Og-da*," bore to the Australian custom. It is not the only resemblance the Andamanese bear to our Aborigines.

It was my intention to have made some remarks on the use of black as a sign of mourning amongst the Australian Indigenes, but the present subject has extended beyond the limits I at first contemplated.

* Journ. Anthrop. Inst., 1878, vii. p. 445.

ON THE FLORA OF MT. WILSON.

By Alex. G. Hamilton.

Mount Wilson, Parish of Irvine, County of Cook, is about 5 miles as the crow flies from Bell Station, on the Great Western Line (83 miles from Sydney). The road from Bell passes along the old stock route known as Bell's Line for 5 miles, and from the point where it diverges from Bell's Line to the Zigzag, which leads up to the summit, is 4 miles.

The highest point is 3,388 feet above the sea, but as the mountain rises from a ridge or table-land, it does not show as a very conspicuous peak. From the lowest point of the Zigzag to the summit, the rise is 275 feet. Seen from the railway line, Mt. Wilson appears as a long hog-backed ridge.

It is topographically a very well defined floral district, as it is bounded by the Wollongambe (a tributary of the Colo), and the Bowen, which flows into the Wollongambe. As the head waters of two tributaries of these streams rise within half a mile of each other, on opposite sides of a narrow ridge, the mountain is almost entirely enclosed by the two streams.

The higher part of the ridge is narrow, the level or comparatively level part being nowhere more than 400 yards across, and in most places it is much less. It is remarkable that the spurs from the main range are usually much wider than the range itself. The general direction is a little north of east, but there are two main spurs, one running nearly east and the other almost west, causing a wide separation of the Wollongambe and the Bowen at this place.

The mountain is one of a group of five—Mt. Wilson, Mt. King George, Mt. Tomah, Mt. Hay, and Mt. Bell—which are all capped with basalt. The basalt overlies the Hawkesbury Sandstone; and it is believed that the cappings on the summits mentioned are the remnants of a once continuous sheet of volcanic rock which originally probably welled up at Mt. Wilson and overspread the surrounding area to a now unknown extent (6 and 7). Mt. King George is, according to the parish map, 5 miles in a straight line from Mt. Wilson, and Tomah and Bell 4 miles: the intervening country is occupied by an intricate network of ravines with the characteristic precipitous sides found in valleys in the Hawkesbury Sandstone region.

On the eastern side of Mt. Wilson, Waterfall Creek, a tributary of the Bowen, takes its rise and falls over the edge of the basaltic sheet, which there is 275 feet below the summit and about 100 yards wide. Here there is basalt of a massive character, while 50 or 60 yards up the creek it splits into thin flat pieces, which ring like a piece of metal. The rock is also found in roughly prismatic columns in places. It usually weathers irregularly all over, the large crystals decomposing first and leaving hollows like gas bubbles. But in one spot boulders embedded in the soil decompose concentrically, so that the weathered stuff comes off in layers like the coats of an onion. The product of the weathering is a soil usually red, but sometimes approaching a chocolate colour.

Here and there zeolites are found throughout the mass. Mr. George Card, A.R.S.M., has been good enough to examine a micro-section of the rock, and gives me the following description of it:—"The rock is an olivine basalt. The minerals present are olivine, augite, plagioclase felspar (probably Labradorite), magnetic (and other) iron oxides. These are embedded in a light brown glass. The felspar microlites give rise by their disposition to a good fluidal structure, floating round the porphyritic constituent. Olivine is abundant and remarkably fresh. It occurs as porphyritic individuals, presumably from an earlier stage of crystallization, and numerous granules through the rock. The augite has a tendency to assume a purplish tint, and is slightly pleochroic." The basalt of Mt. Irvine is of a similar character.

From the point where the road crosses the neck between the Bowen and the Wollongambe to the foot of the Zigzag, the soil is derived from the weathering of the Hawkesbury Sandstone, which here appears to contain a good deal of iron. At this part, the vegetation is of the ordinary character obtaining all over the Blue Mountains. But at the foot of the Zig-zag, the sandy soil is mixed with the basaltic detritus, and the vegetation at once changes. The forest becomes very dense with creepers, sassafras and other brush trees, and tree-ferns. There is a distinct aromatic smell, mingled with that of decaying vegetation and fungoid growths, which I have everywhere noticed as a characteristic of the basaltic brush forests.

The winding road passes through this brush country up to the top of the Zigzag, where there is a patch of sandstone soil again, and, as before, the plants are of the ordinary Blue Mountain type, with one difference, that a number of minute and rare species of the genus *Prasophyllum* occur here, some of which have so far not been collected anywhere else. The road then winds round the highest part of the mountain, with thick growing vegetation of the brush forest type above and below. The houses are scattered along the length of this part of the ridge for about a mile; the ridge running along some six miles to Mt. Irvine, which is the extremity of Mt. Wilson, and some 700 feet lower down than Mt. Wilson proper. Here two or three blocks of land have recently been taken up and are being cleared. The vegetation all along the road is brush, but at Mt. Irvine many plants occur which are not found at the older settlement, and which show an approximation to the flora of the Kurrajong. Unfortunately very little collecting has been done at Mt. Irvine, and from the extremely patchy way in which plants occur all over the mountain it is probable that many additional plants will be found here.

Quite a number of species are found only in extremely limited areas all over the mountain, and continued collecting will be likely to yield other species.

The climate is as a general rule moist, and I have thought it worth while to insert a comparison with some other well-defined localities. For this purpose I have taken Sydney and Cordeaux River as types of coast climate in about the same latitude: Mt. Victoria as a mountain peak of nearly the same height, but not possessing brush forests, and very close in point of distance; and Mudgee as a type of climate on the inner aspect of the tableland. I have taken the yearly rainfall of these for the time during which a record has been kept at Mt. Wilson, viz.:—1876 and 1887 to 1897. I have also taken 1894 as an average year for comparison (as the annual rainfall in that year approaches very near the average for the whole period).

A comparison of the averages brings out the interesting fact that Mt. Victoria, in almost the same latitude and longitude, and with almost the same altitude and distance from the sea, has 11·73 inches less rain, and yet has 8 more rainy days in the year. Sydney has 2·80 inches less rain, but 67 more rainy days annually; Cordeaux River, 3·24 inches more rainfall and 29 more rainy days; and Mudgee, 24·89 inches rainfall and 29 rainy days less than Mt. Wilson. In comparing the figures it is also necessary to take into account the number of wet days as compared with the rainfall. Working these out for the 12 years during which the rain records have been kept at Mt. Wilson the results show that the average number of wet days to each inch of rainfall is as follows:—Mt. Wilson, 2 days to each inch of rain; Mt. Victoria, 2·7; Sydney, 3·4; Cordeaux, 2; Mudgee, 2·8.

These results make plain the fact that it is entirely to its rich soil that Mt. Wilson owes its wealth of vegetation. This is borne out also by the average for Cordeaux River (which has a little more rain), being equal to that of Mt. Wilson. At the Cordeaux the rich brushes are found only in those spots where there are basaltic dykes, the vegetation at other spots being nothing out of the common. I append comparative tables compiled from the Sydney Observatory reports (**3**).

Annual Rainfall for 1894,

(a fair average year for all the stations except Sydney).

Name.	Latitude.	Longitude.	Distance from Coast.	Altitude.	1894.	Av'ge. 12 years
Mt. Wilson	... 33° 25″	... 150° 29′	... 51 miles	... 3388 ft.	... 58·72	.. 57·44
Mt. Victoria	... 33° 36″	... 150° 15″	... 61 ,,	... 3490 ,,	... 47·20	... 48·30
Sydney	... 33° 51″	... 150° 13″	... 5 ,,	... 146 ,,	... 38·22	... 49·76
Cordeaux	... 34° 19″	... 150° 44″	... 6 ,,	... 1200 ,,	... 67·85	... 65·70
Mudgee	... 32° 35″	... 149° 35″	... 121 ,,	... 1635 ,,	... 29·11	... 27·67

Table of Average Rainfall and Number of Rainy Days

(for the 12 years (1876-97) during which a record has been kept at Mt. Wilson up to 1897).

Mt. Wilson.		Mt. Victoria.		Sydney.		Cordeaux.		Mudgee.	
Inches.	Wet Days.	Inches.	Wet Days.	Inches.	Wet Days.	Inches.	Wet Days.	Inches.	Wet Days.
52·56 ...	106 ...	40·83 ...	114 ...	49·76 ...	173 ...	60·61 ...	122 ..	27· ..	73

By the courtesy of Mr. J. D. Cox I am enabled to add a table of temperatures for the years 1896, 1897 and 1898. From these it appears that the average maximum temperature for the period is 57·7°; minimum, 42·9°; and mean for the period, 50·3 . During the whole period of 1,095 days the temperature fell to or below freezing point on 128 occasions; and rose to 90° or over on 5. The highest recorded temperature was 92°, and the lowest 22°. The average daily variation between maximum and minimum is 10°, but it sometimes rises as high as 54°, and falls as low as 0°. The greatest variations occur in the warmer months, and the least in the colder. The averages for the months of June, July and August are: max., 45·5; min., 33·8; mean, 39·6. And for December, January and February: max., 67·9°; min., 52·4°; mean, 60·1.

The year 1897 was remarkable for the number of times the temperature fell below the minimum, viz., 57. Yet the mean for that year is higher than for either 1896 or 1898, although 1897 had very few abnormally warm days.

Average Temperatures for 1896, 1897, 1898.

Year.	Max.	Min.	Av'ge Max.	Av'ge Min.	Mean.
1896	91	22	57·7	43·6	50·6
1897	92	23	59·4	42·9	51·1
1898	92	26	56·6	42·3	49·2

The general facies of the flora resembles that of the Illawarra brush-forests, but many plants characteristic of the latter district are wanting, while on the other hand but a few are found at Mt. Wilson and not in Illawarra. Among the important orders and genera not represented at Mt. Wilson are Anonaceæ, Menispermaceæ, Piperaceæ, Meliaceæ, Passifloræ (a seedling plant sent to me by Mr. Cox resembled *Passiflora aurantia*, but he was unable to find a mature plant), Sapotaceæ, and Ebenaceæ, and *Livistona*.

Livistona is common on the Kurrajong; *Metrosideros*, *Platycerium* and *Asplenum nidus* grow at Mt. Irvine, but not at Mt. Wilson proper.

It is remarkable that of 12 species of *Eucalyptus* growing on the mountain, but two—*E. viminalis* and *E amygdalina*—are to be found on the basalt. And 10 out of the whole number belong to the section Renantheræ, which has only 23 species altogether.

Another remarkable point is the scarcity of Loranthaceæ. Four species occur, but they are rare indeed, except the curious terrestrial, non-parasitic Loranth, *Atkinsonia*. The rarity of *Dicæum hirundinaceum* which feeds on loranth berries would seem to bear out Professor Tate's theory as to the absence of the Loranthaceæ in Tasmania being due to the absence of the bird also, but I do not think the two facts have anything to do with each other. Many of the honey-eaters devour the loranth fruits, and distribute the seeds both in their droppings and by their wiping off adherent fruits from their beaks on the branches of trees.

The absence of *Ranunculus* is strange. In Illawarra *R. lappaceus* is very plentiful in open grassy forests resembling some of the Mt. Wilson country.

Two species of *Peperomia* are extremely common in Illawarra on mossy rocks, but although I looked out specially for them in the same situations I never came across either species. Only one of the Cruciferæ is found. Flame-trees, Giant-nettles and Fig-trees are wanting. Of course some of these plants may yet be found as the locality is more closely examined.

In the brush at the top of the Zigzag there are very large numbers of that fine Labiate, *Prostanthera lasianthos*, of greater dimensions, and more profusely flowering than any I have seen elsewhere.

The most striking feature of the mountain is the quantity and vigorous growth of the ferns. They cover the ground, the rocks, and even the tree trunks. The tree-ferns are especially plentiful and well grown. In one creek I measured a *Dicksonia* 8 feet 6 inches in circumference of trunk and with fronds 16 feet in length. *Alsophila* grows to a great height. In the denser parts of the forest *Hymenophyllum* and *Trichomanes* are plentiful, and in Waterfall Creek *Todea Fraseri* flourishes, its translucent fronds sometimes reaching 6 feet in length.

The epiphytal orchids are plentiful in the same places, and every tree is covered with many species of mosses, hepatics, lichens and fungi. There are some very fine black-wood trees in some places, and the Eucalypts grow to an enormous girth and height without branching.

As an illustration of the general moistness of the air mention may be made of the ready germination of various seeds on the stems of the tree-ferns. In Mr. J. D. Cox's garden quite a number of seedlings of Cape heaths, which are cultivated close by, flourish on the trunks. *Quintinia Sieberi* is common on them. It has been said that this tree always begins life as a lodger on the fern-trees, but this is not so, as I have often found seedlings and young trees elsewhere. At Mitchell's Causeway, Mt. Victoria, a fine plant may be seen springing from the joints of the masonry. A healthy Eucalypt sapling is growing in a fern trunk in Mr. Cox's grounds. I have also found *Hydrocotyle*, *Geranium dissectum*, and several species of grasses growing on them.

On the north-western side of the range, where the plants are exposed to drying winds, the brush vegetation extends but a few yards down the slope. But on the east it goes right down to the bottom, and here a splendid soil, partly basaltic in origin and partly vegetable soil, is found. Here earthworms of large size flourish. In such situations there is little undergrowth but ferns; no grasses occur at all. The same thing occurs in the brush forests of Illawarra, and when the land is cleared it has to be sown with English grasses for dairy farming.

One point worth noticing is the much greater diversity of flowering plants on the sandstone.

I have not given the numbers on either formation, as no record was kept in many instances. On the sandstone the plants are seldom restricted to one small area, while it is very much the case on the basalt, some plants being found only in one small patch of but a few square yards in extent. Probably as more attention is paid to collecting in all parts of the volcanic area some additional plants will be found.

A comparison of the floras of the five peaks mentioned would be of interest, but sufficient data are not at present available. Allan Cunningham (1) and Dr. Woolls (8) have recorded their experiences at Tomah, but in neither case was a census of the flora the object in view.

The following list has been compiled from Dr. Woolls' paper (9) and a manuscript list he gave me, from plants collected by Messrs. J. H. Maiden, J. D. Cox, J. Gregson, P. N. Trebeck (5) and myself. Mr. Gregson's plants have been identified by Mr. Maiden, and Mr. Cox's and my own by Dr. Woolls and Mr. Maiden :—

Note.—The letter B after the name of a plant denote that it grows on the basaltic area ; S on the sandstone ; and B & S on both. Where no initial is appended, no record has been kept.

RANUNCULACEÆ.

Clematis aristata, R.Br. B.
glycinoides, DC. B.

DILLENIACEÆ.

Hibbertia Billardieri, F.v.M. S.
serpyllifolia, R.Br. S.
saligna, R.Br. S.

MAGNOLIACEÆ.

Drimys dipetala, F.v.M. B.

PAPAVERACEÆ.

Papaver aculeatum, Thunb. B.

CRUCIFERÆ.

Arabis glabra, Crantz. B.

VIOLACEÆ.

Viola betonicifolia, Sm. B.
hederacea, Labill. B.
Ionidium filiforme, F.v.M. S.
Hygmenanthera Banksii, F.v.M.

PITTOSPOREÆ.

Pittosporum undulatum, Andr. B; rare.
Marianthus procumbens, Benth. S.
Citriobatus multiflorus, A. Cunn.
Billardiera scandens, Sm. B. & S.

TREMANDREÆ.

Tetratheca ericifolia, Sm. S.
thymifolia, Sm. S.

POLYGALEÆ.

Comesperma volubile, Labill. S.
ericinum, DC. S.

CARYOPHYLLEÆ.

Stellaria pungens, Brongn. B.
flaccida, Hook. B.
Polycarpon tetraphyllum, Loefl. S.

HYPERICINEÆ.

Hypericum Japonicum, Thunb. B.

STERCULIACEÆ.

Lasiopetalum dasyphyllum, Sm. S.
ferrugineum, Sm., and var. *cordatum*. S.

TILIACEÆ.

Elæocarpus holopetalus, F.v.M. B.
reticulatus, Sm. B.

GERANIACEÆ.

Geranium pilosum, Sol. B.
Pelargonium australe, Willd., var. *erodioides*. B.
Oxalis corniculata, Linn. B. & S.

RUTACEÆ.

Zieria Smithii, Andr.
lævigata, Sm.
Boronia ledifolia, J. Gay. S.
microphylla, Sieb. S.
floribunda, Sieb. S.
pinnata, Sm. S.
Barkeriana, F.v.M. S.
anemonifolia, A. Cunn. S.
Phebalium Billiardieri, A. Juss. S.
Eriostemon obovalis, A. Cunn. S.

OLACINEÆ.

Olax stricta, R.Br. S.

CELASTRINEÆ.

Celastrus australis, Harv. et F.v.M. B.
Elæodendron australe, Vent.

STACKHOUSIEÆ.

Stackhousia viminea, Sm.

RHAMNACEÆ.

Pomaderris elliptica, Labill.
ledifolia, A. Cunn.
apetala, Labill.
Cryptandra ericifolia, Sm.
amara, Sm.

AMPELIDEÆ.

Vitis antarctica, Benth. B.
hypoglauca, F.v.M. B.

SAPINDACEÆ.

Dodonæa pinnata, Sm. S.
multijuga, G. Don. S.

LEGUMINOSÆ.

Oxylobium ellipticum, R.Br. S.
trilobatum, F.v.M. S.
alpestre, F.v.M. S.
Mirbelia grandiflora, Ait. S.
reticulata, Sm. S.
Gompholobium latifolium, Sm. S.
grandiflorum, Sm. S.
minus, Sm. S.
uncinatum, A. Cunn. S.
glabratum, DC. S.
Huegelii, Benth. S.
Sphærolobium vimineum, Sm. S.
Daviesia umbellulata, Sm. S.
latifolia, R.Br. S.
ulicina, Sm. B.
genistifolia, A. Cunn. B.
alata, Sm.
Phyllota phylicoides, Benth.
Pultenæa scabra, R.Br.
viscosa, R.Br.
flexilis, Sm. On margin of B. & S.
elliptica, Sm.
Dillwynia ericifolia, Sm.
floribunda, Sm.
Bossiæa heterophylla, Vent. S.
ensata, Sieb. S.
scolopendria, F.v.M. S.
lenticularis, Sieb. S.

Hovea linearis, R.Br.
longifolia, R.Br. (Narrow-leaved form).
Indigofera australis, Willd.
Desmodium varians, Endl.
Glycine clandestina, Wendl.
Kennedya rubicunda, Vent.
monophylla, Vent.
Acacia juniperina, Willd.
asparagoides, A. Cunn.
romeriformis, A. Cunn.
linifolia, Willd.
myrtifolia, Willd.
falcata, Willd.
penninervis, Sieb. (Mountain glaucous form).
suaveolens, Willd.
rubida, A. Cunn.
elongata, Sieb., var.
melanoxylon, R.Br.
implexa, Benth.
longifolia, Wendl.
linearis, Sims.
pumila, J.H.M.
elata, A. Cunn. B.
discolor, Willd.

ROSACEÆ.
Rubus parvifolius, Linn. B.
rosæfolius, Sm. B.
Moluccanus, Linn. B.
Moorei, F.v.M. B.
Acæna ovina, A. Cunn. B.
sanguisorbæ, Vahl. B.

SAXIFRAGEÆ.
Quintinia Sieberi, DC. B.
Ceratopetalum gummiferum, Sm. B.
apetalum, D. Don. B.

Schizomeria ovata, D. Don.
Bauera rubioides, Andr.

CRASSULACEÆ.

Tillæa verticillaris, DC. S.

DROSERACEÆ.

Drosera binata, Labill. S.

HALORAGEÆ.

Haloragis heterophylla, Brongn.
tetragyna, R.Br.
Callitriche Muelleri, Sond.

MYRTACEÆ.

Darwinia taxifolia, A. Cunn.
Calythrix tetragona, Labill.
Bæckea brevifolia, DC.
linifolia, Rudge.
virgata, Andr.
Leptospermum flavescens, Sm.
scoparium, R. & G. Forst.
arachnoideum, Sm.
lanigerum, Sm.
var. *macrocarpum*, M. & B.
parvifolium, Sm.
stellatum, Cav., var. *grandiflorum*.
attenuatum, Sm.
Kunzea capitata, Reichb.
Callistemon lanceolatus, DC.
Eucalyptus coriacea, A. Cunn. S.
stellulata, Sieb., var. *angustifolia*, Benth. S.
stricta, Sieb. S.
amygdalina, Labill.
Luehmanniana, F.v.M., var. *altior*, D. & M. S.
piperita, Sm. S.
eugenioides, Sieb. S.
capitellata, Sm. S.

Eucalyptus haemastoma, Sm., var. *micrantha*. S.
Sieberiana, F.v.M. S.
viminalis, Labill. B.
goniocalyx, F.v.M. S.
Tristania neriifolia, R.Br.
laurina, R.Br. On Wollongambe.
Syncarpia laurifolia, Sm. Mt. Irvine.
Eugenia Smithii, Poir.

ONAGREÆ.

Epilobium glabellum, G. Forst.

UMBELLIFERÆ.

Hydrocotyle hirta, R.Br. B. & S.
asiatica, Linn. B. & S.
Trachymene cyanopetalus, F.v.M. S.
glaucifolius, F.v.M. S.
incisus, Hook. S.
ericoides, Sieb.
linearis, Spreng. S.
Billardieri, F.v.M.
Xanthosia tridentata, DC. S.
pilosa, Rudge.
Atkinsoniana, F.v.M.
Actinotus Helianthi, Labill. S.
minor, DC. S.

ARALIACEÆ.

Astrotriche floccosa, DC., var. *angustifolia*.
Panax sambucifolius, Sieb. (Narrow-leaved form).

LORANTHACEÆ.

Viscum articulatum, Burm.
Loranthus celastroides, Sieb.
pendulus, Sieb.
Atkinsonia ligustrina, F.v.M. S.

CAPRIFOLIACEÆ.

Sambucus xanthocarpa, F.v.M.

RUBIACEÆ.

Coprosma Billardieri, J. Hook.
Opercularia hispida, Spreng.
aspera, Gaertn.
Pomax umbellata, Sol.
Asperula oligantha, F.v.M.
Galium umbrosum, Sol.
australe, DC.

COMPOSITÆ.

Lagenophora Billardieri, Cass.
Solenogyne bellioides, Cass.
Brachycome graminea, F.v.M.
linearifolia, DC.
Aster myrsinoides, Labill.
ellipticus, A. Cunn.
dentatus, Andr.
ramulosus, Labill.
stellulatus, Labill., var. *quercifolius*
Gnaphalium luteo-album, Linn.
Japonicum, Thunb.
Helichrysum lucidum, Henck.
scorpioides, Labill.
rutidolepis, DC.
elatum, A. Cunn.
leucopsidium, DC.
Cassinia denticulata, R.Br.
aurea, R.Br.
longifolia, R.Br.
arcuata, R.Br.
Humea elegans, Sm. B.
Siegesbeckia orientalis, Linn.
Centipeda orbicularis, Lour.
Senecio velleioides, A. Cunn.
dryadeus, Sieb., var. *macrodontus*.
Erechthites prenanthoides, DC., var. near *picridioides*.
mixta, DC.
Crepis Japonica, Benth.

STYLIDEÆ (CANDOLLEACEÆ).

Stylidium graminifolium, Sw.
lineare, Sw.
debile, F.v.M.

GOODENIACEÆ.

Brunonia australis, Sm.
Dampiera Brownii, F.v.M.
lanceolata, A. Cunn.
stricta, R.Br.
Scævola hispida, Cav.
Goodenia decurrens, R.Br.
bellidifolia, Sm.
ovata, Sm.
barbata, R.Br.
heterophylla, Sm.
Velleya perfoliata. R.Br.

CAMPANULACEÆ.

Lobelia simplicicaulis, R.Br.
dentata, Cav.
anceps, Thunb.
purpurascens, R.Br.
Isotoma fluviatilis, F.v.M.
Wahlenbergia gracilis, A.DC.

EPACRIDEÆ.

Styphelia læta, R.Br., var. *angustifolia*, Benth.
Melichrus urceolatus, R.Br.
Lissanthe sapida, R.Br.
Leucopogon lanceolatus, R.Br.
muticus, R.Br.
Acrotriche aggregata, R.Br.
divaricata, R.Br.
Monotoca elliptica, R.Br.
scoparia, R.Br.
Brachyloma daphnoides, Benth.
Epacris longiflora, Cav.
reclinata, A. Cunn.

Epacris crassifolia, R.Br.
obtusifolia, Sm.
robusta, Benth.
petrophila, J. Hook.
rigida, Sieb.
heteronema, Labill.
microphylla, R.Br.
Woollsia pungens, F.v.M.
Sprengelia incarnata, Sm.
Dracophyllum secundum, R.Br.

MYRSINACEÆ.

Myrsine variabilis, R.Br. B.

APOCYNEÆ.

Lyonsia straminea, R.Br. B.
reticulata, F.v.M. B.

ASCLEPIADEÆ.

Tylophora barbata, R.Br. B.
Marsdenia rostrata, R.Br. B.
suaveolens, R.Br. B.

LOGANIACEÆ.

Mitrasacme paludosa, R.Br. S.
pilosa, Labill. S.
polymorpha, R.Br. S.
Logania floribunda, R.Br.

GENTIANEÆ.

Sebæa ovata, R.Br. B.
Erythræa spicata, Pers.

BORAGINEÆ.

Myosotis australis, R.Br.
Lappula concava, F.v.M.
Cynoglossum latifolium, R.Br.
suaveolens, R.Br.
australe, R.Br.

CONVOLVULACEÆ.

Convolvulus marginatus, Poir.
Dichondra repens, R. & G. Forst. B. & S.

SOLANACEÆ.

Solanum nigrum, Linn.
aviculare, G. Forst.
xanthocarpum, Schrad.
pungetium, R.Br.
campanulatum, R.Br.

SCROPHULARINEÆ.

Gratiola Peruviana, Linn. S.
Veronica calycina, R.Br. B.
plebeja, R.Br. B.

LENTIBULARINEÆ.

Utricularia dichotoma, Labill. S.

GESNERACEÆ.

Fieldia australis, A. Cunn.

BIGNONIACEÆ.

Tecoma australis, R.Br. B.

VERBENACEÆ

Spartothamnus junceus, A. Cunn. S.
Chloanthes stoechadis, R.Br. S.

LABIATEÆ.

Plectranthus parviflorus, Willd. B.
Prunella vulgaris, Linn. B.
Prostanthera lasianthos, Labill. B.
cærulea, R.Br. B.
linearis, R.Br. B.
Hemigenia purpurea, R.Br.
Ajuga australis, R.Br. B.
Teucrium corymbosum, R.Br. B.

PLANTAGINEÆ.

Plantago varia, R.Br.

CHENOPODIACEÆ.

Rhagodia hastata, R.Br.
Chenopodium triangulare, R.Br.

POLYGONACEÆ.

Rumex Brownii, Campd.
Polygonum plebejum, R.Br.
Muehlenbeckia gracillima, Meiss. B.

MONIMIACEÆ.

Doryphora sassafras, Endl. B.
Atherosperma moschatum, Labill. B.
Hedycarya Cunninghami, Tul. B.

LAURINEÆ.

Cryptocarya (probably *glaucescens*, R.Br.). B.
Litsea dealbata, Nees. B.
Cassytha glabella, R.Br. B. & S.

PROTEACEÆ.

Petrophila pedunculata, R.Br.
pulchella, R.Br.
Isopogon anethifolius, R.Br.
petiolaris, A. Cunn.
Conospermum tenuifolium, R.Br.
ericifolium, Sm.
Symphyonema montanum, R.Br.
Persoonia ferruginea, Sm.
hirsuta, Pers.
Chamæpitys, A. Cunn.
salicina, Pers.
lanceolata, Andr.
lucida, R.Br.
ledifolia, A. Cunn.
mollis, R.Br. B.
myrtilloides, Sieb.
oxycoccoides, Sieb.
acerosa, Sieb.
Lambertia formosa, Sm.

Grevillea laurifolia, Sieb.
sphacelata, R.Br.
Hakea pugioniformis, Cav.
saligna, R.Br.
dactyloides, Cav.
gibbosa, Cav.
propinqua, A. Cunn.
pubescens, Sch.
Lomatia longifolia, R.Br.
silaifolia, R.Br.
Telopea speciosissima, R.Br.
Banksia ericifolia, Linn. f.
spinulosa, Sm.
collina, R.Br.
integrifolia, Linn. f.
marginata, Cav., var. *acutifolia.*
paludosa, R.Br.
serrata, Linn. f.
aemula, R.Br.

THYMELEÆ.

Pimelea collina, R.Br. S.
linifolia, Sm. S.
ligustrina, Labill. B.
hirsuta, Meissn. S.

EUPHORBIACEÆ.

Monotaxis linifolia, Brongn. S.
Poranthera microphylla, Brongn. S.
ericifolia, Rudge. S.
corymbosa, Brongn. S.
Pseudanthus pimeleoides, Sieb. S.
Amperea spartioides, Brongn. S.
Phyllanthus thymoides, Sieb. S.

URTICACEÆ.

Urtica incisa, Poir.

CASUARINEÆ.

Casuarina glauca, Sieb. S.
distyla, Vent. S.
nana, Sieb S.

SANTALACEÆ.

Exocarpus stricta, R.Br. S.
Omphacomeria acerba, A.DC. S.
Leptomeria acida, R.Br.
Choretrum Candollei, F.v.M.

CONIFERÆ.

Callitris Muelleri, Benth. & J. Hook.

ORCHIDEÆ.

Dendrobium speciosum, Sm. S.
æmulum, R.Br. B.
pugioniforme, A. Cunn. B. & S.
teretifolium, R.Br.
striolatum, Reichb.
Sarcochilus falcatus, R.Br. B.
montanus, R.D.F. B.
Dipodium punctatum, R.Br. B.
Gastrodia sesamoides, R.Br. B.
Spiranthes australis, Lindl. S.
Thelymitra circumsepta, R.D.F.
carnea, R.Br.
media, R.Br.
pauciflora, R.Br.
venosa, R.Br.
Diuris sulphurea, R.Br. B.
Orthoceras strictum, R.Br.
Calochilus campestris, R.Br.
paludosus, R.Br.
Cryptostylis longifolia, R.Br.
erecta, R.Br.
leptochila, R.Br.

Prasophyllum flavum, R.Br.
striatum, R.Br.
nigricans, R.Br.
rufum, R.Br.
fimbriatum, R.Br.
intricatum, C. Stuart.
densum, R.D.F.
ansatum, R.D.F.
transversum, R.D.F.
longisepalum, R.D.F.
eriochilum, R.D.F.
Microtis porrifolia, Spreng.
parviflora, R.Br.
Corysanthes unguiculata, R.Br. B.
pruinosa, A. Cunn. B.
bicalcarata, R.Br. B.
Pterostylis curta, R.Br.
nutans, R.Br.
hispidula, R.D.F.
pedunculata, R.Br.
coccinea, R.D.F.
reflexa, R.Br.
obtusa, R.Br.
parviflora, R.Br.
longifolia, R.Br.
Caleana major, R.Br.
minor, R.Br.
Acianthus fornicatus, R.Br.
exsertus, R.Br.
Eriochilus autumnalis, R.Br.
Caladenia carnea, R.Br.
dimorpha, R.D.F.
testacea, R.Br.
Chiloglottis diphylla, R.Br.
formicifera, R.D.F.
Glossodia major, R.Br.

IRIDEÆ.

Patersonia glauca, R.Br.
sericea, R.Br.

AMARYLLIDEÆ.

Haemadorum planifolium, R.Br.
Hypoxis hygrometrica, Labill.

LILIACEÆ.

Smilax glycyphylla, Sm.
australis, R.Br.
Dianella longifolia, R.Br.
cærulea, Sm.
Tasmanica, J. Hook.
revoluta, R.Br.
Eustrephus Brownii, F.v.M.
Geitonoplesium cymosum, A. Cunn.
Blandfordia grandiflora, R.Br.
nobilis, Sm.
Thysanotus Patersoni, R.Br.
tuberosus, R.Br.
junceus, R.Br.
Cæsia vittata, R.Br.
parviflora, R.Br.
Stypandra glauca, R.Br.
cæspitosa, R.Br.
Arthropodium minus, R.Br.
Sowerbæa juncea, Sm.
Alania Endlicheri, Kunth.
Xerotes longifolia, R.Br.
Brownii, F.v.M.
glauca, R.Br.
flexifolia, R.Br.
Xanthorrhœa hastilis, R.Br.

XYRIDEÆ.

Xyris operculata, Labill. S.
gracilis, R.Br. S.

JUNCACEÆ.

Luzula campestris, DC.
Juncus planifolius, R.Br.
pallidus, R.Br.

ERIOCAULEÆ.

Eriocaulon Smithii, R.Br.

RESTIACEÆ.

Lepyrodia scariosa, R.Br.
Restio australis, R.Br.

CYPERACEÆ.

Scirpus riparius, Spreng.
Schoenus villosus, R.Br.
melanostachys, R.Br.
deustus, F.v.M.
Lepidosperma exaltatum, R.Br.
Gahnia Gunnii, F.v.M.
psittacorum, Labill.
Caustis pentandra, R.Br.
flexuosa, R.Br.
Carex paniculata, Linn.

GRAMINEÆ.

Panicum sanguinale, Linn.
gracile, R.Br.
Anthistiria ciliata, Linn. f.
Ehrharta stipoides, Labill.
Stipa Dichelachne, Steud.
aristiglumis, F.v.M.
Echinopogon ovatus, Palis.
Amphipogon strictus, R.Br.
Agrostis nivalis, F.v.M.
rudis, Roem et Schult.
Solandri, F.v.M.
Anisopogon avenaceus, R.Br.
Danthonia penicillata, F.v.M.
Poa cæspitosa, G. Forst.
Agropyron scabrum, Palis.

Lycopodiaceæ.

Tmesipteris Tannensis, Benth.
Lycopodium laterale, R.Br.
densum, Labill.
Selaginella uliginosa, Spreng.

Filices.

Schizæa rupestris, R.Br.
bifida, Willd.
dichotoma, Sm.
Trichomanes venosum, R.Br.
Hymenophyllum Tunbridgense, Sm.
formosum, Bracken.
flabellatum, Labill.
Gleichenia circinata, Sw. S.
dicarpa, R.Br. S.
flabellata, R.Br. S.
dichotoma, Hook. S.
Osmunda barbara, Thunb. S.
Fraseri, F.v.M.*
Alsophila australis, R.Br. B.
Leichhardtiana, F.v.M. B.
Dicksonia antarctica, Labill. B.
davallioides, R.Br.
Davallia pyxidata, Cav.
dubia, R.Br.
Lindsaya linearis, Sw. B.
microphylla, Sw.
Adiantum æthiopicum, Linn. B.
formosum, R.Br. B.
affine, Willd. B.

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* Mr. Trebeck in his paper on Mt. Wilson Ferns (5) mentions *O. hymenophylloides*, "a very beautiful membranous fern, 2 to 2 feet 6 inches high, but not so beautiful as at Katoomba." This is probably the young stage of *O. Fraserii*, which looks very distinct from the mature plant.

Adiantum hispidulum, Sw. B.
diaphanum, Blume.
Pteris falcata, R.Br.
umbrosa, R.Br.
aquilina, Linn.
arguta, Ait.
incisa, Thunb.
comans, Forst.
Lomaria Patersoni, Spreng.
discolor, Spreng.
Capensis, Willd.
Blechnum cartilagineum, Sw.
laevigatum, Cav.
Woodwardia aspera, Mett.
Asplenium nidus, Linn. Mt. Irvine.
flabellifolium, Cav., var. *cristatum*.
attenuatum, R.Br.
falcatum, Lam.
marinum, Linn.
umbrosum, Sm.
flaccidum, Forst.
bulbiferum, Forst.
Aspidium molle, Sw.
decompositum, Sw., var. *glabrum*.
tenerum, Spreng.
hispidum, Sw.
aculeatum, Sw., var. *proliferum* B.
Capense, Willd.
coriaceum, Sw.
Polypodium serpens, Forst.
australe, Mett.
attenuatum, R.Br.
pustulatum, Forst.
scandens, Forst.
tenellum, Forst.
punctatum, Thunb.
Platycerium alcicorne, Desr. Mount Irvine.

There are thus 77 Natural Orders, 257 genera, and 545 species. On tabulating the above species (Mt. Wilson plants only) it will be found that the ferns have 18 genera and 61 species; the Orchideæ 20 genera and 58 species. These Natural Orders, however, on account of their attractiveness, have probably been most assiduously collected. Next come the Leguminosæ with 15 genera, 52 species; Proteaceæ, 11 genera, 38 species; Myrtaceæ, 10 and 30; Liliaceæ, 12 and 25; Epacrideæ, 11 and 22; and a few of the remaining orders have over 10 species.

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5. Trebeck, P. N.—Mt. Wilson and its Ferns. P.L.S.N.S.W. 1886 (2), Vol. i. p. 491.
6. Wilkinson, C. S.—Mines and Mineral Statistics of N.S.W., 1876, p. 136.
7. ——— ———Notes on the Geology of N.S.W., p. 62.
8. Woolls, W.—A Contribution to the Flora of Australia, 1867, p. 173.
9. ———————A Glance at the Flora of Mt. Wilson. P.L.S.N.S.W. 1887 (2), Vol. ii. p. 6.

NOTES AND EXHIBITS.

Mr. R. Etheridge, Junr., exhibited the three aboriginal mortuary caps described in his paper. Also a remarkable spear with the following

Note on a "Musical Spear."

When classifying the collection of Pacific Island Spears at present unexhibited in the Australian Museum from want of space, one in particular attracted my attention by the production of a rattling noise when the weapon was shaken or placed in any other position than that of the vertical, butt downwards. The spear in question is seven and a half feet long, with a heavy palm wood shaft, and a bamboo butt, two feet six inches in length, and one inch in diameter. In the piece of bamboo are retained two nodes and three internodes, and the exterior is ornamented with burnt-incised figures. The noise was observed to proceed from the interior of the butt, and a further examination revealed the fact that the hollow interior of the bamboo to the first node, a length of six inches, was utilised as a box or receptacle for twenty small limestone pebbles, the orifice being closed with a wad of twisted leaves. When the spear is poised and shaken, with the pebbles *in situ*, a pleasing rattle-like noise is produced. It is from New Ireland.

Mr. Baker exhibited herbarium specimens, timbers, oils, camphor, and kinos, of the Eucalypts described in his paper. Also a "native yam" from Angledool (on the Queensland border) forwarded by Mr. A. Paddison. It weighs $8\frac{1}{2}$ lbs., and measures 12 inches in length, and 6 in diameter; 30 lbs. weight of these yams were yielded by a single vine. The botanical material forwarded shows the plant to be a twiner and an undescribed species of *Lyonsia* [*Parsonsia*: see p. 386]. The tubers are eaten by both colonists and aboriginals. This is the first record of an edible "yam" from an Australian Asclepiad.

Mr. Harper showed a selected series of human bones and relics in illustration of his paper.

Mr. Stead exhibited a specimen of basalt from Kiama showing the effects of atmospheric erosion. Also examples of silicified wood forming the shingle of a beach near Wollongong.

Mr. Rainbow exhibited the collection of Santa Cruz Spiders enumerated or described in his paper.

Mr. Fred. Turner exhibited a collection of forage plants and grasses typical of the herbage of New England in March of the present year.

Mr. T. Steel exhibited two needles made of human bones, from Fiji, where they are used in thatching.

Mr. Whitelegge, on behalf of the Rev. W. W. Watts, of Ballina, exhibited a collection of Australian Mosses named by Dr. Brotherus, of Helsingfors, and communicated the following :—

Notes on some recently described Species of N. S. Wales Mosses. By the Rev. W. W. Watts.

In a recent return from Dr. V. F. Brotherus, of Helsingfors, who has been kind enough to determine a large number of specimens of mosses collected by me on the Northern Rivers, I was pleased to find no less than 21 new species, one of which is also the representative of a new genus.

In sending this return, the distinguished specialist intimated that he had not yet examined the numerous specimens belonging to the genera *Macromitrium* and *Fissidens*, but said that he had no doubt these would contain several new species.

I have mounted specimens of all the new species, except one, viz., *Stereophyllum Wattsii*, the material of which is small, and the moss itself very minute. It is, however, one of the most interesting of the series, no species of *Stereophyllum* having been previously recorded for New South Wales, and only one other species being known in Australia.

It gives me especial pleasure to introduce to the Linnean Society the new genus, inasmuch as it is dedicated to my friend Mr. Thomas Whitelegge. The moss grows on the Richmond River in many places, though it requires a good deal of patience to collect it in any quantity. I found it some two or three years ago, and sent specimens to Dr. Brotherus; but, much to my disappointment, no mention was made of them in his returns.

Last February I was looking through some of Mr. Whitelegge's mosses, and was much interested to find this particular species. He had sent it to Dr. Brotherus, but it had been omitted in his returns. To my great satisfaction a recent letter reports this moss as representing a new genus under the name *Whiteleggea australis*. It is a very distinct moss, and the fruit is a very beautiful object when examined with a low power of the microscope, or even an ordinary lens.

The following are the new species which Dr. Brotherus and Dr. Warnstorf have found among my specimens:—

Sphagnum Wattsii, Warnst.; *Dicranella pellucida*, Broth.; *Campylopus perauriculatus*, Broth.; *Philonotis micropteris*, Broth.; *Bryum Wattsii*, Broth.; *B. erythrocarpulum*, Broth.; *B micropachypoma*, Broth.; *Pterygophyllum Wattsii*, Broth.; *Cryphaea papillarioides*, Broth.; *Thuidium liliputanum*, Broth.; *T. subliliputanum*, Broth.; *T. atrovirens*, Broth.; *Stereophyllum Wattsii*, Broth.; *Amblystegium austro-palustre*, Broth.; *Isopterygium latifolium*, Broth.; *I. Novae-Valesiae*, Broth; *I. amoenum*, Broth.; *I. arachnoideum*, Broth.; *Rhaphidostegium micropyxis*, Broth.; and *R. Wattsii*, Broth.

Unfortunately, the name of one of these species, *Bryum erythrocarpulum*, though eminently suitable to the moss, has been appropriated by Dr. Carl Müller, in his recent *Symbolae ad Bryologiam Australiae*. I have reminded Dr. Brotherus of this, but in the meantime give his naming as supplied to me. I am sending specimens of the new species for exhibition, and I regret that in some cases the material is poor.

In addition to the above, I send also a good specimen of a new species mentioned in my last communication, shortly to be described by Dr. Brotherus as *Physcomitrium Novæ-Valesiæ*, Broth.; my last return contains several references to this striking species. My lists comprise the names of several species and forms which, so far as I can judge, are new to the colony. Among these I may mention the following:—

Sphagnum centrale, Jens.; *S. cymbifolium* var. *glaucescens*, form *brachyclada*, Warns.; *S. cymbifolium* var. *carneopallidum*, Warns.; *Campylopus Woollsii*,* C.M.; *Entosthodon Smithhurstii*, B.G.; *Philonotis pseudo-mollis*, C.M.; *P. tortifolia*, C.M.; *Bryum chryso-neuron*, C.M.; *B. pusillum*, Broth.; *Hookeria karsteniana*, B.G.; *Hypnum convolutifolium*, *H. austrinum*, *Orthorrhynchium cymbifolioides*, *Sciaromium hispidum*. Of some of these I have mounted specimens for exhibition. I am also sending specimens of *Dawsonia intermedia*, C.M., and *Aulacopilum Hodgkinsoniæ*, C.M., this latter a very rare moss, of which I have been fortunate enough to find a good specimen.

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* Dr. Brotherus has now given this name to all specimens of mine previously named by him *C. torquatus*.

WEDNESDAY, JULY 26TH, 1899.

The Ordinary Monthly Meeting of the Society was held at the Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesday evening, July 26th, 1899.

Mr. Henry Deane, M.A., F.L.S., Vice-President, in the Chair.

Mr. W. Buckingham, Marrickville; Mr. Julius H. Camfield, Botanic Gardens, Sydney; Mr. John F. Campbell, Walcha; Mr. Edwin Cheel, Penshurst; Dr. C. Dagnall Clark, North Sydney; Mr. Alex. Grant, Botanic Gardens, Sydney; Mr. Francis H. E. Le Bihan, Glebe Road; Mr. George B. Pritchard, Melbourne; Mr. Charles W. Smith, Gladesville; Rev. Walter W. Watts, Ballina, were elected Ordinary Members of the Society.

DONATIONS.

Department of Agriculture, Brisbane—Queensland Agricultural Journal. Vol. v. Part 1 (July, 1899). *From the Secretary of Agriculture.*

Australian Museum, Sydney—Memoir iii. The Atoll of Funafuti. Part 8 (July, 1899). *From the Trustees.*

Department of Mines and Agriculture, Sydney—Agricultural Gazette of New South Wales. Vol. x. Part 7 (July, 1899). *From the Hon. the Minister for Mines and Agriculture.*

Royal Society of New South Wales, Sydney—Journal and Proceedings, Vol. xxxii. (1898): Abstract, July 5th, 1899. *From the Society.*

Australasian Journal of Pharmacy, Melbourne. Vol. xiv. No. 163 (July, 1899). *From the Editor.*

Department of Agriculture, Victoria.—Guides to Growers. Nos. 32-44 (1897-99); Three Reports by Messrs. A. N. Pearson, D. Wilson and R. Crowe (1898-99). *From the Secretary of Agriculture.*

Department of Mines, Victoria: Geological Survey of Victoria—Progress Report. No. x. (1899). *From the Secretary for Mines.*

Field Naturalists' Club of Victoria—Victorian Naturalist. Vol. xvi. No. 3 (July, 1899). *From the Club.*

Gordon Technical College, Geelong—The Wombat. Vol. iv. No. 3 (May, 1899). *From the College.*

Nova Scotian Institute of Science, Halifax—Proceedings and Transactions. Vol. ix. Part 4 (Session, 1897-98). *From the Institute.*

American Academy of Arts and Sciences, Boston—Proceedings. Vol. xxxiv. Nos. 11-14 (Feb., 1899). *From the Academy.*

American Naturalist (Cambridge). Vol. xxxiii. No. 390 (June, 1899). *From the Editor.*

American Philosophical Society, Philadelphia—Proceedings. Vol. xxxvii. No. 158 (Dec., 1898). *From the Society.*

Johns Hopkins University, Baltimore—University Circulars. Vol. xviii. No. 140 (June, 1899). *From the University.*

Smithsonian Institution, Washington, D.C.—Annual Report of the Board of Regents to July, 1897 (1898): Report of the U.S. National Museum for the Year ending June 30th, 1896 (1898): Bulletin No. 47. Parts ii.-iii. (1898); Proceedings. Vols. xviii. and xx. (1895-98). *From the Institution.*

Imperial University, Tōkyō—Journal of the College of Science. Vol. viii. Part ii. (1895); Vol. xi. Part iii. (1899) *From the Director.*

Societas Zoologica Tokyonensis — Annotationes Zoologicæ Japonenses. Vol. iii. Pars 1 (May, 1899). *From the Society.*

Indian Museum, Calcutta — Materials for a Carcinological Fauna of India. No. 4, Part ii. (1899). *From the Superintendent.*

Geological Survey of India, Calcutta—General Report for the Period from the 1st April, 1898, to the 31st March, 1899. *From the Director.*

Perak Government Gazette. Vol. xii. Nos. 16-20 (June, 1899). *From the Government Secretary.*

Manchester Literary and Philosophical Society, Manchester—Memoirs and Proceedings. Vol. xliii. Parts ii.-iii. (1898-99). *From the Society.*

Marine Biological Association of the United Kingdom, Plymouth—Journal. New Series. Vol. v. No. 4 (June, 1899). *From the Director.*

Royal Society, London—Proceedings. Vol. lxv. Nos. 414-415 (May-June, 1899). *From the Society.*

Zoological Society of London—Abstract. June 6th, 1899. *From the Society.*

Royal Irish Academy, Dublin—Proceedings. Third Series. Vol. v. No. 2 (1899). *From the Academy.*

Naturhistorisches Museum in Hamburg—Mitteilungen. xv. Jahrgang (1897). *From the Museum.*

Zoologischer Anzeiger. xxii. Band. Nos. 588-589 (May-June, 1899). *From the Editor.*

Société Géologique de Belgique, Liége—Annales. Tome xxvi. 2^e Liv. (May, 1899). *From the Society.*

Faculté des Sciences de Marseille — Annales. Tome ix. Fasc. i.-v. (1899): Annales de l' Institut Colonial de Marseille. Vol. v. 1^er. Fasc. (1898). *From the Faculty.*

Royal Academy of Sciences, Amsterdam—Jaarboek 1897: Verhandelingen. Tweede Sectie. Deel vi. Nos. 1-2 (Sept., 1897-July, 1898): Verslagen. Deel vi. (1898). *From the Academy.*

Societas Entomologica Rossica—Horae. T. xxxii. Nos. 3-4 (1898). *From the Society.*

Kongl. Svenska Vetenskaps-Akademie, Stockholm—Oefversigt. 55 Bd. (1898). *From the Academy.*

La Nuova Notarisia, Padova. Serie x. (Luglio, 1899). *From M. le Doct. G. B. De Toni.*

Museo di Zoologia ed Anatomia comparata della R. Università di Torino—Bollettino. Vol. xiv. Nos. 335-353 (Feb.-May, 1899). *From the University.*

South African Museum, Cape Town—Annals. Vol. i. Part 2 (March, 1899). *From the Trustees.*

SOME FURTHER OBSERVATIONS ON THE VEGETATION OF LORD HOWE ISLAND.

By J. H. Maiden, F.L.S., Botanic Gardens, Sydney.

(Plates xxxii.-xxxiii.)

I offer a few brief notes on some Lord Howe Island plants to which I have given attention since the publication of my former paper (P.L.S.N.S.W. 1898, p. 112), together with a few additional bibliographical notes of some interest to the botanist. May I remind my readers, in passing, that there is, in the Santa Cruz Group, a second Lord Howe Island (see Proc. R.G.S. xlii. 220).

JASMINEÆ.

Notelæa quadristaminea, *Hemsl.*—"Blue Plum." In my former paper (p. 130) I gave an account of the Blue Plum, and figured the fruits; I supposed it had not been recorded as having been found on the island. I have since received a complete series of botanical specimens, and find that the Blue Plum is referable to *Notelæa quadristaminea*, and a description of the fruit will be found in Mueller's Fragm. viii. 42, as *Chionanthus*. An amended description is given at x. 89, as *Mayepea*. I cannot find that this plant has anywhere been referred to by Mueller or others as "Blue Plum."

Through Mr. J. G. Luehmann's kindness I have received specimens of leaves of (1) ? *Endiandra* sp., Russell River, Queensland (Sayer); (2) large coriaceous ovate lanceolate leaves, 8 inches long by 3 inches wide, New South Wales (Camara). Both are accompanied by fruits of *Notelæa quadristaminea*. They are, in my opinion, incorrectly matched, but they afford clues as to the occurrence of this species on the mainland. Up to the present I have not received these characteristic fruits from an Australian locality for certain.

ORCHIDEÆ.

DENDROBIUM GRACILICAULE, F.v.M., var. HOWEANUM, var.nov.

I brought some plants of the Lord Howe Island *D. gracilicaule*, and have watched their growth. The Lord Howe Island plant is stouter than the normal species; the pseudo-bulb is swollen at the place of attachment to the rhizone to a much greater extent than I have observed it in the normal species.

The inflorescence is more erect, and the individual flowers are larger than those of *D. gracilicaule*. The blotches of purple seen on *D. gracilicaule* appear to be entirely absent, the whole flower (with the exception of the labellum) being of a pale cream colour, lighter than that of *gracilicaule*.

The labellum is marked with purplish lines the whole length from the base to the point; in *gracilicaule* the marking only extends half-way from the base. As a florist's flower it is of superior merit to *D gracilicaule*. I propose the name *Howeanum* for this variety.

PALMÆ.

HEDYSCEPE CANTERBURYANA, *F.v.M.*—I am now in a position to offer an illustration of the inflorescence of this palm. It has not been previously figured, and Plates xxxii.-xxxiii. are from photographs taken by Mr. Wm. Forsyth in the Sydney Botanic Garden at the end of February, 1899. This is the first occasion in which this palm has flowered in cultivation, I believe, and it has arrived at an opportune time, as a large number of specimens of the inflorescence collected and attempted to be preserved for me on the island have arrived in Sydney in a bad state.

From the flowers depicted in the photograph the following description was drawn up:—

Flowers bisexual, sessile in pairs or rarely single on the branches of the panicle. Outer perianth-segments consisting of three short acuminate segments, the inner ones more than twice as long, ovate-acute, both of a pale yellow colour. Stamens 10-12, slightly exceeding the perianth, with versatile anthers. Style rather shorter than the stamens, with a small stigma (not trifid). Compare B Fl. vii. 138; also my former paper, p. 139.

LYCOPODIACEÆ.

Lycopodium varium, *R.Br.*—See Hemsley's list, p. 260 (*op. cit.*); also B.Fl. vii. p. 674. It would be desirable to enquire whether *L. varium* has really come from Lord Howe Island, or whether a mainland plant has not been substituted through inadvertence.

L. nutans, Brackr., from Lord Howe Island, is in the herbarium of the Botanic Gardens, Sydney.

Following are the bibliographical notes referred to :—

Baker, J. G. "Ferns of Lord Howe Island." *Gardeners Chronicle*, 24th February, 1872, p. 253.

"I cannot, from the dry fronds, separate one from the well-known *Alsophila excelsa* of Norfolk Island." He adds that this is not a final judgment. The other is *Hemitelia Moorei*, Baker, n.sp. These are the two tree-ferns referred to in Dr. G. Bennett's letter in the Gard. Chron. of 27th January, 1872. He describes another new fern under the name of *Deparia nephrodioides*. (The latter species was subsequently figured in Hooker's *Icones Plantarum*, t. 1608.)

Baker, J. G. "New Ferns from Lord Howe Island." *Journ. Bot* xi. 16 (1873).

Two ferns collected by the Eclipse Expedition of 1871, viz. :—*Todea* (*Leptopteris*) *Moorei* and *Asplenium* (*Darea*) *pteridoides*. The former species was in 1887 figured in Hooker's *Icones Plantarum*, t. 1697, and the latter at t. 1649.

Baker, J. G. "Tree-fern from Lord Howe Island." *Journ. Bot.* xii. 279 (1874).

"The fine tree-fern described by Baron von Mueller in the part of his Fragmenta just received (viii. p. 176) under the name of *Hemitelia Macarthuri* is identical with the *Cyathea Moorei* of the yet unpublished 2nd Ed. of Hooker and Baker's *Syn. Filicum*, p. 453."

Bennett, G. *Gardeners' Chronicle*, 27th January, 1872, Dr. Bennett writes that Mr. W. Carron went in H.M.S. "Rosario" to Lord Howe Island. "My object is to direct your attention to the discovery of two remarkable tree-ferns of the genus *Alsophila* and supposed to be new." Sketches are given of "Branched Alsophila" and "Alsophila sp."

Iris Robinsoniana, F.v.M.—*Gardeners' Chronicle*, 23rd March, 1872, p. 393, with two figures, gives a full account of this interesting plant, now of course referred to *Moræa*.

McFarland, A. Mutiny in the "Bounty," and Story of the Pitcairn Islanders (Sydney, 1884).

At pp. 126, 127 are notes in regard to Pitcairn Islanders who died (in the early thirties) at "Lord Howe" Island. The notes are not botanical, but are interesting as referring to the early history of Lord Howe Island, concerning which we have but little information.

Moore, C. "Vegetation of Lord Howe's Island." *Journ. Bot.* vii. 299 (1869). (Reprinted from *Gard. Chron.*, 1869, p. 968). Also, "Sketch of the Botany of Lord Howe Island." *Trans. Bot. Soc. Edin.* x. 365. Covering much the same ground as the preceding paper.

Shortland, Lieut., and Watts, Lieut., in "The Voyage of Governor Phillip to Botany Bay, &c. (1789)."

There is a brief note concerning Lord Howe Island at p. 94; at pp. 180, *et seq.*, there is an excellent map and chart of the island, also a view of "Ball Pyramid." Shortland's only allusion to the vegetation is . . . . "but it abounds with cabbage-palms, mangrove and manchineal trees, even up to the summit of the mountains. No vegetables were to be seen." At pp. 223, *et seq.*, Lieut. Watts gives an account of the island, and says:—"This island is well covered with wood, the chief of which is the large and dwarf mangrove, the bamboo and the cabbage-tree. The different vegetables met with were scurvy-grass, wild celery, spinach, endive and samphire." These brief notes were more or less adopted by other navigators prior to say 1860, who gave an account of the products of the island.

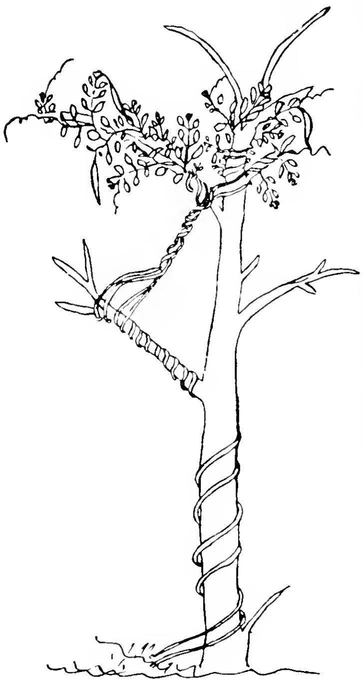
ON AN APOCYNACEOUS PLANT YIELDING LARGE EDIBLE TUBERS.

By R. T. Baker, F.L.S., Curator, Technological Museum, Sydney.

(Plates xxxiv.-xxxv.)

Parsonsia Paddisoni, n.sp.

A glabrous woody climber. Leaves opposite, on a petiole from 6 to 8 lines long, obovate, elliptical-lanceolate, abruptly acuminate, glabrous on both sides, upper surface dark green, venation about equally prominent on both sides, reticulations perhaps more distinct on the upper surface, under side pale-coloured, margins recurved, about 3 to 4 inches long.



Cymes axillary, only in one axil of the pair of leaves, peduncles pubescent, shorter than the leaves. Calyx-segments equal, lanceolate, subulate, ribbed, pubescent, 1 to $1\frac{1}{2}$ lines long, margins hyaline. Corolla-tube shorter than the calyx, constricted at the attachment of the stamens, lobes glabrous, about 2 lines long, the right edge imbricate. Filaments slender, pubescent, slightly twisted under the anthers; anthers wholly exserted, acuminate, forming a cylinder nearly as long as the corolla, without dorsal appendages, basal lobes long, incurved at the ends.

Fruits 5 to 7 inches long, follicles thin, seeds attenuate into a short beak at the hilum, with a coma over 1 inch long.

Hab.—New Angledool, N.S.W. (A. Paddison).

I have failed to obtain specimens of the original *P. lanceolata*, R.Br., for comparison, so have drawn the distinctions from Bentham's description (B. Fl. Vol. iv. p. 318).

If it were not for the imbrication of the petals and the leaves it could be placed as a variety of *Lyonsia eucalyptifolia*, F.v.M., as it certainly has many features common with that species, particularly the appearance of the inflorescence and the anthers.

It differs from *P. lanceolata*, R.Br., in its axillary cymes, shape of leaves, and calyx-lobes being equal.

It is very probable that two species are included under that species as described in B. Fl. iv. p. 318.

My attention was first drawn to this plant by Mr. A. Paddison, of New Angledool, who sent for identification a large tuber or "yam" weighing about 10lbs., stating that similar yams were eaten both by settlers and aborigines. After receiving specimens of leaves, flowers and fruits, it was found that the plant was referable to *Parsonsia*, and not *Lyonsia*, as a preliminary examination of the first fragments of leaves and flowers received had led me to suspect, as mentioned by me in the Abstract of Proceedings for June.

The average height of the plant is about from 10 to 15 feet. This, however, is very difficult to determine satisfactorily, inasmuch as the height depends upon the height of the tree around which it is climbing.

Stock are very fond of the leaves, so that this plant should be ranked as a fodder.

The stem is about one inch in diameter a foot or so above the ground, the bark being of quite a corky nature.

The presence of tubers in Parsonsia is quite without record as far as I have been able to ascertain. They are common enough in Marsdenia, but it would appear that no one has yet associated them with Parsonsia, or for the matter of that with any Apocynaceous plant.

The tubers are known locally as "Native Yams," a very good descriptive name as they (particularly the larger ones) very much resemble in shape and outward appearance the "Yam" of the South Sea Islands, obtained from species of the family Dioscorideæ.

The "skin" is of an earthy colour, similar to that of a potato or a native truffle. The interior is composed of a whitish substance, for the chemical analysis of which I am indebted to my colleague, Mr. H. G. Smith, F.C.S.

The root fibres are distinctly seen in a transverse section, and in the smaller yams are arranged in bundles in concentric circles similar to the protecting wires in a submarine telegraph cable, whilst in the larger ones these are distributed irregularly. As the tubers are eaten by both colonists and aboriginals, it was thought advisable to place on record a chemical analysis. The results are disappointing, as it was hoped that it would be possible to announce the discovery of a more nutritive article of diet. However, it is of some importance if in these tubers the inhabitants of the dry interior have a vegetable "standby" in times of drought when it is impossible to grow the ordinary domestic vegetables. Under cultivation they would probably improve in quality.

In a raw state they have not that glutinous character which is offered by an Island yam when freshly cut. They taste very much like a turnip, both in the raw and cooked condition. The colour and consistency of the largest specimens resemble those of the common mangel-wurzel.

Mr. Paddison, writing to me about these tubers, states:—"As you are interested in the above, perhaps a few words relative to the manner of growth and locality of this plant may not be out of place. As I have before remarked, it is a vine, generally found growing at the foot of and twisting itself around some small tree, and that tree in nine cases out of ten a 'wilga,' *Geijera parviflora*, Lindl. After receiving your letter, a Mr. A. S. Read of this town and myself started out to find a plant. We discovered one about 400 yards from the township, and forthwith set to work to dig out the yams. We dug a hole about four feet in diameter around the plant and wilga. Keeping well down around the circumference we soon had the yams, or most of them, exposed to view. Underneath the ground they grow from the plant in exactly the same manner as the potato, the largest close to the parent root, and the smaller at the end of the root fibres. The top one was 4 inches from the surface, and the deepest that we could find was 21 inches from the surface. We dug up all that we could find, carried them home, and weighed each one separately, 29 yams in all. Following are the weights :—$12\frac{1}{4}$, $10\frac{1}{2}$, 9, $7\frac{3}{4}$, 7, 6, $5\frac{1}{2}$ (2), $4\frac{1}{2}$, $4\frac{1}{4}$, $3\frac{3}{4}$, $2\frac{1}{2}$ (2), 2 (5), $1\frac{3}{4}$, $1\frac{1}{2}$ (2), $1\frac{1}{4}$ (2), 1 (2), $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$ (2) lbs., making a total of $101\frac{1}{4}$lbs. for the 29.

"Seeing that we have practically had a drought here for the last four years, I have no doubt that under favourable circumstances a yield of from 150 to 200 lbs. might be found.

"As, perhaps, this yield ($101\frac{1}{4}$ lbs.) may appear incredible to anyone not acquainted with the plant, I have named this gentleman, Mr. Read, so that any person inclined to doubt may at any time communicate with him. He is known to the Curator of the Australian Museum, as he often sends birds, &c., to be identified; four other persons also saw them weighed. When I was first shown the plant I did not believe that such large tubers grew underneath, therefore I can understand others doing likewise.

"Another curious thing about them is that, although one end of the yam may be damaged by bandicoots, bilbies, &c., it does not hurt the whole. The part immediately around the bitten part will decay, but the rest of the yam is not affected.

"About the second one from the top is the largest in each case, with its sides very much gnarled with age; the others have a fresher and smoother looking skin."

A chemical analysis of one of the tubers shows this "article of diet" to be somewhat inferior as a food substance, being deficient in nitrogenous substances and carbonaceous principles.

The bundles of root fibres run parallel to the outer edge of the tuber, the distance between the respective bundles becoming greater as the root expands in size, and contracting again at each end. These root fibres account for the comparatively high percentage of crude fibre. The amount of mineral matter is also large, and contains a large percentage of the chlorides; the other constituents usually found in similar ashes were present as phosphoric and sulphuric acids, lime, magnesia and the alkalies, with a good percentage of potassium.

Only a small quantity of starch is present, as only a few granules were indicated by iodine. These granules are quite spherical and vary much in size as ranging from $\frac{1}{30000}$ to $\frac{1}{2580}$ of an inch, the largest number being about $\frac{1}{10000}$ of an inch. Only those granules stained blue were measured.

A proximate determination of the constituents was not made as the general value is so low. Although only ·77 per cent. of nitrogenous substances, calculated as albuminoids, was present, yet it it is probable that even some of this nitrogen is not so combined. Duplicate results were made. A fair section was taken for analysis through the centre of a tuber and the mean of the result stated. The results show that only 4½ per cent. of carbonaceous principles is present—an exceedingly low result.

The general constitution is as follows :—

Water	90·774	per cent.
Nitrogenous substance*	0·770	,,
Starch and other carbonaceous principles	4·564	,,
Crude fibre (ash free)	1·900	,,
Mineral matter†	1·992	,,
	100·000	

I have to acknowledge my indebtedness to Mr. S. J. Johnston, B.A., for the measurements of the starch granules, and also to Mr. M. F. Connelly for the photographs illustrating this paper.

* Equal to 0·123 per cent. nitrogen.

† Contains 18 per cent. chlorine.

EXPLANATION OF PLATES.

Plate xxxiv.

Fig. 1—Portion of twining stem.
Fig. 2—Branchlet with inflorescence.
Fig. 3—Individual flower (enlarged).
Fig. 4—Calyx showing hypogynous scales (enlarged).
Fig. 5—Stamens (enlarged).
Fig. 6—Fruit.
Fig. 7—Seed.

Plate xxxv.

Fig. 8—Tuber weighing 10½lbs.
Fig. 9—Tuber in section.

The text figure (p. 385) is reproduced from a photograph showing a plant of *Parsonsia Paddisoni* twining round a dead tree about 20 feet high.

A ZOOGEOGRAPHIC SCHEME FOR THE MID-PACIFIC.

By Charles Hedley, F.L.S.

Three years ago it was my fortune to be attached as naturalist to the Royal Society Coral Boring Expedition, which operated on Funafuti, an atoll of the Ellice Group in the South Central Pacific. Previous to the arrival of this expedition the flora and fauna recorded in scientific literature from Funafuti amounted only to two plants, *Suriana maritima* and *Rhizophora mucronata*,* and seven snails, *Endodonta modicella*, *Stenogyra gracilis*, *Vertigo pediculus*, *Tornatellina conica*, *Truncatella valida*, *Omphalotropis zebriolata* and *Assiminea nitida*.†

One of the results of the expedition has been to identify and record a fauna of nearly nine hundred species. Of these one-sixth were described as new to science. Classified by sub-kingdoms, this fauna is composed of 2 Mammals, 15 Birds, 5 Reptiles, 73 Fishes, 2 Enteropneusts, 87 Crustaceans, 27 Arachnids, 5 Myriopods, 42 Insects, 440 Molluscs, 1 Brachiopod, 28 Echinoderms, 5 Annelids, 12 Gephyrean worms, 16 Sponges, 8 Hydrozoa, 2 Scyphozoa and 120 Actinozoa.‡

No other island of the Central Pacific has yet been so fully surveyed from a zoological standpoint. Having gained so much fresh information, it seems a suitable opportunity to pause and reflect what light it may throw on the distribution of life in this region.

Controversy has long raged around the geology of coral atolls. The scanty information possessed by science on their history and

* Botting Hemsley—Chall. Report. Botany i. Pt. iv. pp. 131, 237.

† Mousson—Journ. de Conch. xxi. 1873, p. 107.

‡ Hedley—The Atoll of Funafuti: Memoirs iii. Australian Museum, 1899, pp. 513-535.

structure has been repeatedly dissected, scrutinised and pieced together by two generations of geologists. Yet the result of their labours has been rather the production of conflicting explanations than the discovery of fundamental principles on which all might agree.

Although the zoologist might at least claim a co-heritage with his geological brother in the subject of a coral atoll, but small share has been taken by naturalists in the discussion. Yet the great questions of whether the atolls of the Central Pacific represent the vanishing mountain tops of a drowned Trans Pacific Continent or whether they are newly emerged land, should present problems as pertinent to zoological as to geological inquiry. And a zoologist whose attention has been claimed by them should be able to provide from his special store of knowledge means for their solution which are not at the disposal of his co-workers

On this line of inquiry it is proposed to examine the fauna of Funafuti, and incidentally that of the Central Pacific, and endeavour to ascertain whether it is a Continental or an Oceanic Island, when and whence its fauna was derived.

From the standpoint of Zoogeography all islands are divided into two classes: Continental Islands which have been at a more or less distant period united to a continent, and Oceanic Islands which have never been so united. The distinction between their respective fauna and flora, is that while the first received its population by normal methods of migration, while it was a part of, or at a short distance from, the mainland; the second received only such animals and plants as might cross actively by flight or swimming, or be borne passively across the intervening space by winds or waves. Since such transmission would be easy for a few, difficult for many and impossible for most, the fauna and flora of an Oceanic Island will bear to an appreciative eye the distinctive stamp of its selective origin.

This idea appears to present much difficulty. For instance it is concluded by one writer that, "There seems to be an argument in a circle as far as oceanic insular floras are concerned. First of all, it is assumed that if the depth is over a certain amount—say 1,000 fathoms—former land connection was not possible; then comes the study of the flora and fauna of those islands which are thus situated, and those are then looked upon as characteristic of such islands—other islands have these characteristics—the conclusion is drawn that they also have never been connected with the land."*

The only safe mode of reasoning is to eliminate the factor of the depth of intervening seas, since we cannot count the amount of past possible upheaval or depression, and to rely on biological data alone. Lest the important distinction between what Baur so happily terms "harmonic" and "disharmonic" faunas, should escape attention, I venture to again express it thus.

Let an area of say ten square miles be selected in, for example, England; a census of its fauna will yield a certain total of mammals, frogs, birds, fish and so on. Let another such census be made of an equal area in the United States and in Australia. Now though the individual species would be different in each of the three resulting catalogues, yet a general harmony in the proportion of each group to the whole will prevail. On contrasting the totality of the Central Pacific fauna with such lists, the gaps at once make discord. For example, the loss of the mammals, snakes and amphibia, leaves the whole Phylum Chordata with scarcely a representative in the Central Pacific.

The deduction from this comparison is that the population of the Central Pacific has been received by drift, from a continent or continental islands. Consequently all that the atolls have, their source should have also. But of the population of that source, only such may extend to the atolls as may first endure the ordeal of transit, and secondly obtain the means of life upon arrival. And the disharmony will result in the elimination from that atoll fauna, as compared to the continental, of the animals which have failed to comply with these two conditions.

* Deane—Proc. Linn. Soc. N.S.W. xxi. 1896, p. 847.

The Continental Faunas.

Before we can profitably discuss the insular region of the mid-Pacific, we must grasp the main features of the continental area which lies to the west of it.

Broadly, the physical features of the latter are as follows :—The eastern coast of Australia presents a great and pretty uniform curve. An arc, which though diverging as it trends southward, somewhat corresponds to that curve, appears in broken segments in south-east New Guinea, the Louisiades, New Caledonia and New Zealand.* Beyond that again an outermost arc is formed by the Solomons and Fiji.

In the Central Pacific the curves are reversed. Towards Australia is presented the convexity of a long chain of archipelagoes which runs from the Marshalls, through the Gilberts, Ellice, Samoa and the Hervey to the Austral Islands, and which, as my reviewer in *Nature* suggests, is "perhaps represented still further to the south-east by the great Patagonian platform that projects north-westwards from the coast of South America."† This chain I call the Marshall-Austral chain.

To understand the source of the fauna of Funafuti, it will be necessary to trace the relations of the various continental faunas which lie nearest.

A large proportion of the Marine Invertebrates of Funafuti can be followed westwards through New Guinea, the Malay Archipelago, the Andamans, Ceylon, and Mauritius to the Red Sea. This tract is generally known as the Indo-Pacific or Oriental Region. Some writers have divided this region by a line which, running between Bali and Lombok, is called "Wallace's Line," after its describer. This division has occasioned much dispute

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* Koto has remarked how "New Zealand and New Caledonia conform to the outcurve of Eastern Australia." (Journ. Coll. Sci. Univ. Tokyo. xi. Pt. ii. 1899, p. 114).

† *Nature*, 7th July, 1898, p. 221.

between zoologists. Meyer and Wigglesworth quote the opinions of thirty-six writers upon it.*

This, however, need not concern us here, and we may commence on the westward our inquiries with New Guinea. The use of political boundaries has much confused the lines of zoo-geographical demarcation. "The Australian Region," meaning the continent of Australia, together with the Islands of New Guinea and the West Pacific, is an especially misleading term, and has tended to obscure natural boundaries. Within Australasia are several regions, peopled by distinct and unrelated faunas. To a zoologist, Australasia is not an entity, and may with advantage be dismissed from his vocabulary. I am unable to recognise New Zealand and other West Pacific Archipelagoes as appanages of Australia.†

It is first necessary to understand the faunal regions of Australia. In 1894 I published a short sketch, showing that three distinct faunal elements were included in this continent.‡ This view was afterwards accepted and amplified by Spencer.§ The oldest of these three, named by Tate the Autochthonian and by Spencer the Eyrean, has its chief seat in the extreme south-west, but its influence is perceptible across the continent to the north-

* Meyer and Wigglesworth—The Birds of Celebes, i., 1897.

† The usual classification of New Zealand originated at a time when the fauna was little known, and being uncontradicted has grown into general acceptance without due examination. Swainson appears to have introduced the idea by dividing (A Treatise on the Geography and Classification of Animals, 1835, p. 117) "the Australian Province" into "three subordinate districts. The first may comprehend New Guinea and its adjacent islands; the second, Australia properly so called, with Van Dieman's Land and New Zealand; and the third, the numerous groups of smaller islands clustered in the great Pacific Ocean." Sclater wrote more cautiously in 1857 (Journ. Linn. Soc. Zool. ii. p. 136), "I should be inclined for the present not to separate New Zealand and the Pacific Islands generally from the Australian division."

‡ Hedley—Proc. Austr. Assoc. Adv. Sci. 1893 (1894), pp. 444-6.

§ Spencer—Rep. Horn Sci. Exped. i. 1896, pp. 171-198.

east of Queensland. This fauna is not concerned in the zoology of the Pacific.

The second oldest Australian element is that called by Tate the Euronotian, and by Spencer the Bassian. It is the most characteristic Australian element, and consists of a rich fauna of Antarctic origin, which entering by Tasmania, overran the whole continent, crossed Torres Straits into New Guinea, and reached its utmost eastern limit in the Solomons. Characteristic members of it are the marsupials, monotremes, cystignathous frogs, venomous snakes, and snails of the Order Macroogna.*

The third and youngest Australian element, which has been called by Spencer the Torresian, was first noted by myself in 1892, when describing the irruption of Papuan Mollusca into Queensland:† a description which has been without acknowledgment appropriated by A. H. Cooke.‡

Along the whole east coast of Queensland a strong colony of Papuan fauna and flora is established. Among plants the wild banana, pepper, orange, and mangosteen, rhododendron, ephiphytic orchids, and the palms, among mammals, the bats and mice; among birds, the cassowary and rifle birds; among reptiles, the *Rana* or true frog, the crocodile, and the tree snakes; among butterflies, the *Ornithoptera;* and among mollusca, the operculate snails and the genus *Papuina*, characterise this element. So much is this so, that in the heart of a great Queensland "scrub," a naturalist could hardly answer from his surroundings whether he were in New Guinea or Australia.

Among recent writers, Haddon has shown that the islands of Torres Straits are the denuded remnants of a former extension of the Cape York Peninsula.§ A slight elevation of less than ten fathoms would now serve to connect the opposite shores of the Straits, and it is evident that it was by this route that the Papuan

* Hedley—Proc. Roy. Soc. N.S.W. xxix. 1895 (1896), pp. 278-286.

† Hedley—Proc. Linn. Soc. N.S.W. (2) vi. 1891 (1892), p. 694.

‡ Cooke—Camb. Nat. Hist. ii., Mollusca, 1895, p. 322.

§ Haddon, Sollas and Cole—Trans. Roy. Irish Acad. xxx. 1894.

emigrants reached Australia. The same land-bridge sufficed to admit numerous Australian plants and animals, such as the *Eucalyptus*, marsupials, and venomous snakes into New Guinea.

A considerable amount of specific difference has arisen since the isolation of this Papuan colony, and indicates a corresponding age for the water barrier of Torres Straits. An earlier, possibly Eocene, connection across Torres Straits is postulated by Pilsbry to explain the distribution of certain snails.*

New Guinea is a centre whence seem to me to radiate several streams of migration. That which crosses Torres Straits and passes down the Queensland coast, has just been described. A second runs a briefer course; it travels along the south-east peninsula, peoples the Louisiades, and terminates with that Archipelago. Characteristic of this area are the giant *Pupinellæ*.

Another stream branches off in German territory, traverses in succession New Britain and New Ireland, crosses to the Solomons and runs along the axis of that Group. Then, much impoverished, it divides, sending one branch to Fiji and another along the chain of the New Hebrides. Again, with lessened force, the latter turns to reach New Caledonia. Weaker still, it continues its course, sends an offshoot to Lord Howe Island, and ultimately arrives at New Zealand.

Since writing the above, I find that the path here suggested for the fauna was long ago traced by Lesson for the flora. As the remarks of that able writer appear to have sunk into undeserved oblivion, and as they are not generally accessible to students, I give the following free translation of a passage of his article "Coup d'œil sur les iles Océaniennes et le grand Océan."†

After remarking that in the vegetation might be found a clue like the thread of Ariadne to guide the inquirer aright through the maze of the South Sea Islands, he continues :—"The Indian flora flourishes in all its magnificence under the equator; commencing with the Sunda Islands, we follow it through Malaysia. It appears richly developed in the eastern Moluccas and in New

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* Pilsbry—Man. Conch. ix. 1894, p. 127.

† Lesson—Ann. Sci. Natur. v. 1825, pp. 179-181.

Guinea. Here we find numerous palms and cycads, with ferns whose trunks form stately columns. The forests are composed of tall trees such as the Gatip, of long arborescent lianas and of numerous forms of leguminous plants. Here the food trees of Pacific islanders, such as the breadfruit, the spondias plum, and the banana, are indigenous. Following this superb vegetation, we see it diminish in proportion as we advance towards Torres Straits. Only a certain number cross into Australia, of which some characteristic members are the Indian *Erythrina*, two bananas, the *Flagellaria indica*, &c. But if instead of turning from New Guinea at Torres Straits, we follow the chain of islands leading to Polynesia, namely, New Britain and New Ireland, we find this vegetation still in full development, and the areca palm, the sago palm, the tree-ferns and the *Drymirhiza* still inhabit the forest. The neighbourhood of Port Praslin in New Ireland is clad with *Pandanus*, *Baringtonia*, *Calophyllum* and *Casuarina indica*. But in proportion as we advance southward to the New Hebrides and New Caledonia, the Indian vegetation decreases. Still further south, the temperate zone brings a change of climate. Norfolk Island produces an *Araucaria*, like that on the East Australian coast, and the *Phormium* which is common to New Zealand and peculiar to these islands. New Zealand, though not very distant from Australia, in no respect shares the productions of that vast country, but one still remarks, and this is worthy of attention, the Indian genera of plants such as the olive, the pepper and a reniform fern which recurs at Mauritius."

A centre of distribution has been described for New Guinea; another such occurs in New Zealand.

It is now generally admitted that a former southern prolongation connected that Archipelago with the Antarctic Continent. Thence were derived a fauna and flora akin to that now inhabiting South America, of which the New Zealand *Fuchsia* is a well known and typical example. Among mollusca, we point to the Rhytididæ and *Placostylus*. Along the tortuous route by which the Malayan forms crept south to New Zealand from New Guinea, there flowed a return current of Antarctic life, which though feebler in lower latitudes may be traced up to New Guinea

It is to be noted that the Antarctic fauna which passed over New Zealand is quite distinct from, and probably far older than, that other Antarctic element, the Euronotian, which reached Australia through Tasmania.*

Returning to a closer examination of the Malayan or Oriental stock, it seems probable that in its passage through New Guinea it recruited an Australian company, of which the Cuscus is a significant example. The spread of this element as far as the Solomons is so recent as to be obvious, and has been generally recognised. Beyond this point the progress of Malayan life is less distinct, and has given rise to diverse views. The importance of the classification of the Fijian fauna, in connection with that of the Central Pacific, warrants an attentive consideration of its relations with western continental lands.

From geological data it is evident that the Fijian Group has undergone much recent upheaval; previous to which it certainly underwent great subsidence. Prior to that subsidence, it is generally admitted that the group stood at a level sufficiently high to unite such outlying islands as Kandavu to the principal masses of Vanua Levu and Viti Levu. Such a union is indicated by the close affinity of their land molluscan fauna, and some measure of its antiquity is afforded by the specific differentiation which has arisen between corresponding species which represent each the other in different islands, as the various *Trochomorpha* and *Placostylus* do.

The writer was the first to contend that this former elevation not only sufficed to amalgamate the separate islands, but to join the whole to the Solomon Group.†

* A few representatives in the West Pacific of tropical South American forms like the Queensland plants *Omphalea* and *Bursera* (Bailey—Rep. Austr. Assoc. Adv. Sci. vi. 1895, p. 393) and the Fijian lizard, *Brachylophus*, possibly indicate a trans-Polar migration antecedent to either referred to above.

† Hedley—Proc. Linn. Soc. N.S.W. (2), vii. 1892, p. 339; *idem*, xxiii. 1898, p. 99.

If subsidence had continued to the extent of lowering the whole group beneath the sea and drowning the indigenous terrestrial fauna, it is necessary to note that though on emergence the land would have acquired by drift a new fauna, yet that fauna would be disharmonic, and though geologists might still count it as continental by reason of its position on a continental platform, biologists on the other hand would class it as oceanic from the nature of its fauna and flora.

As the result of a geological reconnaissance in Fiji, Prof. Sollas reckons this and the Hawaiian Group in the latter category, as clusters of volcanic cones which, like Stromboli and Vulcano, rise from the depths of the sea, thus opposing them to true continental islands like New Caledonia and New Zealand.*

Some proof will now be advanced that this latter is an untenable position, and that Fiji has relics of an ancient and strictly continental fauna. The first writer to touch on the question seems to have been A. A. Gould, who in 1851 remarked :—"But if we may draw evidence from the land shells, the Samoan and Friendly Islands are more intimately related to the Society Islands, though at a much greater distance, than to the Feejee Islands. . . . Indeed, judging from the land shells, the Feejees are more nearly allied to the islands to the westward, such as the New Hebrides, than to the Friendly Islands on the east, though so much nearer."†

In 1892, I urged that :—"Eastwards of Fiji, the molluscan fauna indicates the abrupt termination of the Melanesian Plateau. Between the Samoas and Fijis a sounding of 2,600 fathoms has been obtained. Significant of this is the absence of *Placostylus* from Savaii, Upolu, or Tutuila. The Samoan Islands appear as well fitted as the Fijian to nourish an extensive series of *Placostylus*. They are large, densely wooded, with a warm, moist, and equable climate. The distance from their western neighbours is

* Sollas—Natural Science, xiv. 1899, p. 17.

† Gould—United States Expl. Exped. xii. 1851, Mollusca, p. xiv.

no greater than from the latter to the groups to the westward, and not to be compared to the spaces between New Caledonia and Lord Howe Island or New Zealand, which have proved no obstacle to the spread of the genus. Yet the Samoas possess a distinctive oceanic molluscan fauna comparable to that of Tahiti, while the molluscan fauna of the Fijis is as distinctly continental."* My scheme and nomenclature were abstracted without acknowledgment by the Rev. A. H. Cooke.†

The reptilian fauna at once bears evidence of continental rank, and of derivation from the Solomons. Boulenger has recorded three species of frogs from Fiji, one of which, *Cornufer dorsalis*, recurs in the Solomons. E. R. Waite has published the occurrence in Fiji of a blind snake, *Typhlops aluensis*, hitherto only known from the Solomons.‡

T. Steel has described two land planarians from Fiji, *Geoplana trifasciata* and *Rhynchodemus scriptus*.§ The genus *Geoplana* is regarded as especially characteristic of continental areas. The land molluscan genus *Pupina*, which also seems peculiar to the continental region, finds its eastern limit in Fiji.

The Coleoptera of Fiji impressed Fairmaire as of a continental character. He draws a contrast between them and those of the oceanic islands of Tahiti and Marquesas.|| I am indebted to Mr. J. J. Fletcher for a reference to this interesting article.

Among marine animals I have drawn attention to *Nautilus*, which inhabits Fiji, as confined to the coasts of the continental area. It has not strayed beyond the borders of the Melanesian Plateau, within which temperature limits its southern range to the Isle of Pines.

Glancing at the flora, it may be noted that W. B. Hemsley has described a remarkable Sapotaceous genus, *Chelonespermum*, of

* Hedley—Proc. Linn. Soc. N.S.W. (2), vi. 1892, p. 336.

† Cooke—Camb. Nat. Hist. iii. 1895, p. 323.

‡ Waite—Proc. Linn. Soc. N.S.W. xxii. 1897, p. 685.

§ Steel—Proc. Linn. Soc. N.S.W. xxii. 1897, pp. 120-122, pl. vii., figs. 9, 10.

|| L. Fairmaire—Ann. Soc. Ent. de France (6), ii. 1881, p. 241.

which two of the known species are from the Solomons, and the third from Fiji.*

Geological evidence may also be produced to substantiate the claim of Fiji to be called continental. Wichmann, whose work I quote at second hand from Baur, reports a considerable extension of old crystalline massive rocks and crystalline schists.† The latter include amphiboliites, eurites, quartz-mica-schists and granular limestone. Among the older massive rocks occur granite, quartz porphyry, diorite, gabbro, diabase, foyaite, and a sandstone similar to itacolumit. Of minerals, gold, copper, quartz, pyrite, haematite and others were found.

Practically nothing is known of the fauna and flora of the Santa Cruz Group. I cannot therefore tell whether they should be classed as oceanic, or as their position at the intersection of the axes of the Solomons and the New Hebrides suggests, as continental.

The collection made by J. S. Gardiner on Rotuma, leaves no doubt of its oceanic nature.

Comparatively little biological research has been conducted in the New Hebrides. Enough, however, is known of them to constitute a link between the Solomons and New Caledonia.

A close relationship exists between the animals and plants of New Caledonia and New Zealand. That it has never been recognised by New Zealand writers, is simply owing to New Caledonian literature and material being inaccessible to them. The first to grasp the geological connection between the two countries was Heurteau.‡ A considerable correspondence occurs between the Mesozoic strata of each.§

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* Hemsley—Journ. Linn. Soc., Botany, xxx. 1894, p. 164.

† Wichmann—Ein Beitrag zur Petrographie des Viti-Archipels. Tschermak's Mineral. und Petrograph. Mittheilungen. (Neue Folge) v. 1883, pp. 1-60.

‡ Heurteau—Rapport sur la Constitution de la Nouvelle Calédonie, 1876, p. 17.

§ Pelatan—Les Mines de la Nouvelle Calédonie, 1892, pp. 14, 19.

In the recent fauna there is the same absence of all Mammals, except bats and rats, and the same poverty of Reptiles. Snakes are absent from both, and the Amphibia consist of one in New Zealand and none in New Caledonia.

Among the mollusca we note in each a close correspondence between *Melanopsis*, *Placostylus*, *Rhytida*, *Athoracophorus*, the *Charopa* group of *Endodonta*, and the *Rhytidopsis* and *Monomphalus* groups of *Flammulina*.*

The land mollusca of Lord Howe Island have a close affinity to those of New Caledonia.†

The foregoing account of the migration and classification of different faunas, usually confounded together as Australian, is diagrammatically represented in the accompanying map.

I beg to point out that this sketch is not constructed from contour levels and deep sea soundings. Ocean depths may yield to a zoogeographer valuable suggestions, and such have been here considered, but to follow them implicitly leads straight to error. The fact that *older movements may be less and younger more*, quite destroys the relevancy between present shallow water and former dry land. In these calculations the sea can be regarded as of one value only, that of a barrier to migration. The difference between a sea fifty fathoms and another five thousand fathoms deep may be that the former is of less duration than the latter. But unless biological data can be educed to support the youth of the smaller depth, it is for the zoologist of equal value to the greater. Thus the Arafura Sea though shallow separates more diverse faunas in Western Australia and Dutch New Guinea than does the deeper water which intervenes between Fiji and the Solomons.

The land mollusca have served me as a basis in the construction of this scheme.

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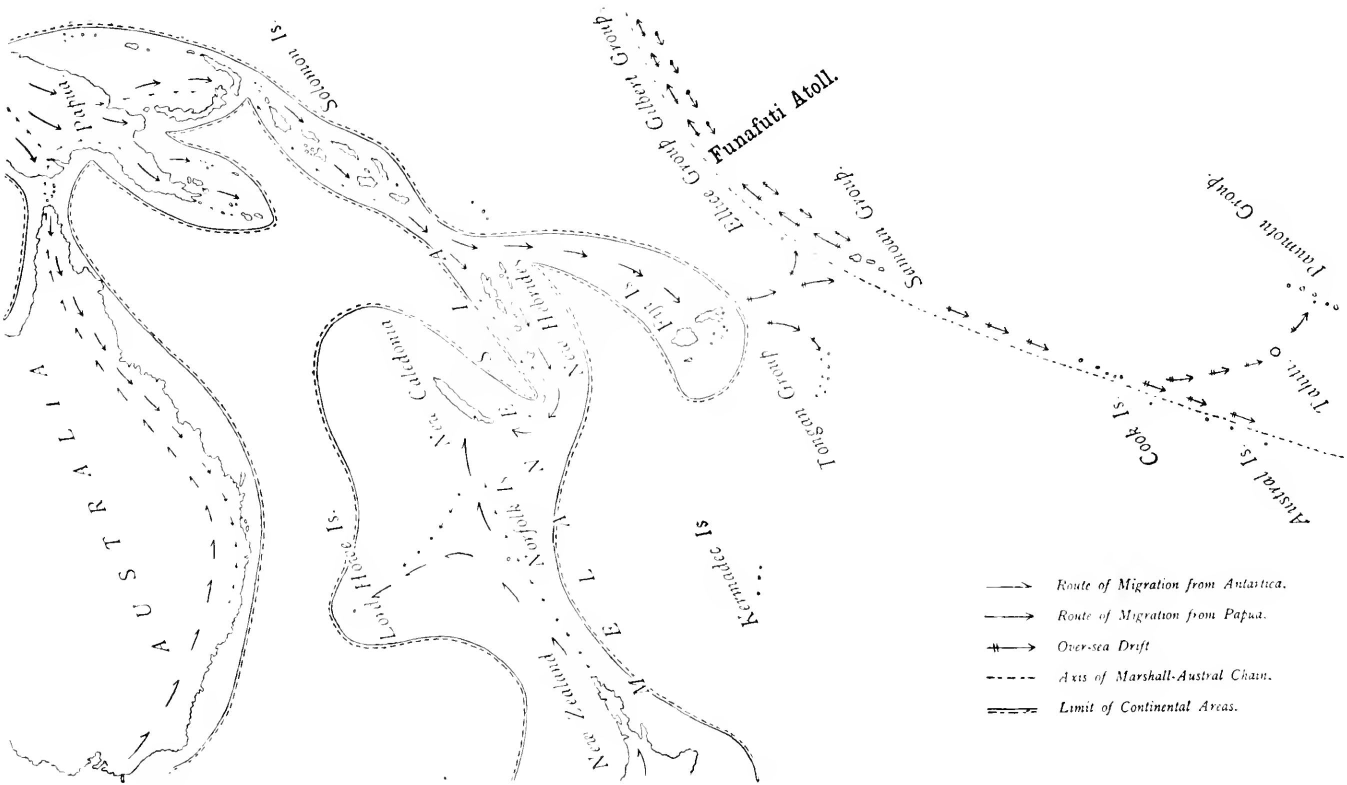
* Crosse—Journ. de Conch. xlii. 1894, p. 453.

† Hedley—Records Aust. Mus. i. 1891, pp. 134-144.


AUSTRALIA
Papua
Solomon Is.
MELANESIA
Lord Howe Is.
New Caledonia
Norfolk Is.
New Hebrides
New Zealand
Fiji Is.
Kermadec Is
Tongan Group
Ellice Group
Gilbert Group
Funafuti Atoll.
Samoan Group.
Cook Is.
Austral Is.
Tahiti.
Paumotu Group.
Route of Migration from Antartica.
Route of Migration from Papua.
Over-sea Drift
Axis of Marshall-Austral Chain.
Limit of Continental Areas.

If this arrangement is a natural one, it will be found equally applicable to the remainder of the fauna and flora. For I have no sympathy with writers who plot out different areas for different groups of animals and plants with a view to the reconstruction of past continental land. Where the evidence of one group conflicts with that of another, either the testimony or the application is at fault

The Route of the Polynesian Fauna.

Dr. Guppy* has suggested that Polynesia was peopled from the Malay Archipelago by two routes, the one by Micronesia and the other by Melanesia. In the first case, plants and animals may be traced from the Moluccas or the Philippines through the Pelews and Carolines to the Marshalls, and thence down a long chain of archipelagoes, including the Ellice, to the Austral and Paumotu Groups By this route probably came the Pacific rat. In the second case Fiji formed the point of departure, and the invaders passed into Polynesia through Samoa.

A return current appears to have carried Melanesian forms back to the Carolines, Ladrones and Pelews Evidence of this is given by the occurrence there of *Partula*, a genus which, as it evidently descended from the *Placostylus* stem, undoubtedly arose in Melanesia.

As the process of populating the Central Pacific Islands by drift from Melanesia is now in progress, it is almost superfluous to remark that both the Papuan and the Antarctic elements of the Melanesian Plateau have contributed to the Polynesian land Mollusca; the former giving *Tornatellina*, *Helicina* and *Trochomorpha*, and the latter *Partula* and *Endodonta*.

The route of the Polynesia fauna after its departure from the continent is too erratic to be exactly recovered.

Some useful data have been collected by Garrett, who tabulated the range of three families of marine Mollusca through ten archipelagoes of the Pacific, as follows†:—

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* Guppy—Trans. Vict. Inst. 1896.

† Garrett—Journ. Conch. i. 1878, p. 356, ii. 1879, p. 108, iii. 1880, p. 8.

	Conidæ.	Cypræidæ.	Mitridæ.
Fiji	60	44	117
Tonga	30	36	46
Samoa	41	41	73
Gilberts	44	43	42
Carolines	34	32	36
Cooks	34	36	41
Society	42	45	64
Paumotus	38	43	75
Marquesas...	14	13	6
Hawaii	21	31	31

An examination of these data shows a deterioration of the fauna from west to east, the five western archipelagoes mustering nearly one-fifth more than the eastern. The even distribution of *Cypræa* forms an exceptional case: it actually totals one species more in the Society Islands than it does in Fiji. With the exception of *Cypræa* there is a sharp fall in numbers on leaving the continental area of Fiji. From the nearest to the farthest groups the loss then continues in a parabolic curve. The most distant, the Marquesas and Hawaii, being in every case the poorest.

The Society Islands, however, possess a richer fauna than their distance appears to entitle them to have. This comparative wealth may be accounted for by their superior antiquity. The elevated masses of Tahiti and associated islands have for long stood in the drift track and intercepted migrant forms. It may even be that Tahiti has been receiving such from a time which anteceded the present form and population of the Melanesian area. A highly curious Tahitian tree, *Lepinia*, was lately rediscovered in the Solomons.* A subgenus of land shells, *Libera*, is peculiar to the Cook and Society Islands. They also possess half the known species of *Partula*.† Their poverty of insects as compared to western continental islands greatly impressed D'Urville.‡

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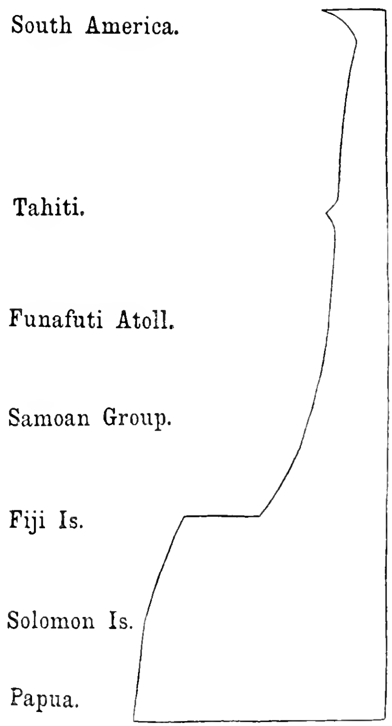
* Botting Hemsley—Science Progress, i. 1894, p. 30.

† Hartman—Bull. Mus. Comp. Zool. ix. 1881, p. 173.

‡ D'Urville in Boisduval—Voy. Astrolabe, Entomologie, i. 1832, pp. 20-22.

The average of Garrett's tables may be taken to roughly express the distribution of the fauna of this region generally.

This I would show diagrammatically by the descending line in the following figure:



From New Guinea as a starting point on the east the fauna declines slightly to Fiji. Leaving here the continental area, an abrupt fall occurs indicative of numerous feeble swimmers unable to cross deep water. Then through the nearer oceanic islands of Samoa, the fauna is by degrees sifted into strong and stronger swimmers. A small and sudden elevation occurs at Tahiti, and relates to the antiquity of that refuge for ocean waifs. Past Tahiti the life line slowly lowers till a minimum is reached at the point of furthest western intrusion of American life.

Though zoologists seem undecided on the question, botanists appear to be resolved that the flora of the Central Pacific Archipelagoes reached them as over sea drift. W. B. Hemsley writes: "For the purposes of the 'Botany' of the Challenger Expedition and ever since the publication of that work, I have collected all the data coming under my notice bearing on the dispersal of plants to considerable distances by wind, water, birds or other creatures excepting human. The evidence thus collected sufficiently accounts for the vegetation of low coral islands."*

Though I have not data to prove the suggestion, I venture to submit that seaweeds have slight extension in the Central Pacific. I was struck by their comparative absence on Funafuti. Kotzebue observes—"Algæ, which seem to be entirely wanting on the low islands, are found on the reefs at the foot of the high land."†

The only terrestrial mammal with any claim to be regarded as native to the Central Pacific is the Rat, *Mus exulans*. But Thomas‡ considers that "it has probably travelled from island to island in native canoes or on floating logs, etc., long before European ships began to bring over the ubiquitous Grey and Black Rat." Confirmation that such was the case is supplied by Kotzebue, who mentions the opinion of a well informed Marshall islander, "Kadu, who seems to think that the rat is only to be found in the company of man, affirms that there are none on Bygar."§

No Bats have reached the Ellice Group. The eastern limit of the Dugong does not seem to be definitely known. The farthest record I have is New Caledonia.‖ It certainly does not attain the Central Pacific, and I apprehend that it does not stray beyond the continental area in the southern hemisphere, though in the northern I believe that it reaches the Pelews.¶ This latter group seems to be a continental outpost in the Northern Pacific, corresponding to Fiji in the Southern.

There is an interesting record of a stray seal having once reached Polynesia. Dr. W. Wyatt Gill wrote: "A native of Mangaia one day came running to me saying that Satan had just

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* Hemsley—Nature, lii. 1895, p. 623.

† Kotzebue—A Voyage of Discovery into the South Sea and Beerings Straits, iii. 1821, p. 144.

‡ Thomas—P.Z.S. 1895, p. 338.

§ Kotzebue, *loc. cit.* p. 156.

‖ J. Garnier—Voyage autour du Monde, 1871, p. 182.

¶ Kotzebue, *op. cit.* iii. p. 191.

landed on the northern coast of the island. . . . But another native fishing on the reef, who had some experience in the Arctic regions, happened also to see this marine animal, and recognised it as a fur seal."*

The terrestrial reptilian fauna is represented on Funafuti by four Lacertilians. Of one of them, Dr. Baur remarks—"The next species, *Gehyra oceanica*, Lesson, reaches from the Moluccas eastwards to the Cook Islands (Rarotonga), being found on the Admiralty, Solomon, Fiji, Tonga and Samoa Islands, Savage Island and Lord Howe Island. . . . This distribution can only be explained by a former Indo-Pacific continent extending from Malaysia to the west coast of America."† A little local knowledge of the region on which he wrote might have saved Baur from drawing so tremendous a deduction from so simple a fact. Observation on the spot enables C. M. Woodford‡ to thus easily explain the matter, without invoking a Jurassic Continent. "It is the rule rather than the exception for one or more lizards to be unwilling passengers when one of the large native canoes is at any time put into the water . . . their presence therefore, even upon remote islands, presents little difficulty."

The Green Turtle occurs at Funafuti, and may, I believe, be traced to the uttermost limits of Polynesia. Other members of this group of powerful swimmers are widely spread in the South Seas. Gill says—"Several species of Turtle—Loggerhead, Hawksbill, Green Turtle, etc.—are very plentiful on Rakaanga in the breeding season."§

Crocodiles do not, to my knowledge, intrude further into the South Pacific than the Solomons, though their appearance in the Santa Cruz and New Hebrides would not be surprising. The ascription of them to Fiji by Boulenger‖ is contradicted by local observers. Mariner has given a vivid account of a stray crocodile

* Gill—Jottings from the Pacific, 1885, p. 125.

† Baur, *loc. cit.* p. 880.

‡ Woodford—Geogr. Journal, vi. 1895, p. 349.

§ Gill—Jottings from the Pacific, 1885, p. 128.

‖ Boulenger—Cat. Chelonians and Crocodiles, Brit. Mus. 1889, p. 285

which once reached Fiji, and was killed by the natives. "It was the first animal of the kind the natives had ever seen or heard of."*

It is probable that both the land birds and the Lepidoptera were blown to the Ellice Group. From facts which he advances, especially their absence from Fiji and the Solomons, Woodford concludes† that *Remigia translata*, *Cephonodes hylas*, and *Chloanges suralis* reached the Gilberts from Eastern Asia by way of the Marshall Group. When we add that they passed on from the Gilberts to the Ellice, we but take another step along the same path. It is noteworthy how the thoughts of two such excellent naturalists as Guppy and Woodford, who gained their knowledge of the Pacific on the spot, independently agree in tracing the same path of migration for plants and insects respectively. Were we in doubt as to the last step between the Gilberts and Ellice taken by migrating butterflies, it should be removed by Kotzebue, who when precisely midway between the two archipelagoes wrote —"When we were exactly in 4° 15′ latitude and 178° longitude, heavy gales brought swarms of butterflies and small land-birds to the ship; we must therefore have been near land, but we looked for it in vain; and this discovery remains for some future navigator."‡

The birds blown from atoll to atoll in the way the foregoing passage describes, would be themselves the unconscious vehicle of small animals or plants. J. J. Lister writes—"At Canton Island a clump of *Tournefortia* trees was habitually used by these birds (*Sula piscatrix*) as a roosting and preening place. Among the pieces of down which were sticking to the bare branches having been preened out of the feathers, was found one entangled with a seed of one of the trailing plants of the island (*Boerhavia tetrandra*, Forster), which is beset with glandular hairs Such an

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* Mariner—Tonga Islands, i. 1817, p. 337.

† Woodford, *loc. cit.*

‡ Kotzebue—A New Voyage Round the World, i. 1830, p. 292.

incident indicates a method by which seeds may be distributed from island to island by birds."*

Attention may be profitably given to an efficient agent in distribution, which though not entirely unnoticed,† has excited little remark. Every one who has crossed a woodland tract in windy weather has seen handfuls of dead leaves whirled up by eddying gusts. Let such a gust pick up such leaves from a Pacific atoll, during the height of a violent cyclone, they travel softly, without jarring off what has adhered to them, and may easily be dropt on an atoll a hundred miles distant after a few hours. To all collectors it is well known what numbers of small Invertebrates attach, either as ova, larva or adult, to fallen leaves. So a shower of a few dead leaves might throw at once a dozen species of insects, spiders and snails on an island where no life was before. I am satisfied that herein lies the explanation of the wide distribution of *Helicina*, *Endodonta* and *Tornatellina* in the South Pacific.

The introduction of fleas and mosquitoes to the islands of the eastern Pacific is a matter of recent history. Dr. W. W. Gill has stated that mosquitoes were accidentally conveyed in water casks to Penrhyn and Rakaanga in 1859, and to Manihiki in 1862.‡

Dr. Baur lays great stress on the fact that ants are represented by numerous species and genera in the Mid-Pacific. I am, however, unable to follow him in deducing therefrom that "it is quite evident that this distribution of the Formicidæ cannot be explained by accidental introduction. Also here we are forced to accept a former Pacific continent."§ He apparently overlooked the fact that at one period of their lives both sexes of ants are endowed with considerable powers of flight, and might then be blown from one island to another.

* Lister—Proc. Zool. Soc. ii. 3, 1891, p. 294.

† Kew—The Dispersal of Shells, 1893, p. 146.

‡ Gill—Jottings from the Pacific, 1885, p. 162.

§ Baur—American Naturalist, xxxi. 1897, p. 878.

Dr. Baur in continuation of his argument has pointed out that "*Pocillopora*, a coral of the Madreporaria, is found only in the Indo-Pacific region. It is represented by an extraordinary large number of forms reaching north to the Loo Choo and Sandwich Islands, and is also common on the west coast of America. It is totally absent, however, from the Carribbean or West Indian Sea and the eastern American coral region. . . . The general distribution of *Pocillopora* and the Trapeziidæ in the Indo-Pacific region can only be explained by a former land connection of this region. . . . If we consider the Pacific Islands as the remains of a former Pacific Continent, we have no difficulty whatever in explaining the general distribution of *Pocillopora*."*

In this deduction Baur failed to remember Darwin's caution—"How ignorant we are with respect to the many curious means of occasional transport." Though it was hardly to be anticipated that the problem could be so neatly solved, we can demonstrate in the case of this identical genus how fallacious is the support which *Pocillopora* appears to give to the hypothetical former Pacific Continent.

Kent collected on Cairn Cross Beach, Barrier Reef, Queensland, "a rounded lump of pumice stone, about 3½ inches in diameter, to which two young coralla of the madrepore, *Pocillopora damicornis*, were attached. The bases of the coralla are each about 1½ inch wide, and the rudimentary tuberculate branchlets are about ¾ of an inch high. This specimen was thrown on the beach in a buoyant condition, as is evident by its still floating lightly even in fresh water. The attached *Pocillopora* probably represent the growth of a few months only, and would, at an early date, have completely invested the pumice stone fulcrum, and caused it to sink."†

The beaches of Eastern Australia are bestrewn with flotsam from the West Pacific Archipelagoes, including South Sea canoes,

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* Baur, *loc. cit.* p. 864.

† Kent—The Great Barrier Reef of Australia, 1893, p. 122.

empty *Nautilus* shells, pumice, coco-nuts and fruits of *Barringtonia butonica*.* My colleague, Mr. T. Whitelegge, has shown me pieces of pumice which he collected on a beach near Sydney. To these adhered young coralla of *Pocillopora* similar to those observed by Kent in Queensland. The unique occurrence of a live *Pocillopora* on rocks near Sydney noted by Mr. Whitelegge may be thus explained.†

Guppy furnishes the following evidence from the Indian Ocean: "Washed up on the weather side of North Keeling Island I found a piece of Krakatoa pumice, on which had grown four bosses of a pretty incrusting species of *Pocillopora*, each of the size of a dollar and $\frac{1}{4}$ to $\frac{1}{2}$ inch in thickness. This piece of pumice still floated buoyantly, and had evidently been caught in the reef for some time before it had been thrown up on the beach. Mrs. Ross showed me specimens about three times the size, of the same species of *Pocillopora*, that had grown on a large log of timber, which having been caught in the outer edge of the reef for about a fortnight, had then been rolled on shore. . . . Mr. Ross subsequently informed me that not infrequently large blocks of corals, mostly of the massive astrean type, and foreign to the atoll, are washed ashore on the western coasts of the eastern islands. He showed me one in his possession, a massive astrean coral, which was six feet in circumference and weighed 88 lbs., and in order to convince me of its buoyancy he had it carried to the beach and thrown into the water, when it floated readily."‡

F. Jousseaume states that corals attach themselves even to the shells of turtles and the skins of marine animals.§

The Nereid worm "Palolo" extends from Torres Straits and the continental islands eastwards to Samoa and Tonga, but is unknown to the natives of the Ellice, the Gilberts or the

* Hedley—Proc. Linn. Soc. N.S.W. xxiv. 1899, p. 192.

† Whitelegge—Proc. Roy. Soc. N.S.W. xxiii. 1889, p. 191.

‡ Guppy—Scot. Geograph. Mag. v. 1889, p. 288.

§ Jousseaume—La Philosophie aux prises avec la Mer Rouge, le Darwinisme et les trois Règnes des corps organisés, 1899, p. 241.

Marshalls.* A division of the Polynesian calendar is called Palolo, and in a philological connection Hale has drawn attention to the absence of this worm from eastern Polynesia.†

Among the marine molluscan fauna of most regions are certain genera which impress a geographical stamp upon the whole. Thus *Trigonia* in Australia, *Nautilus* in Melanesia, *Struthiolaria* in the circum-Antarctic zone, *Eburna* in East Asia and *Concholepas* in west South America, each express a key-note of their respective fauna. The Mollusca of Funafuti contain no such form. If spread out in a series on a table they would merely suggest to a conchologist that they came from tropical latitudes, between the longitudes of Mauritius and Hawaii, without affording him a clue to more exact locality.

Indeed, as in all oceanic islands, the absence of certain forms is more remarkable than the presence of others. Throughout the continental islands nearest to Funafuti—New Guinea, the Solomons and Fiji—various species of *Melo*, *Voluta* and *Nautilus* are abundant and conspicuous. The line which I draw between the oceanic and continental islands, is, however, an insuperable barrier to these, though it is none to such genera as *Mitra*, *Conus*, or *Cypraea*, which flourish within and beyond it. The reason suggested is that *the former lay eggs of great size, the young have no trochosphere stage and are already bulky when hatched.* They are not therefore capable of crossing spaces of open sea like the others.

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* Krämer—Biologisches Centralblatt, xix. 1899, p. 18.

† "Palolo in Samoan is the name of a kind of sea-worm which makes its appearance in shoals in the reefs, at a certain time of year, and is esteemed a great delicacy by the natives. This worm is not known at the Society Islands, but the name is still retained, with no meaning whatever attached to it—a striking evidence of the derivation of the Tahitians from Samoa."—(Hale, U.S. Expl. Exped. Ethnography and Philology, viii. 1846). This argument appears to me unsound. To cite a parallel case, would it not be considered rather that the English called the Hawthorn "May," from the month in which it flowered, than that the shrub gave its name to the month?

In tropical latitudes the family Onchidiidæ are usually numerous; their complete absence at Funafuti therefore struck me as remarkable. Samoa and Tonga appear to be their farthest stations in the West Pacific. Their limited powers of migration are explained by the statement of J. Joyeux-Laffuie that—"The whole development of *Onchidium* takes place within the egg, and the young at the time of hatching already possess the form of the adult."*

I should suppose indeed that the bulk of the molluscan fauna reached Funafuti in the larval swimming stage.

Fischer records† having taken in the open sea a *Triforis* which, although eight or nine whorls of the shell were formed, still retained the larval, *i.e.*, swimming characters. In the light of this statement the wide range which *Triforis* enjoys in Polynesia might have been anticipated.

Little is known of the comparative endurance of the swimming larval stages of Mollusca. That Pelecypoda range farther than Gasteropoda suggests that they swim longer. *Tritonium* and *Cerithium* should by their distribution be gifted with unusual swimming powers.

That the Polyplacophora should only be represented by a fragment in the roll of the Funafuti Mollusca is quite in keeping with the distribution of this order in the Central Pacific. But six species were known from this region to Harper Pease, who in his last paper wrote—"The absence of Chitonidæ from Polynesia has been noticed by authors as a remarkable fact, abounding as they do in the surrounding provinces, especially on the west coast of America, at Australia and New Zealand."‡

Interesting results would be reached by tabulating marine Invertebrata, according as they travel much, a little, or not at all, in the early stages of their development; by plotting the geographical distribution of each, and comparing the results.

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* Joyeux-Laffuie—Archives Zool. Expér. x. 1882, p. 333.

† Fischer—Manuel Conch., 1887, p. 679.

‡ Pease—Am. Journ. Conch. vii. 1872, p. 194.

Such data as I have suggest that the distribution obtained in the Eastern Pacific would be described by concentric zones of which the outer would be attained only by the strongest swimmers.

Mr. T. Whitelegge has pointed out to me that the Australian starfish, *Asterina exigua*, never passes through a free pelagic stage, but goes through all stages of development on the rock on which the egg is laid and to which it adheres. I cannot, however, divide the Echinodermata by similar and opposite habits, sufficiently to draw any conclusions from them.

The abundance of Crustacea at Funafuti agrees with their larval capacity of swimming. The same may be said of the occurrence there of Enteropneusta, Gephyrea and Actinozoa. The genera of Reef Corals diminish markedly in number from west to east. We noticed the absence from Funafuti of many genera usually common and conspicuous on continental islands, such as *Galaxea*.

Too few examples were obtained at Funafuti of the fauna of the deep sea to admit of much discussion. The interesting Palu, *Ruvettus pretiosus*, however, supports the opinion that a general uniformity prevails over vast areas, if not indeed all round the world, among abyssal animals.

Our increased knowledge develops distinctions more than affinities between the Central Pacific and tropical Atlantic. But the list of species either closely related in or common to both oceans has been lately enlarged, both among deep and shallow water forms. Willey has commented on the affinity between *Asymmetron caudatum* from the Louisiades, and *A. lucayanum* from the Bahamas.* Before its discovery at Funafuti, the sponge *Hippospongia dura* was only known from the Atlantic coast of North America. The fish *Ruvettus pretiosus* is now shown to be common to both oceans, and the new Brachiopod from Funafuti finds a close ally in *Thecidium barretti* from the West Indies. I have drawn attention to the relation of *Iphitus tuberculatus*, Watson, from the West Indies, and my *Mecoliotia halligani* from Funafuti. *Acanthogorgia muricata*, described by Verrill from

* Willey—Quart. Journ. Micro. Sci. xxxix. 1896, p. 220.

Barbadoes, has been rediscovered at Funafuti.* Six medusæ are noted as common to Fiji and the West Indies.† Darwin wrote that "not one single sea-shell is known to be common to the Pacific and to the west coast of America," but the statement is no longer true.

A list of the Polynesian fauna which reappear on the west coast of America would be of value. Materials are at present wanting to construct it, but it is evident that the proportion is small. Their extension eastwards is obstructed partly by the large expanse of water unbroken by islands, and partly by the cold current which flows northwards along the American coast.

No sign of an American immigration can be traced in the Central Pacific. Had the Trans-Pacific Jurassic Continent advocated by such writers as Hutton and Baur any foundation in fact, then, if not terrestrial, at any rate marine forms should now extend eastwards from America along its former site.

* Hiles—Proc. Zool. Soc. 1899, p. 48.

† Agassiz and Mayer—Bull. Mus. Comp. Zool. xxxii. 1899, p. 158.

NOTES AND EXHIBITS.

Mr. Baker exhibited herbarium specimens and tubers of the new species of Parsonsia described in his paper. Also admirably executed casts of three food-fishes, modelled at the Technological Museum for museum purposes; and a section of the trunk of the "cork-wood" *(Hakea lorea)* of the interior.

Mr. D. G. Stead exhibited specimens of Hawkesbury sandstone (1) from the sea shore between tide-marks showing the tunnelling of marine Isopods *(Sphaeroma)*, with the living animals *in situ;* and (2) from the hill-tops overlooking Port Jackson, offering examples of the borings which so often attract notice, and the production of which has been attributed to Hymenoptera, and also to Termites. Since last meeting Mr. Stead reported that he had investigated the matter, and that, after breaking up a quantity of stone, he had come upon Termites, of a species at present undetermined, actually at work. Of these he exhibited specimens.

Mr. Stead also stated that he had been informed by Captain Wallace, who had shown him the bird, that on 5th May last, while the s.s. Perthshire was drifting about in a disabled condition, about 500 miles from the nearest land (Cape Howe), a common bronze-wing pigeon *(Phaps chalcoptera*, Lath.*)* flew on board in an exhausted condition.

Mr. R. Greig Smith, M.Sc., the Macleay Bacteriologist, exhibited two samples of butter prepared from the same original lot of cream which had been divided into two portions, one being ripened with the ordinary acid starter, the other having a culture of the aroma-producing bacterium *No. 41* (*Conn* added with the starter. The difference between the samples was very striking, the one having very little smell, while the other had the flavour and aroma characteristic of the finest butters. It was interesting to note that the bacteria from which the culture was prepared had been kept growing on artificial solid media for three years without having lost the aroma-producing property.

WEDNESDAY, AUGUST 30TH, 1899.

The Ordinary Monthly Meeting of the Society was held at the Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesday evening, August 30th, 1899.

The Hon. James Norton, LL.D., M.L.C., President, in the Chair.

Mrs. LOUISA ROSS, St. Peter's, Armidale, N.S.W., was elected an Associate Member; and Mr. JOHN L. BOORMAN, Leichhardt, Mr. ROBERT GRANT, Department of Public Health, Sydney, Mr. HENRY MALTHOUSE, Camperdown, and the Rev. E. STANLEY WILKINSON, M.A., Bowral, were elected Ordinary Members of the Society.

The President made the following announcement:—Members desirous of taking a course of instruction in Bacteriology are requested to forward their names to the Secretary, who will afford information as to fees and other matters. As there are only two vacancies, application should be made without delay.

DONATIONS.

Department of Agriculture, Brisbane—Queensland Agricultural Journal. Vol. v. Part 2 (August, 1899). *From the Under Secretary for Agriculture.*

Australian Museum, Sydney—Catalogue No. xvii. (1899): Memoir iii. The Atoll of Funafuti. Part 9 (August, 1899): Report of the Trustees for the Year 1898. *From the Trustees.*

Department of Mines and Agriculture, Sydney—Agricultural Gazette of N.S. Wales. Vol. x. Part 8 (August, 1899). *From the Hon. the Minister for Mines and Agriculture.*

Royal Society of New South Wales, Sydney—Abstract of Proceedings, August 2nd, 1899. *From the Society.*

The Surveyor, Sydney. Vol. xii. Nos. 7-8 (July-Aug., 1899). *From the Editor.*

Australasian Journal of Pharmacy, Melbourne. Vol. xiv. No. 164 (August, 1899). *From the Editor.*

Field Naturalists' Club of Victoria—Victorian Naturalist. Vol. xvi. No. 4 (August, 1899). *From the Editor.*

Royal Geographical Society of Australasia: Victorian Branch—Transactions. Vol. xvi. (1898). *From the Society.*

The University, Melbourne—Calendar for the Year 1900. *From the Council.*

Department of Mines, Tasmania.—Progress of the Mineral Industry of Tasmania for the Quarter ending 30th June, 1899. *From the Secretary for Mines.*

Geological Survey, Perth, W.A.—A Geological Map of Coolgardie (1899) [in 4 sheets]. *From the Government Geologist.*

American Academy of Arts and Sciences, Boston—Proceedings. Vol. xxxiv. Nos. 15-17 (March, 1899). *From the Academy.*

American Geographical Society, New York — Bulletin. Vol. xxxi. No. 3 (1899). *From the Society.*

American Naturalist (Cambridge). Vol. xxxiii. No. 391 (July, 1899). *From the Editor.*

Johns Hopkins University, Baltimore—University Circulars. Vol. xviii. No. 141 (July, 1899). *From the University.*

Denison University, Granville—Bulletin of the Scientific Laboratories. Vol. xi. Arts. iv.-viii. (pp. 75-173: Dec., 1898-March, 1899). *From the University.*

New York Academy of Sciences—Annals. Vol. xi. Part iii. (December, 1898). *From the Academy.*

U.S. Geological Survey, Washington—Eighteenth Annual Report. Parts ii. and v. [in two] (1896-97). *From the Director.*

Museo Nacional de Montevideo—Anales. Tomo ii. Fasc. xi. (1899). *From the Museum.*

Museu Paulista, São Paulo—Revista. Vol. iii. (1898). *From the Museum.*

Perak Government Gazette, Taiping. Vol. xii. Nos. 21-23. (July, 1899). *From the Government Secretary.*

Cambridge Philosophical Society, Cambridge—Proceedings. Vol. x. Part ii. (June, 1899): Transactions. Vol. xvii. Part iii. (May, 1899). *From the Society.*

Entomological Society of London—Transactions, 1899. Part ii. (June). *From the Society.*

Conchological Society of Great Britain and Ireland—Journal of Conchology. Vol. ix. No. 7 (July, 1899). *From the Society.*

Manchester Museum, Owens College, Manchester—Publications. Nos. 25-27 (1899). *From the Museum.*

Royal Microscopical Society, London—Journal, 1899. Part 3 (June). *From the Society.*

Royal Gardens, Kew—Hooker's Icones Plantarum. Vol. vii. Part i. (June, 1899). *From the Bentham Trustees.*

Royal Society, London—Proceedings. Vol. lxv. No. 416 (July, 1899). *From the Society.*

Zoological Society of London—Abstract, June 20th, 1899: Proceedings, 1899. Part 1 (June, 1899). *From the Society.*

Royal Dublin Society, Dublin—Scientific Proceedings. Vol. viii. N.S. Part 6 (Nov., 1898): Scientific Transactions. (Series ii.) Vol. vi. Parts xiv.-xvi. (April-Aug., 1898): Vol. vii. Part 1 (Aug., 1898). *From the Society.*

Naturwissenschaftlicher Verein für den Reg.-Bez. Frankfurt (Oder)—Helios. xvi. Band. (1899): Societatum Litteræ. Jahrgang. xii. Nos. 5-12 (Mai-Dec., 1898). *From the Society.*

Medicinisch-Naturwissenschaftliche Gesellschaft zu Jena—Jenaische Zeitschrift. xxxiii. Band. ii. Heft (1899). *From the Society.*

Verein für Erdkunde zu Leipzig—Mitteilungen. 1898: Wissenschaftliche Veröffentlichungen. iii. Band. iii. Heft. (1899). *From the Society.*

Zoologischer Anzeiger, Leipzig. xxii. Band. Nos. 590-592 (June-July, 1899). *From the Editor.*

Gesellschaft für Erdkunde zu Berlin—Verhandlungen. xxvi. Band. No. 1 (1899): Zeitschrift. xxxiii. Bd. No 5 (1898). *From the Society.*

Société Royale Linnéenne de Bruxelles—Bulletin. 24[me] Année. Nos. 7-8 (May-June, 1899). *From the Society.*

Journal de Conchyliologie, Paris. Vol. xlvii. No. 2 (1899). *From the Director.*

l'Académie Impériale des Sciences de St. Pétersbourg—Mémoires. viii[e] Série. Vol. vii. No. 1 (1898). *From the Academy.*

Russisch-Kaiserliche Mineralogische Gesellschaft zu St. Petersburg—Verhandlungen. Zweite Serie. xxxvi. Band. 1 Lief. (1899). *From the Society.*

Société Impériale des Naturalistes de Moscou—Bulletin. Année 1898, No. 4. *From the Society.*

Comité Géologique, St. Pétersbourg—Bulletin. Tome xvii. Nos. 6-10 (1898); T. xviii. Nos. 1-2 (1899): Mémoires. T iii. T.p., &c. (1885-89); T. viii. No. 4, T.p., &c. (1898): T. xii. No. 3 (1899). *From the Committee.*

Naturforschende Gesellschaft in Bern—Mittheilungen aus dem Jahre 1897. *From the Society.*

Société Helvétique des Sciences Naturelles, à Berne—Actes et Compte Rendu, 80^me^ Session (Lucerne, 1897); 81^me^ Session (Berne, 1898). *From the Society.*

l'Académie Royale des Sciences à Stockholm—Bihang. Vol. xxiv. Section 1-4 (1898-99). *From the Academy.*

Zoological Museum of the University of Copenhagen—The Danish Ingolf-Expedition. Published at the cost of the Government Vol. i. Part 1; Vol. ii. Part 1; Vol. iii. Part 1 (1899). *From the Director.*

Académie Royale des Sciences et des Lettres de Danemark, Copenhagen—Bulletin. 1899, Nos. 2-3. *From the Academy.*

Zoological Results based on Material from New Britain, New Guinea, Loyalty Islands and elsewhere, collected during the Years 1895-97, by Arthur Willey, late Balfour Student, University of Cambridge. Parts i.-iii. (4to Cambridge, 1897-99). *From A. Willey, Esq., D.Sc., M.A.*

Contributions from the Australian Museum.

METHOD OF SUSPENDING THE PALU, OR SO-CALLED "SHARK"-HOOKS, AS DEDUCED FROM A MODEL.

By R. Etheridge, Junr., Curator of the Australian Museum.

(Pate xxxvi.)

The misconception that has arisen as to the use of at least some of the "remarkable large wooden hook(s) from Micronesia and Polynesia,"* termed the "Shark-hook," has been dispelled by Mr. C. Hedley, who has shown that the latter is used in the capture of the Palu or "Oil Fish" of the Pacific, and possibly not for Shark-fishing at all. So far, I do not think any description of the method of mounting these hooks on deep sea lines has appeared.

The history of this model is briefly this:—It was given to Mr. H. S. W. Crummer, of the Department of Lands, Sydney, by the well-known traveller and author, Mr. Louis Becke, and by the former given to our President (Hon. Jas. Norton, LL.D., M.L.C.), who generously presented it to the Australian Museum. It is of course quite possible that Mr. Becke may have already described this method in one of his numerous writings, but I am ignorant of the fact. The model is from Nieue, or Savage Island.

In explaining the method of Palu fishing at the Ellice Group, Hedley has given† a very full description of these hooks, with an account of their manufacture, history, and distribution. The distribution of the hook has been supplemented by that of the fish, by Mr. Edgar R. Waite, who states‡ that we now possess records

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* Hedley, Mem. Austr. Mus., 1897, iii. Pt. 4, p. 272.

† Mem. Austr. Mus., 1897, iii. Pt. 4, p. 273.

‡ *Ibid.*, 1899, iii. Pt. 9, p. 540.

of the occurrence of the Palu (based on that of the hook), throughout twenty-six degrees of longitude in the Pacific, *i.e.*, from the Gilbert Islands on the east to Manahiki, or Humphrey Island, on the west, or from 175° E. to 160° W., and throughout nineteen degrees of latitude, from about the equator to Nieue, in 19° S. If to this be added the later known occurrence of the hook the distribution may be "extended north of the line to the Marshall Group, thence westward to the Caroline Islands," and Eastern New Guinea, south of the equator.*

The Palu has been identified by Waite as *Ruvettus pretiosus*, Cocco, the "Escolar" of the Canary Islands fishermen, and the "Rovetto" of the Mediterranean, a species extending from the Adriatic on the east to the N. American coast on the west, throughout one hundred degrees of longitude, and twenty-five degrees of latitude, from 25° to 45° N.† It is known to exist bathymetrically to depths as great as four hundred fathoms.

Mr. Waite has also given an account of the method of fishing for Palu, from the graphic pen of Mr. Louis Becke.‡

A remarkably fine series of these V-shaped hooks is now in the Australian Museum, from the gigantic Mortlock Island implement, of seventeen inches in length, and weighing 1 lb. 15¾ oz., to the smallest *Kouborn* of Funafuti, or the baby hook, of the first-mentioned locality, only three and a-half inches long.

The model consists of a two-ply cocoanut-fibre line, to which is joined another fine white two-ply line of a different fibre. To this are attached by loop hitches two outriggers of wood in such a manner that they stand out at a more or less oblique angle to the line, but on opposite sides of the latter. The white line is in one continuous piece from the cocoanut deep-sea line to sinker attachment, and does not pass along either of the outriggers. A still finer line is made fast at the proximal end of each of the latter, and is Mr. Hedley's "cord of attachment," or *oukafakama-*

* Waite, *loc. cit.*, p. 541.

† *Id.*, *ibid.*, p. 539.

‡ *Ibid.*, 1897. iii. Pt. 3, p. 199.

pana; in the actual fishing line, a piece of cocoanut-fibre rope about two feet in length.* In the model this is passed under and over the outriggers to their distal ends, and further secured at the centre of each outrigger by a half-hitch. At the distal ends of the latter these cords of attachment are bound to them by whipping, and then pass to the upper extremity of the major shanks of the hooks, where they are made fast.

In the largest Mortlock Island hook the *oukafiukamapana* is terminated by both a knot and an eye for bending on to the main line, but Hedley says that in the Ellice Islands implement a knot only is used; the model agrees with the latter. Another Mortlock Island hook, twelve inches in length, retains both the cord of attachment and outrigger, the former passing along the latter just as in the model, but instead of passing under and over, and with a half-hitch in the centre, it is simply laid against the outrigger and lashed at the centre, otherwise this specimen exemplifies the great accuracy of the model. Unlike that of the seventeen-inch hook, the cord of attachment of this twelve-inch hook terminates in an eye only, and not a knot and an eye.

To the bottom of the line is made fast a piece of bast, which acts as the suspensory of the sinker. The latter consists of a piece of coral carefully ground to the shape of a fender, and secured to its suspensory by a square lacing of the same material.

According to Mr. Louis Becke, the Palu line is made from the very best cocoanut-fibre, four- to six-ply, and the sinker is from three to six pounds.† Thanks to the generosity of Mr. Crummer I am able to exhibit such a line that has actually been in use; this, however, is only a two-ply line.

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* *Loc. cit.*, 1897, iii. Pt. 4, p. 276.

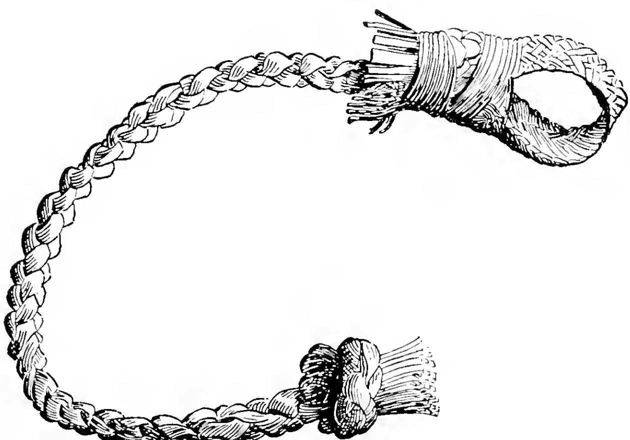
† Waite, *loc. cit.*, 1897, iii. Pt. 3, p. 200.

THE TANNA SPEAR-BECKET.

By R. Etheridge, Junr., Curator of the Australian Museum, Sydney.

At a recent meeting I exhibited and described the Spear-beckets of New Caledonia and the New Hebrides, and referred to the use of these implements on the Islands of Tanna, Aneiteum, and Efate in the latter group. At the same time I exhibited a drawing of the Tanna becket copied from the Rev. G. Turner's illustration,* and another of the Aneiteum implement taken from one kindly lent to me by the Rev. J. H. Lawrie.

I am now able, through the kindness of Mr. W. R. Harper, to exhibit an admirable example of the Tanna becket, received by



him from the Rev. Dr. Macdonald, of Havannah Harbour, Efate, who, in a letter to Mr. Harper, dated June 26th, 1899, says:—"The becket or spear-thrower is, I believe, not known in Efate or to the north. I wrote to Rev. W. Watt, of Port Resolution, Tanna, and he has very kindly brought me a good specimen from

* Nineteen Years in Polynesia, 1861, p. 81.

Tanna, which I send you. . . . . It appears that the use or knowledge of the becket was confined to the islands south of Efate, that is, Erromanga, Tanna, Aneiteum, Futuna, and Aniwa."

In the first place, this Tanna becket is of much simpler construction than that illustrated by Mr. Turner, in that it has no "tags" or "collar," and the knot is a very simple one. In its simpler construction it resembles the Aneiteum example lent to me by Mr. Lawrie, as well as two of those from the Cook Collection, that I assumed to be New Caledonian, but in the light of the present specimen *may* be from Tanna or Aneiteum, bearing in mind that Cook called at the former island. In the second place, it will be noted that Dr Macdonald says the Spear-becket is not known on Efate, but against this I may refer to one of the quotations given in my previous paper. I there stated that in Mr. J. E. Erskine's work, "Journal of a Cruise amongst the Islands of the Western Pacific,"* occurs the following passage relative to Efate :—"From a village . . . a canoe pushed off to intercept us as we were working in, one of the three men occupying it handing up a becket of plaited cord, such as we had seen in the hands of the Tannese for throwing their spears." It seems, therefore, from this discrepancy of statement that further investigation is required as to the use of the becket on Efate.

The Tanna implement forwarded by Dr. Macdonald on behalf of the Rev. W. Watt is a large one, eleven inches long, and apparently made of strips of a palm spathe, exceedingly well plaited in three strands, forming a round cord. The palm spathe used is possibly that of an *Areca*. The eye of the cord is made in a precisely similar manner to those already described, but the plaiting of the eye is more elaborate than that of the cord proper. The free ends are not gathered into tags, but left frayed out, and are secured to the standing part of the cord by a thimble of spun-yarn wound round, in which the smell of the tar is still faintly, although distinctly perceptible.

I am again indebted to Mr. Hedley's kindness for the drawing accompanying these notes.

* 1853, p. 323.

DESCRIPTION OF A NEW GENUS, *AUSTROSAREPTA*, AND NOTES ON OTHER MOLLUSCA FROM NEW SOUTH WALES.

By Charles Hedley, F.L.S.

Before discussing the following new genus, a brief glance may be taken at the literary history of kindred forms.

Writing from on board the vessel on which he served as naval surgeon, Dr. Arthur Adams drew up the diagnosis of a remarkable little bivalve which had just been dredged in 63 fathoms in the Straits of Korea by H.M.S. *Actaeon*. In conclusion he remarked (Ann. Mag. Nat. Hist. [3] v. April, 1860, p. 303) that the novelty, *Sarepta speciosa*, "agrees with *Nucula* in the simple pallial line and internal ligament, and with *Malletia* in not being nacreous or pearly within, and in general form and character. It belongs to a distinct subfamily between Nuculinæ and Malletinæ." The type has unfortunately never been figured.

From great depths in the Central Pacific the *Challenger* took a second species of *Sarepta*, described and figured by Smith (Chall. Reports, Zool. xiii. p. 244, Pl. xx. ff. 6, 6*a*, 6*b*) as *S. abyssicola*. No other species appear to be recorded.

Last year Dall defined (Wagner Free Inst. Sci. Trans. iii. p. 583) the subfamily Sareptinæ, indicated by Adams, in the following terms:—"Nuculacea with a more or less developed external ligament in addition to a sunken internal resilium, a short hinge plate, a simple pallial line, and a porcellanous shell. The species are usually small and rounded, smooth or concentrically striated externally, not rostrate, and without crenulations on the margins of the valves."

Under this heading Dall groups *Sarepta*, *Glomus* and *Microyoldia*.

For some time I have had under consideration a minute bivalve, obtained by several collectors, including myself, as dead and separate valves washed ashore on rocky places near or facing the ocean round Sydney. The position of the ligament and the entire pallial line appeared to throw it into the vicinity of *Sarepta*. Yet the totality of the remaining characters revolt against the definitions both of that genus and of its subfamily, drawn up by Dall. Excluding these two points my shell would rather be associated with such a group as *Trinacria*. Round *Leda* there have been arranged forms which, while preserving the same hinge type, have in contour assumed as great divergence as parts *Sarepta* from the shell in question. So I have, in disregard of remaining features, followed the clue offered by the more important taxonomic characters and with diffidence invite the attention of systematists to my puzzle under the title of :—

AUSTROSAREPTA, g.n.

A genus of the subfamily Sareptinae, distinguished by an amphidetic internal ligament and a distinct though feebly separated resilium. Hinge line arched, teeth few, beyond which are several crenulations on the dorsal margin. Valve brightly coloured, subrostrate, with sharp folds proceeding obliquely from the beak to the postero-ventral margin. Type *A. picta*.

Since the progress of evolution in the ligament has been from amphidetic to opisthodetic, this genus may be considered as a more primitive form than the other members of the subfamily.

AUSTROSAREPTA PICTA, sp.n.

(Figs. 1, 2.)

Shell minute, moderately thick, swollen, inequilateral, obliquely subquadrate. Colour variable, rarely all violet, usually mottled in different patterns by brown on a pale horn ground. Umbo not turned either anteriorly or posteriorly, elevated, rounded, situated at about one-third of the total length from the anterior end. Ligament amphidetic; beneath it a V-shaped depression marks the position of the resilium. The tract which I suppose to be occupied by the ligament is obscurely perpendicularly grooved, and may correspond to the crenulated provinculum figured by Bernard in the young stage of *Leda fragilis*.* Hinge line arched, broad and strong, its central third occupied by the ligament; on the posterior side are three stout, projecting pyramidal teeth arising from V-shaped roots of which one leg is much longer than the other; on the anterior side two such are followed by small tubercles. Beyond the teeth the margin is on either side crenulated for some distance.

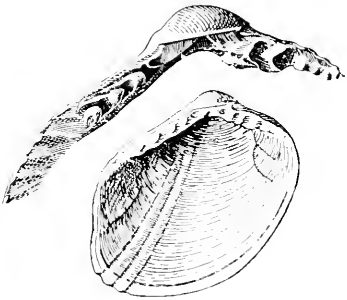


Fig. 1.

Within (fig. 1, interior of left valve) the surface though not nacreous is most glossy, the external sculpture visible through the shell. The oblique external folds show as deep furrows which undulate the margin and traverse the valve. Pallial line simple: the adductor muscle scars are very distinct, so that if a pallial sinus existed it would be readily discernible. Ventral margin smooth and straight.

Externally (fig. 2, right valve of another specimen) the lunule and escutcheon are feebly marked. From the umbo three sharp ridges and intervening furrows cross the valve to the postero-ventral margin. Posterior of these folds the valve is somewhat truncated and flattened, its surface is divided into three facets by minor radiating ridges; anteriorly it is smooth and rounded. The entire external surface is glossy and ornamented

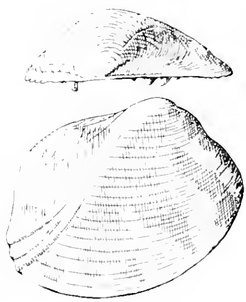


Fig. 2.

* F. Bernard, Bull. Soc. Géol. France, (3) xxiv. 1896, p. 79, fig. 12.

by fine concentric sculpture. There is no trace of epidermis. A large specimen measures, height, 2; length 2·3; breadth of single valve ·8 mm.

Loc.—In sand, Bondi, Watson's Bay, Middle Head and Balmoral, all near Sydney. Its association with such shells as *Cæcum amputatum* suggests to me that it inhabits deep water.

Type to be presented to the Australian Museum.

I consider the shell described as adult, because a considerable series of specimens show little variation in size. This species is perhaps the smallest Australian pelecypod yet described.

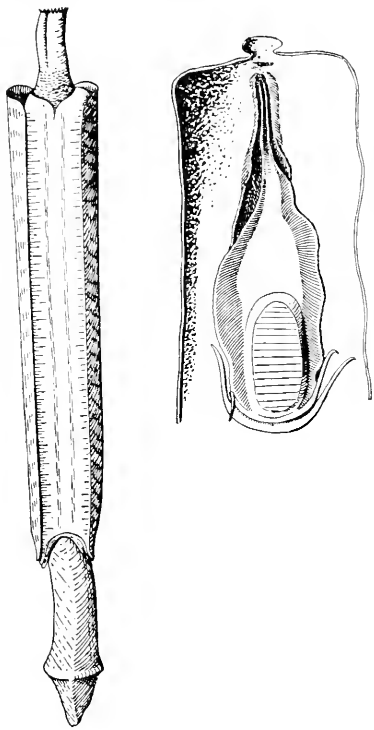


FIG. 3.

SOLEN SLOANII, Gray.

(Fig. 3.)

The recent storms cast ashore on the Middle Harbour beaches numbers of *Solen sloanii*, weakened probably by the unusual quantity of fresh water which heavy rains had poured into the bay. As this species is generally hard to procure in the flesh, and as no mention appears to have been made of its soft parts, I took the opportunity to make the accompanying notes and sketch.

Foot protruded for more than one-third of the shell's length, white, clavate, laterally compressed and pointed distally. Mantle entire, extending the whole length of the shell, notched at either end, edges not papillose. Siphons white with a brown base, united to the tips, orifices fringed with cirrhi. In the right hand figure the mantle has been ripped open and the foot amputated near the base, to show the branchiæ, which extend from between the palpi posteriorly almost to the siphon tube.

TEINOSTOMA STARKEYÆ, sp.n.

(Fig. 4.)

Shell glossy, transparent, depressed, perforate. Whorls four, separated by a deeply furrowed opaque suture. Surface smooth and glossy. Aperture very oblique, semiovate. Lip simple, sharp, sinuate. Body whorl overlaid by a callus. From the lower angle of the lip a broad shelf winds like the thread of a screw into the umbilicus, which it almost fills. Major diameter 4; minor 3·25; height 2 mm.

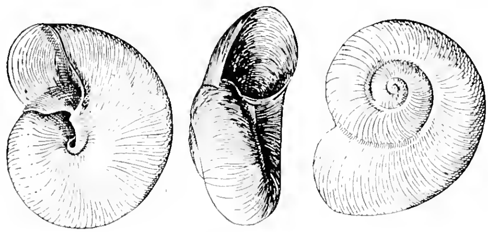


FIG. 4.

Loc.—Balmoral Beach, near Sydney. Type to be presented to the Australian Museum.

This interesting novelty is named in honour of Mrs. C. T. Starkey, who discovered it, and who kindly placed it in my hands for description.

Mr. H. A. Pilsbry has pointed out (Man. Conch. xi. 1889, p. 462) that the following Australian shells described as *Ethalia* must be transferred to the genus *Teinostoma*:—*T. brazieri*, Angas (Proc. Zool. Soc. 1877, p. 39, Pl. v. fig. 17); *T. tasmanica*, T. Woods (Proc. Roy. Soc. Tasm. 1876, p. 146); and *T. cancellata*, Tate (Trans. R.S.S. Australia, i. 1878-9, p. 139, Pl. v. fig. 11). He has since informed me by letter that *Neritula lucida*, Adams and Angas (Proc. Zool. Soc. 1863, p. 35), also belongs to the same genus.

From these four the species before us differs by its perforation. It belongs to a subgenus, *Solariorbis*, named by Conrad in 1865 (Am. Journ. Conch. i. p. 30), which, according to Dall (Trans. Wagner Inst. iii. 1892, p. 412), contains "species in which the young stages of *Teinostoma* are perpetuated, and which show generally an angle or ridge extending from the pillar spirally into a thin broad keel, which might be taken for the umbilical wall, but really overshadows the perforation of the axis and nearly closes it."

As the so-called *Neritula lucida* has never been illustrated, the accompanying figure (fig. 5) is supplied for comparison with the species above made known.

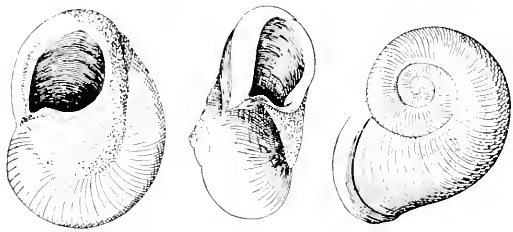


Fig. 5.

Cassis nana, Tenison Woods.

(Fig. 6.)

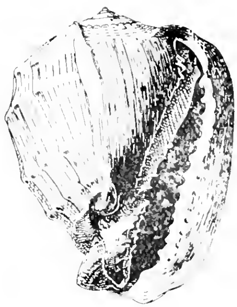


Fig. 6.

This species was originally described in these Proceedings (Vol. iv. 1879, p. 108). Though a remarkable shell, it has not in the past twenty years been again noticed in literature. It is now for the first time illustrated. The type, found by Mr. C. Coxen at Moreton Island, is in the Queensland Museum, where it was for a time in my official charge. The species is known to me to range from the mouth of the Richmond River, N.S.W., north to Caloundra Head, Queensland. Within these limits it is a rare shell.

Cantharus waterhousiæ, Brazier.

(Fig. 7.)

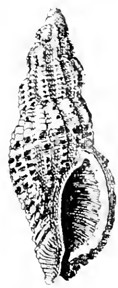


Fig. 7.

Like the foregoing, this species was first described in these Proceedings (Vol. xxi. 1896, pp. 345, 818), and may be most properly illustrated in the same serial. The accompanying figure is drawn from the type, kindly lent for the purpose by Mrs. Waterhouse.

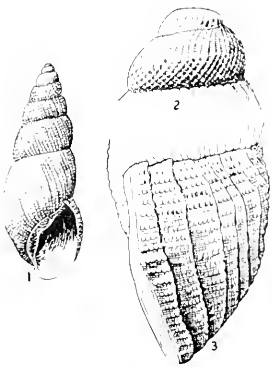
DESCRIPTION OF A NEW SPECIES OF *LIPARUS* FROM WEST AUSTRALIA.

By J. C. Cox, M.D., F.L.S.

Buliminus (Liparus) gratwicki, n.sp.

(Figs. 1-3.)

Shell cylindrically pyramidal, deeply rimate. The shells before me are a dead chalky white (this may only be a bleached condition of an otherwise coloured shell); whorls seven and a half (of which the uppermost two are nepionic), rounded, slowly increasing in length, and separated by a narrow deeply impressed suture, the last whorl is 17 mm. long and 10 mm. wide: the surface of the whorls is rough, having longitudinal arcuate riblets formed by lines of growth irregularly disposed in larger and smaller groups sharply outlined; these cross each whorl, except the apical, from above downwards and plicate the suture as they end in and commence from it; on the upper whorls, commencing as they do about the middle of the 3rd whorl, these arcuate riblets are only slightly raised, but become harsher as they descend. The nepionic whorls are sculptured by a very distinct network of oblique reticulating wrinkles. The longitudinal riblets are cut across at right angles by numerous fine spiral grooves commencing about the 3rd whorl and continuing in a spiral manner till they reach the body whorl; as they pass



round the lower part of the body whorl their impressed character is not so marked. The longitudinal arcuate riblets being cut across by the spiral grooves, the surface is divided into coarse and fine imbricating subsquamose nodosities, causing the surface to resemble bead-like rows, with finer longitudinal beaded rows in between the coarser ones.

Aperture slightly oblique, pyriform; outer lip simple, neither thickened nor reflected, meeting the body whorl at a sharp angle, then slightly bent and regularly curving to the anterior extremity, where it is a little produced and almost effuse. Columella nearly straight, anteriorly everted over the rimate umbilicus; above spreading a thick and sharply defined layer of callus on the body whorl.

Length 30 mm. Width about the middle of the body whorl 10 mm.

Hab.—About 50 miles east of Israelite Bay, Western Australia, two miles from the edge of the cliffs, which are there about 200 feet high: it was found in large numbers. *Bulimus Dux* is also found abundantly there.

The nearest ally of this species is *Liparus Brazieri*, Angas, a broader, shorter and much thinner shell. The surface of *L. gratwicki* is correlated with a sharper, harsher sculpture.

The nepionic apex to which I have drawn attention is the same in all other members of *Liparus*, although, except in the case of *L. Spenceri*, it has received little attention from authors.

I have placed this species in with *Liparus*, although so far nothing is known of the anatomy of the animal, but its general characters and habitat suggest that it should be so placed; it has characters, however, as to shape, the formation of its aperture with its thick callused internal surface, that would place it with *Placostylus*.

The drawing of this species has been generously made for me by Mr. Charles Hedley, Conchologist on the scientific staff of the Australian Museum.

CONTRIBUTIONS TO A KNOWLEDGE OF THE FLORA OF AUSTRALIA.

No. II.

By R. T. Baker, F.L.S., Curator, Technological Museum, Sydney.

ZYGOPHYLLEÆ.

Tribulus terrestris, *Linn.*—Mostly regarded as an inland species, but it extends to both sides of the Dividing Range, occurring at Minto (M. Ryan).

RUTACEÆ.

Boronia anemonifolia, *A. Cunn.*, var. dentigera, *Benth.*—This rare form of the species occurs at Mittagong (W. A. Dixon). also on the Sugar Loaf Mountain, Braidwood, 5 ft. 10 in. high. (W. Bäuerlen).

MELIACEÆ.

Synoum glandulosum, *Juss.*—In the gullies at Bundanoon, Southern Line (B. Dunstan).

RHAMNEÆ.

Cryptandra longistaminea, *F.v.M.*—Woodburn, near the mouth of the Richmond River (W. Bäuerlen). The only locality given in *B.Fl.* Vol. i. p. 444 is New England (C. Stuart).

SAPINDACEÆ.

*Cupania punctulata, *F.v.M.*—This plant was described originally (F.v.M., *Frag.* iii. 12, and by Bentham, *Flora Aus.* i.

* Species marked with an asterisk have not previously been recorded from New South Wales.

458) from material lacking flowers and seeds. Mr. Bäuerlen has been successful in collecting complete material of the species at Tumbulgum, where the tree attains a height of over 50 feet and a diameter of 15 inches. The flowers may now be described as follows:—Panicles axillary, either single or a cluster of from five to six, about 3 inches long. Flowers not numerous, distant: buds globular, a little over one line in diameter. Sepals imbricate in the bud, almost orbicular, unequal, glabrous; petals oval, glabrous, about 1 line long. Sepals and petals reddish with hyaline edges. Stamens eight, pubescent towards the base.

*NEPHELIUM DIVARICATUM, *F.v.M.*—Lismore (W. Bäuerlen).

LEGUMINOSÆ.

BOSSIÆA FOLIOSA, *A. Cunn.*—As an instance of the adaptation of plants to environmental conditions, it may be here recorded that plants of this species collected on the Crackenback Mountain (Mt. Kosciusko) at an elevation of 5,000 feet, by W. Bäuerlen, have the calyx pubescent (as mentioned by Bentham, *B.Fl.* ii. p. 160), whilst specimens of undoubtedly the same species collected at Heydon's Bog, Delegate, 3000 feet, by this gentleman, have the calyx quite glabrous.

ACACIA BAKERI, *J.H.M.*—Tumbulgum, Tweed River, extending also into Queensland (W. Bäuerlen).

ACACIA RUBIDA, *A. Cunn.*—This species is known at Gerogery as "Silver Wattle" (Isaac Mann). This is its most southern recorded locality

ACACIA GLAUCESCENS, *Willd.*—Deep Creek, Quiedong River, Delegate District (W. Bäuerlen).

PITHECOLOBIUM MULLERIANUM, *J.H.M. et R.T.B.*—Tweed River, Murwillumbah (W. Bäuerlen), and probably extending also into Queensland.

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* Species marked with an asterisk have not previously been recorded from New South Wales.

SAXIFRAGEÆ.

Argophyllum Nullumense, sp.nov.

(*Argophyllum nitidum*, Labill., Baker, P.L.S.N.S.W. 1897, p. 232).

In Part i. of these Contributions a full description is given of a plant from Nullum Mt., Murwillumbah (W.B.), accompanied by a figure, placed tentatively under *A. nitidum*, Forst., as no specimens of that species are preserved in the Colony. Since publishing that description I have forwarded specimens to the Director, Royal Gardens, Kew, England, who very kindly compared them with Forster's original and writes me as follows:—"Forster's specimen has *smaller, entire leaves, much less acuminate*, and with slightly longer petioles. The flowers of Mr. Baker's specimens appear to be typical. A specimen collected by Mr. Webb in New Caledonia has toothed leaves, but the teeth are much smaller than in Mr. Baker's plant, and in other respects they agree with the type."

As it is on the differences in leaf-characters that the known species of this genus are founded, and the material collected at Nullum Mountain differs from both *A. Lejourdani*, F.v.M., and *A. nitidum*, Forst., it is here proposed to carry out the suggestion in my former paper (*loc. cit.*) and designate the New South Wales plant as *A. Nullumense*.

MYRTACEÆ.

Callistemon coccineus, *F.v.M.*—This species extends from the South Australian border to almost the coast, having been collected at Dinner Creek, Clyde Road, Braidwood (W. Bäuerlen).

Eucalyptus spp.

The following localities are of interest in regard to the respective species:—

E. Bosistoana, *F.v.M.*—Barber's Creek (H.R.).

E. lævopinea, var. minor, *R.T.B.*—Between Sutton Forest and Berrima Coal Mine. Additional evidence points to this being a new species. Since it was recorded (P.L.S.N.S.W. 1898, p. 416) it appears now to be identical with the tree which the late Baron von Mueller regarded as a Stringybark form of *E. hæmastoma* (*Eucalyptographia*, Dec. ii.). The botanical and chemical evidence show very clearly that the two are quite distinct.

E. PALUDOSA, *R.T.B.*—Bundanoon (T. Steel).

E. MAIDENI, *F.v.M.*—Barber's Creek (H.R.).

E. AMYGDALINA, *Labill.*—Bundanoon (T. Steel).

E. OBLIQUA, *L'Her.*—Bundanoon (T. Steel).

E. FASTIGATA, *H.D. et J.H.M.*—("Cut-Tail.") This species, which is easily identified by its fissile timber and pear-shaped fruits, probably occurs on the coast range from the Victorian to the Queensland border.

E. TERMINALIS, *F.v.M.*—Angledool (A. Paddison), Cobar (H. Cambage).

E. BRIDGESIANA, *R.T.B.*—Goulburn (A. J. Sach), Bathurst, slopes of Bald Hills (W. J. C. Ross, B.Sc.).

E. PULVERULENTA, *Sims.*—Fairly plentiful about Barber's Creek, but beyond Marulan there are hundreds of acres of it.

LORANTHACEÆ.

VISCUM ARTICULATUM, *Burm.*—Yaloroi in the Warialda-Goondiwindi district, "growing on several kinds of scrub" (Mr. D. A. Porter). Recorded also from Narrabri (P.L.S.N.S.W. 1897, p. 254).

COMPOSITÆ.

*CONYZA ÆGYPTIACA, *Ait.*—Murwillumbah (W. Bäuerlen). The plant has toothed leaves like the Egyptian plant referred to by Bentham (*B.Fl.* Vol. iii. p. 497).

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* Species marked with an asterisk have not previously been recorded from New South Wales.

Calocephalus citreus, *Less.*—Bungendore, Lake George (W. Bäuerlen). Previously recorded from west of the Dividing Range.

SAPOTACEÆ.

*Achras Pohlmaniana, *F.v.M.*—Tumbulgum (W. Bäuerlen). Bentham describes it as a shrub, but W. Bäuerlen's measurements give the trees as about 60 feet high and 12 inches in diameter. The wood is softer and whiter than that of the other species.

EBENACEÆ.

*Maba seriocarpa, *F.v.M.*—The description of this plant in Bentham's *Flora Australiensis* (Vol. iv. p. 389) is lacking in one or two essential characters which were wanting in the material examined. These I now add:—Female flowers solitary in the axils of the leaves. Calyx 1½ lines long, silky villous with a pair of ovate brown bracts at the base. Corolla 2 lines long, tube glabrous, shorter than the calyx, lobes silky hairy on the back. Ovary 1 line long, covered with minute silky hairs. Fruit under six lines in diameter, sprinkled with silky appressed hairs. Bentham records the calyx lobes "nearly as long as the berry," but this is not so in my material, but only ¼ the length of the fruit.

The male flowers are also shorter than described *(loc. cit.)*, the calyx measuring one line and the corolla two, lobes obtuse, short.

The general aspect of the plant would lead one to name it at once as *M. hemicycloides*, F.v.M., and the calyx, fruit and leaves agree with that species, but it differs from it and *M. laxiflora*, Benth., in being "silky-pubescent with rust-coloured hairs," which feature and the appressed hairs of the leaves preclude one from removing it from *M. seriocarpa*, F.v.M. My own opinion is that *M. seriocarpa*, F.v.M., *M. hemicycloides*, F.v.M., and *M. laxiflora*, Benth., are all one and the same species. The long

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* Species marked with an asterisk have not previously been recorded from New South Wales.

lobes of the female calyx, above referred to, may be perhaps a typographical error.

Tumbulgum (W. Bäuerlen).

APOCYNEÆ.

Lyonsia lilacina, *F.v.M.*—Judging from specimens obtained by W. Bäuerlen at Lismore, there appears to be in that locality a form of this species differing from Bentham's description (*B.Fl.* iv. p. 321).

The leaves are strongly reticulate and shining above, and the flowers are all in *axillary cymes*, and the corolla-tube and lobes pubescent inside only; the calyx-lobes are also spreading, as in *L. induplicata*, F.v.M.

Fruit terete before dehiscing, about 2 to 3 lines in diameter and 5 to 6 inches long.

Lyonsia induplicata, *F.v.M.*—Mr. J. H. Maiden has collected this species as far south as Robbinsville, near Bulli. The fruit, not previously recorded, is shorter than that of *L. lilacina*, F.v.M., and is flattish and very acuminate.

Omalanthus stillingiæfolius, *Baill.*—As far as I am aware, this species is only recorded from the northern rivers, but I find it occurs near the top of the Sugar Loaf Mountain, Braidwood (W. Bäuerlen), associated with *Eriostemon Coxii*, F.v.M , *Hakea MacRaeana*, F.v.M., and *Eucalyptus Bäuerleni*. It is mostly found in the crevices of the rocks.

SOLANEÆ.

Solanum parvifolium, *R.Br.*—Angledool, N.S.W. (in flower and fruit in March, 1898; Mr. A. Paddison).

BIGNONIACEÆ.

Tecoma Baileyana, *J.H.M. et R.T.B.*—Tumbulgum, under exactly the same conditions as at Mullumbimby, *i.e*, on steep banks of creeks (W. Bäuerlen).

POLYGONACEÆ.

Rumex dumosus, *A. Cunn.*—On the eastern slope of the main Divide at Murwillumbah (W. Bäuerlen).

LAURINEÆ.

Cinnamomum Oliveri, *Bail.*—Bexhill, Alstonville, and Tintenbar, in the Richmond River District; most plentiful at Bexhill, and at Murwillumbah and Tumbulgum on the Tweed, also at Mullumbimby on the Brunswick; more plentiful about Mullumbimby and Murwillumbah than anywhere else (W. Bäuerlen).

PROTEACEÆ.

Grevillea floribunda, *R.Br.*—Gerogery (J. Mann). This is its most southerly recorded locality.

Grevillea Hilliana, *F.v.M.*—Mr. Bäuerlen reports that this tree grows to a great height at North Tumbulgum, some trees measuring 100 feet in height and 2 feet in diameter.

Grevillea juniperina, *R.Br.*—This species extends as far south as Monga, Clyde Road, Braidwood ; and both red and yellow flowers are found on the same plant at Mongarlowe (Braidwood) where the species is plentiful on the banks of the Little River (W. Bäuerlen).

Banksia serrata, *L.*—Occurs as far west as Cadia, Orange (W. Wallace).

EUPHORBIACEÆ.

*Excæcaria Dallachyana, *Baill.*—H. E. Baillon regarded this plant as a variety of *E. Agallocha*, Linn., but Bentham *(B.Fl.* Vol. vi. p. 153) although placing it as a species, also expresses a doubt whether it is not rather a variety of that species.

From the quantity of material collected at Tumbulgum and Ballina by W. Bäuerlen of both plants respectively, the two appear to be quite distinct. Bentham states *(loc. cit.)* that the flowers, both male and female, are apparently the same as in *E. Agallocha.* This does not hold with the specimens from Tumbulgum, for the male spikes of *E. Dallachyana*, Baill., are much shorter as well as more slender, being rarely over 9 lines long, whilst those of *E. Agallocha* are sometimes as much as ·5 inch long. The fruits, however, are nearly 5 lines in diameter.

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* Species marked with an asterisk have not previously been recorded from New South Wales.

URTICEÆ.

Ficus Cunninghamii, *Miq.*—Richmond River (W. Bäuerlen). The receptacles of this species are not "solitary or two together" as stated by Bentham (*B.Fl.* vi. 165) but often in clusters at the base of the petioles.

CONIFERÆ.

Callitris Muelleri, *Parl.*—Carlton, near National Park, Sydney (Mr. Clark). Not recorded south of Port Jackson previously. It also occurs on the Blue Mountains at King's Tableland (W. Bäuerlen).

Callitris calcarata, *R.Br.*—Murrumbo, on the Goulburn River (R.T.B.). This species is not confined to the country west of the main divide as previously supposed.

ORCHIDEÆ.

Spiranthes australis, *Rich.*—Centennial Park, Sydney (Miss S. Hynes, B.A.). In flower in February and March.

Pterostylis pedunculata, *R.Br.*—North Tumbulgum, previously recorded from the Blue Mountains (flowering in September; W. Bäuerlen). My specimen differs somewhat from Fitzgerald's figure of the species; the labellum is differently shaped, and also the wings of the column, and their points do not cross each other; the penicillate appendage at the base of the labellum appears also to be smaller.

DIOSCORIDEÆ.

Petermannia cirrosa, *F.v.M.*—Tumbulgum and Bellambil Creek (W. Bäuerlen), its range thus extending to the Queensland border. The plant from this locality has many more prickles on it than the Clarence River plant, and the fruits measure 5 lines in diameter; Bentham gives 3 lines. In fruit in July.

PANDANACEÆ.

Freycinetia excelsa, *F.v.M.*—This species, first recorded from N.S.W. by me (P.L.S.N.S.W. 1897, p. 236) from the watershed of the Tweed River, occurs also on the northern watershed of the Brunswick River, where it grows in great masses covering steep banks of creeks, as well as ascending trees (W. Bäuerlen).

FILICES.

Hymenophyllum bivalve, *Swartz.*—This species was originally recorded for this Colony by Baron von Mueller in S. Sc. Rec. June, 1883, as occurring at Brogher's Creek, Shoalhaven (W. Bäuerlen). It is, however, omitted from Moore and Betche's Handbook of the Flora of N.S.W.

Pteris falcata, *R.Br.*, var. nana, *Bail.*—Plentiful on the Tweed, Brunswick and Richmond Rivers, extending as far south as the Cambewarra Mountain, Shoalhaven (W. Bäuerlen, 1884).

MUSCI.

Neckera Baeuerleni, *Solms-Laubache.*—Tingiringi Mountain, Delegate District (W. Bäuerlen, 1888).

Raphidostegium Tingiringense, *Geheeb.*—Mt. Tingiringi (W. Bäuerlen).

Catherinea (Atrichum) leptocylindrica, *C. Müller.*—Delegate River (W. Bäuerlen, 1885).

Polytrichium recurvipilis, *C. Müller.*—Braidwood District, 3,400 feet elevation (W. Bäuerlen, 1884).

Bryum (Eubrya) Baeuerleni, *C. Müller.*—Clyde River (W. Bäuerlen, October, 1884).

Bryum (Rhodobryum) subolivaceum, *C. Müller.*—Clyde River (W. Bäuerlen, October, 1884); Richmond River (Rev. W. W. Watts, 1898).

HEPATICÆ.

Brachylejeunea plagiochiloides, *Stephani et Bruce.*—Clyde River (W. Bäuerlen, 1884).

Trachylejeunea elegantissima, *Stephani.*—Clyde District (W. Bäuerlen, 1884). Stephani notes:—"This is undoubtedly the most splendid of all the Lejeuneas known to me. The thickened, strongly refracting cell-wall of the hyaline and rounded off papillæ causes the whole plant by transmitted light to be strewn over with numberless luminous points."

LEPTOLEJEUNEA ROSULANS, *Stephani*.—Clyde District (W. Bäuerlen, 1884).

LICHENES.

PARMELIELLA BAEUERLENII, .—Brogher's Creek, Shoalhaven (W. Bäuerlen, 1884).

FUNGI.

*AGARICUS VERNUS, *Bull.*—John's River, Taree (Mr. E. T. T. Rootes).

*AGARICUS OLIVACEO-ALBUS, *Cke. & Mass.*—Kogarah, near Sydney (Mr. J. L. Bruce).

AGARICUS (PLEUROTUS) CANDESCENS, *Müll.*—This phosphorescent fungus, occurring on dead wood, is extensively known throughout N.S.W., and yet it appears never to have been recorded for this Colony.

*RUSSULA AUSTRALIENSIS, *Cke. & Mass.*—Mount Kembla (Mr. A. G. Hamilton); Katoomba (Mr. T. Steel).

LENTINUS FASCIATUS, *Berk.*—John's River, Taree (Mr. E. T. T. Rootes).

*BOLETUS LACUNOSUS. *Cke. & Mass.*—Woodford, Blue Mts. (W. Bäuerlen).

BOLETUS BOVINUS, *Fr.*—Dobroyde, Sydney (R.T.B.) Pileus 10 c.m. broad, brown, shining or viscid above, dark yellow underneath, stems inclined to excentric. Edible.

*STROBILOMYCES VELUTIPES, *Cke. & Mass.*—Katoomba (Mr. T. Steel).

*POLYPORUS OVINUS, *Fr.*—Belmore, near Sydney; on the ground. (R.T.B.)

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* Species marked with an asterisk have not previously been recorded from New South Wales.

*Polyporus Hartmanni, *Cke.*—Hornsby, near Sydney; on the ground (R.T.B.). Only previously recorded from Queensland.

Polyporus eucalyptorum, *Fr.*—Gerogery; on "Brown Stringy-bark," *E. capitellata*, Sm. (J. Manns).

*Fomes lucidus, *Fr.*—Tumbulgum (W. Bäuerlen). Can be identified with little difficulty from Cooke's description in *Aust. Fungi*, p. 128.

Polystictus xanthopus, *Fr.*—Tumbulgum; on decaying logs (W. Bäuerlen).

*Stereum bicolor, *Fr.*—Belmore, near Sydney, on dead burnt timber; one side is generally attached to the host; it has a gregarious habit and apparently grows in terraces (R. T. Baker). This species is new for Australia.

*Hymenochæte cacao, *Berk.*—Tamworth, on dead wood (Mr. D. A. Porter).

Corticium cœruleum, *Fries.*—Kogarah (Mr. J. L. Bruce).

Hirneola polytricha, *Mont.*—Manly, on decaying trunks of *Ficus rubiginosa* (R.T.B.); Bellumbil Creek, on decaying logs (W. Bäuerlen). This fungus is the "Mu-esh" of Central China.

*Peziza vesiculosa, *Bull.* "Bladdery Peziza."—Strathfield, near Sydney, growing on dung (Mr. Walter Lewis).

*Melampsora nesodaphnes, *B. & Br.*—This minute fungus (although wrongly matched as regards its host) occurs on the fruits of *Cinnamomum Oliveri*, Bail., as far south as Port Macquarie.

*Æcidium violæ, *Schum.*—Monga, on the leaves of the native violet, *Viola betonicæfolia*, Sm., (W. Bäuerlen). Previously recorded only from Victoria.

*Oidium Tuckeri, *B.*—Lake Cowal, Marsden; on vine leaves (Miss Allen).

*Physarum rufibasis, *B. & Br.*—Tamworth (Mr. D. A. Porter).

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* Species marked with an asterisk have not previously been recorded from New South Wales.

OBSERVATIONS ON THE EUCALYPTS OF NEW SOUTH WALES.

Part V.

By Henry Deane, M.A., F.L.S., and J. H. Maiden, F.L.S.

(Plates xxxvii.-xlii.)

E. Macarthuri, sp.nov.—**The Camden Woolly-butt.**

(Plate xxxviii.)

The history of this interesting species is as follows:—Sir William Macarthur collected its timber for the Paris Exhibition of 1855, it bearing the number 142 of the indigenous woods of the southern district he was commissioned to procure for this Exhibition. Under the name of "Wooly Gum of Argyle," he described it as follows: "A species of picturesque growth, confined to a limited extent of country; wood not esteemed, reputed to possess little comparative strength or durability. Height, 40-80 feet; diameter, 36-48 inches."

The identical specimen was sent by Sir William to the London Exhibition of 1862, this time under the name of "Woolly Gum of Berrima," and it was described as "a tree of beautiful form, but the timber weak and worthless."

In the year 1864 Miss Atkinson (afterward Mrs. Calvert) collected it, and following is a copy of her label:—"Bark fibrous, Woolly Gum, Berrima Large round tree, very hard wood, but not used, as it does not split well."

Her original specimens are in the National Herbarium of Victoria, and were seen by Bentham, who referred them to *E. viminalis*. See also *B.Fl.* iii. 240, where this species is referred to as "Camden Woolly Butt, Woolls."

Probably both Miss Atkinson and Dr. Woolls collected specimens, and the following passage was written soon after the arrival of the 3rd volume of the *Flora Australiensis* in the Colony:—

"*E. diversifolia.*—I have ventured to separate the 'Camden Woolly-butt' from the 'Manna Gum' *(E. viminalis)*, with which it has been associated, because the trees differ so much from each other in bark, habit, &c. The Camden Woolly-butt resembles in some respects the Woolly-butt of other districts, having the lower part of the tree covered with fibrous bark and the upper branches smooth. The inflorescence, however, and the leaves are very different, being sometimes narrow-lanceolate and alternate, and sometimes cordate or ovate-acuminate, sessile and opposite. The buds and seed-vessels are small, generally eight in each axillary or lateral umbel. This species is common in the neighbourhood of Berrima, and attains the height of 80 feet, but beautiful as the form of the tree is, the wood is said to be indifferent."—Woolls' *Contribution to the Flora of Australia*, p. 235 (1867).

And again:—"*E. diversifolia*, which, in the *Flora*, is regarded as one of the forms of *E. viminalis*, is certainly a distinct species, and called 'Camden Woolly Butt.' The lower part of the tree is fibrous, and the leaves differ from narrow lanceolate and alternate to cordate, sessile and opposite."—Woolls' *Lectures on the Vegetable Kingdom*, p. 120 (1879).

It will thus be seen that Woolls did not agree with Bentham in placing the "Camden Woolly-butt" under *E. viminalis*, and he himself placed it under *E. diversifolia.* Woolls did this probably because he thought that the reference in *B.Fl.* iii. 240 to *E. diversifolia* was intended for the "Camden Woolly-butt," but it is not Bonpland's species, Mueller *(Eucalyptographia,* under *E. viminalis)*, having shown that the plate in Pl. de Malmaison, 35, t. 13, represents a young state of *E. santalifolia.*

In 1885 Dr. Woolls *(Plants of New South Wales*, p. 55), departed from the opinion he had so long held as to the claim of the "Camden Woolly-butt" to be a distinct species, and looked upon it as a form of *E. Stuartiana*, a statement which could only have been made without due consideration.

"*E. Stuartiana* has a wide range in New South Wales, being found on the Mittagong Range, the hills near Mudgee, and parts of New England. The bark is fibrous and persistent, and it is known by the popular names "Camden Woolly-butt," "Peppermint," or "Stringybark." On young trees the leaves are frequently opposite. It occurs on the Mittagong Range in company with *E. amygdalina*, and rises to the height of 100 feet."—(*Op. cit.*)

A specimen of "Mudgee Peppermint," so labelled by Dr. Woolls, is *E. Stuartiana*, and is not identical with "Camden Woolly-butt" as surmised by him on the label. This confusion of the two trees probably arose from the mixing of herbarium specimens Peppermint is a bad name to apply to this tree, and doubtless arose simply from contemplation of its fibrous bark, which somewhat resembles that of some species known as "Peppermint." The leaves of the "Camden Woolly-butt" emit no odour of peppermint.

We name this species in honour of the late Sir William Macarthur, of Camden Park, who appears to have been the first to recognise this particular Woolly-butt as a distinct tree, while he was certainly one of the pioneers in the difficult task of diffusing accurate information in regard to the Eucalypts of New South Wales.

Vernacular name.—"Camden Woolly-butt," after the county of Camden, New South Wales; it has, however, been found in the county of Argyle also; in fact it was originally called "Woolly Gum of Argyle." The name "Woolly-butt" or "Woolly Gum" is in reference to the texture of the bark and sap wood. It is not to be confused with the common Woolly-butt of the Sydney district (*E. longifolia*), the Woolly-butt of the South Coast (*E. saligna*), or that of the North Coast (*Tristania conferta*).

Bark.—Rough, somewhat box-like, but very woolly. The sap-wood also of a woolly texture.

Timber.—Pale coloured, nearly white. Not a favourite locally as it does not split well and is not durable. Additional notes on the reputed value of this timber have already been given.

Seedling leaves.—Linear-lanceolate, slightly cordate, barely stem-clasping, strictly opposite.

Sucker leaves.—Cordate or ovate-acuminate, stem-clasping, sessile and opposite. Bright green in colour; of similar tint on both sides.

Mature leaves.—Alternate, narrow, lanceolate, often falcate, thickish, of equal colour on both sides. Venation not prominent; intra-marginal vein at some distance from edge; veins not springing from the base, pinnate.

Buds.—Small, the operculum and calyx of approximately equal size, the former but very slightly conical; shining; up to eight in the head but perhaps five on the average. Umbels axillary, with short scarcely flattened stalks, and stalklets absent or nearly so.

Anthers.—Small, ovoid in shape, opening in longitudinal slits; inflexed in bud; apparently all fertile. Stigma slightly dilated, having the appearance of being flattened on top.

Fruits.—Very small, much smaller than that of *E. Stuartiana.* Nearly hemispherical, slightly dilated at the rim, which is well defined; valves usually three but rarely four, scarcely exserted. Seeds small, without any appendage.

Range.—Confined to the counties of Camden and Argyle, N.S.W., as far as known at present.

Prefers swampy or low-lying land, or to follow the course of a stream.

Affinities.—Bentham indicates its affinity to *E. viminalis*, but except in the suckers and mature leaves the affinity does not appear to be marked. Its narrow sucker leaves and small fruits should prevent its confusion with *E. Stuartiana.* The sucker leaves sharply separate it from *E. acaciæformis.*

E. QUADRANGULATA, sp.nov.

(Plate xxxix.)

A tree of 80-100 feet and diameter of 2·4 feet.

Bark.—Very much resembles that of ordinary Box (*E. hemiphloia*) in general appearance, but bark more fuzzy and less soft than the latter; the timber also lighter in colour. The branches have smooth tips.

Timber.—Pale, not brown when fresh like *E. hemiphloia,* inlocked, very tough, evidently an excellent timber. The rougher bark falls off in patches, leaving box-like but less rough patches underneath. Again, these less-rough patches become darker and more rough, and this process is repeated *ad infinitum.*

Kino.—On a tree being cut into a pocket of kino of a treacly consistency and colour exuded, which in a few hours dried into a hard, dark brown mass, which broke with a bright fracture. It is all but insoluble in alcohol and soluble in water, forming a rich tawny solution with deposition of gum on addition of alcohol, and thus belongs to Maiden's gummy group of kinos.

Sucker leaves.—Narrow-lanceolate, cordate and clasping at the base, strictly opposite, markedly paler on the under surface.

The sucker foliage of *E. goniocalyx* presents considerable similarity to that of *E. quadrangulata,* differing chiefly in the greater breadth and shorter length of the former.

The sucker stems are brown (commonly chocolate-brown) and usually square in section. Not only is the young stem quadrangulate, but it is even winged, and this is so marked a character that the name *alata* would probably have been chosen had this name not been preoccupied.

Other instances of quadrangular stems in Eucalyptus are :—

E. tereticornis (apparently not common), *E. globulus*, and *E. Maideni.*

The *E. elata* of Dehnhardt has also quadrangular stems. It has been placed under *E. viminalis* by Bentham, but that is an obvious error, and its position must remain in doubt until adequate material be available. Mueller (*Eucalyptographia*) suggests *E. amygdalina*, with which we also cannot concur.

Mature leaves.—Branchlets angular, lanceolate or narrow-lanceolate, slightly falcate, usually 4 to 6 inches long, scarcely paler on the under surface.

The margin usually sinuate, jagged or remotely denticulate. Venation conspicuous on both sides, the intra-marginal vein conspicuously removed from the edge, the lateral veins spreading. The texture of leaf thickish, hence the oil-dots, which are fairly numerous, are not prominent.

Buds.—Umbels axillary, consisting usually of 4 to 8 in the head, not dull; sessile, the common stalk being broadish and strongly compressed. The calyces sub-conical and exceeding the operculum, which is conoid, the calyces sometimes angular.

Stamens all fertile, inflexed in bud, opening with longitudinal, almost parallel slits.

Fruits.—Small, shining, bell-shaped, rim medium, the valves slightly exserted, and usually three in number. The seeds small, without membranous expansion.

E. quadrangulata presents points of similarity to *E. saligna*, *E. goniocalyx*, and *E. Macarthuri*.

It shows affinity to *E. saligna* in its kino (it is a member of Maiden's Gummy group). In the occasional angularity of its buds and in the general shape of the fruits, there is some approach to *E. saligna*, but the buds of the latter are more pointed, the fruits more cylindrical and the rim more sunk, while the venation of the leaves and the texture of the bark show that the species are very different.

We have already alluded to the similarity of *E. quadrangulata* and *E. goniocalyx* as regards sucker-foliage. The similarity of the mature foliage of the two species is unmistakable and extends even to the margins; very large leaves have not, however, yet been found in *E. quadrangulata*. The shape of the fruits is, however, quite different, while *E. quadrangulata* is a Box and *E. goniocalyx* a Ribbony Gum.

E. quadrangulata possesses no close affinity to the common Box (*E. hemiphloia*).

The sucker foliage of *E. Macarthuri* is sufficiently distinct from that of *E. quadrangulata*, nor are the stems of the former angular. The mature foliage of the two species is not dissimilar. The fruits of *E. Macarthuri* are rather smaller and the valves less exserted. Both species have fibrous barks, but one belongs to what is known as the Box group of barks, and the other to the Woolly-butt group; the timbers also are very different.

Range.—This species has a very limited range, so far as is known at present, having been found only in the neighbourhood of Hill Top, about 70 miles south of Sydney.

E. ACACIÆFORMIS, sp.nov.

(Plate xxxvii.)

A large, rather umbrageous tree, attaining several feet in trunk diameter (Mr. A. R. Crawford says "over 6 feet").

Vernacular names.—This is recognised as a "Peppermint" in New England, and sometimes, by way of distinction, "Black," or "Narrow-leaved Peppermint." The term "black" is in allusion to the dark colour of the bark as compared with that of *E. Stuartiana.*

It is the Eucalypt No. 3 of p. 542, Vol. vii, *Proc. Aust. Assoc. Adv. Science* ("Some Eucalypts of the New England Table-land," by J. H. Maiden).

Bark.—Sub-fibrous, resembling that of *E. piperita* a good deal. "Sometimes very rough and furrowed, almost like an Iron-bark."—(A. R. Crawford, *in litt.*)

Timber.—Pale reddish.

Seedling leaves.—Narrower than the suckers, but otherwise very similar. They are strictly opposite.

Sucker leaves.—Pale coloured, lanceolate, symmetrical, always blunt at the apex which is somewhat rounded. The margin is crenulate, a very unusual circumstance in a Eucalypt; and the leaves are alternate, and not opposite as is the case of normal *Stuartiana.* The average size of the young leaves is $1\frac{3}{4} \times \frac{5}{8}$ in.

Mature leaves.—Lanceolate, the average size of the leaves being $2\frac{3}{4} \times \frac{1}{2}$ in. The foliage is not glaucous in any part, not even the sucker foliage. Margins often crenulate. Equally green on both sides. The intra-marginal vein distinctly removed from the edge; the transverse veins fine, nearly parallel, and at about an angle of 45° with the midrib.

Buds.—Commonly up to 6 or 7 in the head; stalklets short and angular; stalks usually 4 or 5 lines long, very angular or flattened. Operculum a little pointed; about equal in size to the calyx; style short and the stigma dilated somewhat. The anthers opening in parallel slits.

Fruit.—Small, with short stalklets; the stalks of about twice the length, roundish, being only slightly compressed. The valves scarcely exserted, and usually only three. Shape of fruit rather more cylindrical than hemispherical, $\frac{3}{16}$ broad × $\frac{7}{32}$ inch long. Rim of medium width and nearly horizontal.

Range.—Confined to New England as far as observed at present. Common between Yarrowitch and Walcha; also near Moona Plains. Occurs also near Glen Innes and (sparingly so far as observed) in the Tenterfield district, *e.g.*, near Mount Spiraby, east of Bolivia.

Eucalyptus acaciæformis, var. linearis, var. nov.

The Eucalypt referred to as No. 4 at p. 542, Vol. vii., *Proc. Aust. Assoc. Adv. Science.*

A singularly graceful tree, reminding one of a Weeping Willow. Height about 50 feet and trunk diameter 2 feet, as far as seen.

The twigs are slender, a characteristic of the tree being the smallness and the grace of its parts.

Vernacular names.—A "Peppermint" or "Narrow-leaved Peppermint." "Grey Peppermint" (H.D.).

Bark and *timber* similar to preceding

Sucker foliage.—Has crenulated margins like the preceding, but longer, narrower, and more pointed leaves. Some of the very young foliage is linear-lanceolate and even linear.

A good deal of the young foliage reminds one superficially of that of the Wilga *(Geijera parviflora).*

Alternate, not opposite like *E. Stuartiana.*

Mature foliage.—Linear-lanceolate or lanceolate, the average dimensions being, say, 5 × $\frac{3}{8}$ in.

Fruits.—Smaller than the preceding, reminding one of those of *E. microtheca*, but the calyx less hemispherical. Valves well exserted. Pedicels on the average as long as the fruits; the common peduncle also much longer than that of either of the preceding forms.

Range.—New England (Walcha and Glen Innes districts).

E. RUBIDA, sp.nov.—"**Candle-bark.**"

(Plate xl.)

Vernacular names.—Known as "Flooded Gum" at Queanbeyan, Michelago, Cooma; sometimes known as "Bastard White Gum," "Ribbony Gum," and "Drooping Gum." The name "Candle-bark" in use in the Queanbeyan district is in reference to its smooth and glaucous trunk; it is very descriptive of the tree as seen in much of its range and might be adopted for the vernacular, as the others are already appropriated. It has usually reddish or plum-coloured patches on the bark, hence the occasional name of "Spotted Gum." Sometimes the bark is, however, of a yellowish cast (the tips of the twigs being also yellowish) and hence, between Goulburn and Moss Vale, it is one of the trees known in the district as "Yellow Gum." We have also noticed the species to have a yellowish bark between Delegate and Bombala while a label in the National Herbarium, Melbourne, shows that the species at St. Vincent's Gulf, S.A., is also known as "Yellow Gum."

Bark.—Perfectly smooth for the most part, the outer layer of bark falling off in ribbons. The "bole and limbs very white, as if whitewashed" (A. W. Howitt, referring to Gippsland trees). The name "Candle-bark" is also excellently descriptive of the appearance of the bark in the most southern parts of this Colony and in north-eastern Victoria.

It frequently exhibits reddish or plum-coloured patches (hence the specific name); this is a colour rarely, if ever, seen in *E. viminalis*. Sometimes (*e.g.*, Adaminaby to Cooma) the colour of the bark, especially of the branches, may be described as pale pink. We have already referred to the yellowish cast of the bark in widely different localities.

In the case of a species having such an extended range, it is not surprising that the bark shows some variation. For example, the trees about Sunny Corner show perhaps a rougher (more flaky) bark at the butt than is usual in many other localities, but neither here nor anywhere else is such rough bark ever of a fibrous character.

Under *E. Stuartiana*, in the *Eucalyptographia*, the following remarks occur:—"It is possible that in this species a smooth-barked variety occurs, as would appear exceptionally to be the case, according to the notes of several collectors." We do not doubt that *E. rubida* is here referred to, and the reasonableness of the confusion with *E. Stuartiana* is referred to below.

Timber.—Red worthless timber; dries paler.

Sucker leaves.—From nearly orbicular to nearly oblong, often emarginate or retuse, eventually taking on a lanceolate shape. The midrib usually terminating in a short and fine point. Strictly opposite; sometimes stem-clasping and even more or less connate. Very glaucous as a general rule.

Mature leaves.—Dull green; of similar tint on both sides; narrow lanceolate, of thickish texture and hence largely concealing the oil-dots, the intramarginal vein scarcely removed from the edge, the primary veins roughly transverse. Often glaucous, sometimes very much so. Spherical brachyscelid galls are sometimes found on the leaves.

Buds.—Ovoid, axillary; in threes and cruciform; sessile or with very short stalklets; the stalks commonly under $\frac{1}{4}$ inch long, round, rarely flattened, and then only towards the insertion of the buds.

Operculum.—Nearly hemispherical when ripe, hardly pointed; rather shorter than the calyx; conoid when less ripe.

Stamens all fertile and inflected in the bud, anthers ovate-oblong, with parallel distinct cells.

Fruit.—Top-shaped; spreading at the orifice. Usually about 3 lines in diameter. Sometimes nearly hemispherical. Shiny or glaucous. The rim broadish and convex. Valves three or four and exserted.

Affinities.—It has been variously looked upon as a broad-suckered form of *E. viminalis*, or a smooth-barked form of *E. Stuartiana*, while its affinity to *E. Gunnii* though less strong is still obvious. We will give a few notes in regard to these three species.

It resembles *E. viminalis* in its drooping foliage, flowers in threes, and smooth bark. It is Howitt's *viminalis* (*b*). See "Eucalypts of Gippsland," p. 97, to which excellent account of the tree the student should turn, its affinities to *E. viminalis* and *E. Stuartiana* being there clearly indicated. It sharply differs from *E. viminalis* in its broad glaucous suckers.

It shows obvious affinity to *E. Stuartiana* in its broad suckers; its most obvious differences lie in its smooth bark and thinner leaves.

Its most obvious similarity to *E. Gunnii* lies in the fact that it is a smooth-barked Gum with broadish sucker leaves; it may at once be distinguished from that species by the flowers in threes (a constant character of *E. rubida* as far as known), less ovate sucker leaves and uniformly narrower mature foliage.

"*E. Gunnii*, Miq., in *Ned. Kruidk. Arch.* iv. 126 (not of Hook. f.) from Streleczky Range, Victoria, appears to be *E. viminalis*" (*B.Fl.* iii. 240) is probably *E. rubida*.

Range.—The mountain ranges in the south and south-eastern portions of the Colony. Occurs on the lower slopes of the Mt. Kosciusko ranges up to about 5000 feet. Common about Jindabyne, Adaminaby, Delegate to Bombala and Cooma, Michelago, Queanbeyan; northerly nearly as far as Moss Vale; westerly as far as Sunny Corner and the tributaries of the Turon. Extends also to Victoria and South Australia (St. Vincent's Gulf).

Its name of "Flooded Gum" of course indicates the low-lying localities in which it is found, but it is by no means restricted to such situations, occurring in well drained, hilly situations in the southern and western mountain ranges.

Miscellaneous Notes (including descriptions of new varieties).

i. RENANTHERÆ.

E. REGNANS, F.v.M., and E. FASTIGATA, D. & M.

The giant tree of Victoria was not formally described in the first instance. Under *E. amygdalina*, Baron von Mueller first refers to a tree which attains a height of over 400 feet, with "a smooth stem and broad leaves." . . . . "this species or variety which might be called *Eucalyptus regnans*. . . . ." (*Rep. Acclim. Soc. Vict.* 1870, p. 48).

The statement as to "smooth stem and broad leaves" is repeated at p. 114 of his *Select Extra-tropical Plants*, N.S.W. Edition (1881), it being contrasted with *E. amygdalina*, "which has small narrow leaves and a rough brownish bark."

At p. 236 of the *Key to the System of Victorian Plants*, Mueller first botanically defines *E. regnans*. He says: "bark outside whitish and smooth, except at the stem-base," and calls it "Giant Gum-tree" and "Spurious Blackbutt."

Our *E. fastigata* (Proc. Linn. Soc. 1896, p. 809) is a tree with a fibrous bark, not to be distinguished, in this respect, from *E. obliqua* except in the smooth branchlets of the former. Mueller described his *regnans* as a smooth-barked tree; the fruit of our *fastigata* (from Mt. Tantawanglo) is smaller than that of *E. regnans*, and there are other differences, of more or less value, which caused us to look upon our tree as new to science.

We have since studied the distribution of *E. fastigata* and find that it is very widely diffused in New South Wales. Following are some localities:—

Northern District.—New England.

Southern District.—Most mountain ranges, extending at least as far north as near Moss Vale.

Western District.—Jenolan Caves, Mt. Tomah (where it is a giant tree), Tarana ("Messmate"), Burraga ("Blackbutt"), Cowra ("Red Blackbutt"). Hence it occurs in most of the high mountainous districts of the Colony.

Contemplation of these specimens (for the most part collected by ourselves) and inspection of *E. regnans* as it grows in Victoria incline us to the opinion that our *E. fastigata* may not be specifically different from *E. regnans*. Mueller's description of his species would require to be modified in the specially important matter (in the case of a Eucalypt) of the bark, while the size of the fruit and other minor matters in which the published descriptions of *E. regnans* and *E. fastigata* do not agree, may not present insuperable obstacles to the fusion of the two species.

An excellent account of *E. regnans* is given by Howitt in his *Eucalypts of Gippsland* (*Trans. Roy. Soc. Vic.* ii. 87), and he observes that it goes under the name of "Blackbutt" in Victoria.

E. AMYGDALINA, Labill., var. NITIDA, Benth. (*B.Fl.* iii. 203).

We have specimens from Jenolan Caves, N.S.W., which closely resemble Hooker's *E. nitida* as figured in *Fl. Tas.*, and may be arranged under Bentham's variety.

E. DIVES, Schauer.

(Syn. *E. amygdalina*, Labill., var. *latifolia*, Deane & Maiden, Proc. Linn. Soc., (2) x. 609, with figure.)

See also Woolls' *Flora of Australia*, p. 241, except as regards height of this species, which, while it flowers as a shrub, attains the size of a medium-sized tree.

Common on the southern and western spurs of the Great Dividing Range.

E. MUELLERIANA, Howitt.

Trans. Roy. Soc. Vict. Vol. ii. 89 (with figs. 11 and 12), is, in our opinion, identical with *E. dextropinea*, R. T. Baker, *Proc. Linn. Soc. N.S.W.* 1898, 417.

In the Goulburn district it is known as "White Mahogany," but it is not to be confused with *E. acmenoides*. Its branches are rough to the top, affording a ready distinction between it and *E. pilularis*. The bark is very yellow when freshly cut, also the timber, hence its Gippsland name of "Yellow Stringybark." The timber is valued for building purposes, being used for flooring, and weatherboards, &c. It occurs in many places in the coast mountain ranges, both north and south.

E. SIDEROPHLOIA, Benth., var., GLAUCA var.nov.

This is the glaucous interior form of the species, which goes under the names of "Blue-leaf Ironbark" (in allusion to its glaucous foliage) and "Broad-leaf Ironbark," in allusion to its broad sucker-leaves. Its operculum is shorter than that of the normal species, but the fruit of var. *glauca* and of the type are precisely similar except as regards glaucousness.

Dubbo district (H. Deane, Nov., 1892; J. V. de Coque and J. L. Boorman, Nov., 1897). This form (from fragments in our possession) will probably be found to have extended range easterly, and more particulary northerly of the Dubbo district.

"Broad-leaf Ironbark." Mr. J. V. de Coque recently drew attention to this tree, and pointed out that its timber is inferior to that of the other Ironbarks of the Dubbo district. Its timber is of an inferior quality, both as regards "ringing" and "splitting" (cracking), so much so that the timber-getters never cut it except for rails. Mr. Boorman points out that it grows on slightly elevated lands, and is confined to such situations only. When growing in the forest it can readily be noted by its glaucous appearance.

The "Blue-leaf Ironbark" is not really different from the preceding, although local people point out differences in breadth and glaucousness of leaves.

It bears a strong superficial resemblance to a specimen in the National Herbarium, Melbourne (in bud only), collected by Clarendon Stuart in "New England, 1,000-1,500 feet" (New England is never as low as this, so it must have been collected during an ascent). His label further states—"30-40 feet, bark very rugose and deeply furrowed, flowers light yellow, Mountain Ironbark, No. 128." It bears a label in Mueller's handwriting "*E. leucoxylon*," and is probably the var. *pallens* of Bentham

(B.Fl. iii. 210). Ample botanical material is desirable of these aberrant forms; at the same time it is not suggested for a moment that there are not two glaucous species, the stamens and stigma of *E. siderophloia* and *E. leucoxylon (sideroxylon)* being very different.

E. goniocalyx, F.v.M.

(Plate xli., figs. 1-3.)

In this colony this species is sometimes known as "Yellow Gum," owing to the yellowish cast of the foliage (especially when young), of the bark, and of the timber (particularly when fresh). There are several so-called "Yellow Gums" in New South Wales, but they must not be confused with the "Yellow Box" or "Yellow Jacket" (*E. melliodora*), sometimes called "Apple" at Orange, it being confused with *E. Stuartiana*. It is known as "Bundy" at Burraga and Rockley, according to Mr. R. H. Cambage.

It is usually found in gullies—bottoms or sides—and prefers good soil. It attains a diameter of 6 feet, and with 80 or 90 feet of barrel. Its timber has been passed both for Tallow Wood (*E. microcorys*) and Box (*E. hemphloia*), but it more closely resembles the former. It is very hard when dry, and nails do not readily drive in it; hence it is not so well liked for building purposes as some softer but inferior timbers. It stands well in the ground. A correspondent informs us that he is again using some posts of this timber which have been in the ground for 30 years.

E. goniocalyx is found on the southern and western spurs of the Dividing Range. In a stunted form (as "Bundy") it occurs on hills as far west as Mudgee and Bathurst, but in the Blue Mountains and on the southern line north as far as Hill Top it is a magnificent tree.

In Woolls' "Contribution to the Flora of Australia," p. 230, he speaks of *E. Stuartiana*, var. *longifolia*, as the "Yellow Gum" of Wingecarribbee "and other parts of the interior" *(sic)*. . . . "This gum bears some resemblance to the Grey Gum and Hickory of the County of Cumberland." The former was called by Sir William Macarthur "Yellow Gum of Berrima," and is *E. gonio-*

calyx. The Grey Gum or Hickory is *E. punctata*, DC., as has already been pointed out by Mueller in the *Eucalyptographia.* It will be observed that both trees are placed by Bentham (B.Fl. iii. 244) under a variety *longifolia* of *E. Stuartiana*, which variety name should now be dropped.

E. GONIOCALYX, F.v.M., var. NITENS, var.nov.

(Plate xli., fig. 4.)

With small, shiny fruits, up to seven in the head as seen, differing from the type both in the smallness of the fruits and in their shininess, those of the normal species being lustreless. The form formerly known as *E. elæophora*, F.v.M , is intermediate between var. *nitens* and the normal species.

"Silver Top Gum," Glenbog, Candelo (J. Duff); "Silver Top," Mountain Top, Nimitybelle; "Giant Gum," "Mountain Gum," Delegate River (W. Bäuerlen); Mt. Mueller, near Mt. Baw Baw, Victoria (Jas. Melvin), specimens received from Mr. J. G. Luehmann.

In this variety many of the leaves have the sinuous margins which appear to be characteristic of the species.

E. GONIOCALYX, F.v.M., var. PALLENS, Benth. (B.Fl. iii. 230.)

"Rough-barked mountain apple," mountains on Snowy River (Mueller); Rob Roy, Queanbeyan (H.D.); Tumut (W. S. Campbell).

Has a box-like grey, persistent bark, like *E. hemiphloia* and *E. Stuartiana.* Is a stunted, twisted, crooked tree, not straight as *E. goniocalyx* usually is. Leaves often very long.

This is not to be confused with our *E. Gunnii*, var. *glauca*, the white dried herbarium specimens of which bear some resemblance to it; the latter is a smooth-barked tree.

This glaucous form bears resemblance to the glaucous form of *E. goniocalyx*, consisting of small, rather stunted trees on hills in the Bathurst and Mudgee districts. These resemble some South Australian specimens very closely, and are more glaucous than the normal species, though far less so than var. *pallens.*

E. Gunnii, Hook. f., var. glauca, var.nov.

(Plate xlii., figs. 5-7.)

This name we propose for the very glaucous form of this species (far more glaucous than the typical Tasmanian form), the whiteness of the fruits being especially marked. It is not uncommon in the Snowy Mountains of both this colony and Victoria (including summit of Mt. Baw Baw, Mueller), and we have it from as far north as Nimbo Station, head of the Queanbeyan River (H. Deane), where it is known as "Flooded Gum" and "Cabbage Gum."

E. Gunnii, Hook. f., includes, in our opinion, *E. paludosa*, R. T. Baker (*Proc. Linn. Soc. N.S.W.*, 1898, p. 167).

We have specimens of typical *E. Gunnii* from Tasmania which tally with Hooker's description, and are accurately represented by his figure in *Fl. Tas.* We find on the same twig fruits of the shape depicted by Hooker, and of the conical form depicted by Mr. Baker as *E. paludosa.* We find such characters as the undulations of the leaf not constant; and having studied the species in the field for many years, and having examined a large series of specimens from Tasmania, Victoria, and also New South Wales, as far north as Hill Top, southern line, we fail to find a line of demarcation between them sufficient to constitute a second species. The variety name *paludosa* might perhaps, however, be retained to indicate the extreme conical fruited forms, but the tree is not absolutely restricted to marshy localities.

E. saligna, Sm., var. parviflora, var.nov.

(Plate xlii., figs. 1-4.)

This is a tree from northern New England (Bluff River near Tenterfield; also near Red Soil Creek, Mt. Spiraby, east of the Dividing Range) which bears the local name of "Silky Gum," owing to the sheen of its bark. It was also called by some people "White Gum" and "Blue Gum."

It is a very large tree, with smooth and sometimes almost glaucous bark, a little ribbony at the butt. Some of the trees resemble Blue or Flooded Gum (*E. saligna*) a good deal. In other cases it forms a gnarled tree up to 7 or 8 feet in diameter as seen, the scrambling branches in some cases actually touching the ground. Such trees remind one of *Angophora lanceolata.*

The gnarled trees have buttresses spreading over a large area of land, and have thin scaly or ribbony bark extending a good distance up the trunk; in others the roughish bark extends but a short distance.

The trunk and branches show patches of bluish, purplish or reddish. The twigs are often red, so are the young suckers—twigs, midribs and margins.

The tree is what bushmen recognise as a broad-leaved Gum in comparison with other species. The young foliage is especially broad, shining, particularly on the upper surface, and bears some superficial resemblance to pear-foliage.

Apparently rich in oil which has a peculiar and somewhat penetrating odour as tested by the crushed leaves.

The buds are clavate; the fruits are much smaller than those of the normal species; the valves are not exserted. The timber also appears to be different to that of the normal species.

The same tree occurs in the Blue Mountains (*e.g.*, the Valley, Springwood, and also Jamieson Valley, Wentworth Falls (found in the latter place by W. Forsyth), and careful search will doubtless reveal its presence in localities between New England and the Blue Mountains.

E. PULVERULENTA, Sims.

We have observed a double operculum in this species at Marulan, N.S.W. *E. cinerea*, F.v.M., is Howitt's variety *lanceolata* of this species. Mueller desired to abandon *E. cinerea*, but Bentham (*B.Fl.* iii. 239) objected for reasons stated. We have an absolutely perfect series of specimens connecting *E. pulverulenta* and *E. cinerea*, and trust that the latter name may now be finally dropped.

E. TERETICORNIS, Sm.

This is one of the most widely diffused Eucalypts in New South Wales. It presents a considerable amount of variation, and we offer notes on some of its varieties.

E. TERETICORNIS, Sm., var. DEALBATA, var.nov.

(Syn. *E. dealbata*, A. Cunn., *B.Fl.* iii. 239).

(Plate xli., figs. 5-8.)

Bentham (*loc. cit.*) says that this may prove to be *E. pallens*, DC., in which case this must fall. Mueller was (at all events at one time) of opinion that *E. dealbata*, A. Cunn., was a form of *E. viminalis*, Labill., but having considered a very large number of specimens and having studied this form in the field for years and over a large area, we do not hesitate to place it under *E. tereticornis*.

Cunningham's specimens, as described in *Walp. Rep.* ii. 924, were obtained from the Wellington Valley; we have collected in this locality and have also examined authentic specimens in the National Herbarium at Melbourne.

If Western New South Wales specimens of *E. tereticornis* be examined, even from as far east as the Blue Mountains and Richmond, the fruits (as compared with the type form) will be found to be smaller, the rim flatter (more horizontal), the valves less exserted, the operculum shorter (it and the calyx being altogether smaller) and, particularly west of the Blue Mountains, the foliage and inflorescence become more glaucous. In other words, the transition between the normal *tereticornis* and A. Cunn.'s *dealbata* is absolute.

Following are some notes on and localities of actual specimens:

Adelong Crossing (W. Woolls), Tumut (Forest Ranger Mecham), Wagga Wagga (J.H.M.). One of the so-called White Gums from the neighbourhood of Bathurst and Mudgee (see further notes in Woolls' *Flora of Australia*, p. 228). Collected also by A. G. Hamilton. "Red Gum," "Cabbage Gum," Grenfell (Forest Ranger Postlethwaite). "This tree is called Cabbage Gum on account of its small size and crooked, stunted shape. It is most difficult to get a straight log, either from branch or trunk, of even 4 ft. in length. The bark is smooth and grey, similar to the Red Gum *(E. rostrata)* both on trunk and limbs . . the whole tree appears to be the Red Gum in miniature except that it does not grow straight. Sometimes used for fencing where no other timber can be obtained, such as on rocky hills, where it is generally found, and where carting other kinds is difficult." (Mr. Postlethwaite *in litt.*).

Cowra; Wellington (A. Cunn., W. Woolls, J.H.M.); Forbes; Mt. Tyriga, reputed centre of N.S.W., near Condobolin (H.D. & J.H.M.). This is a tree which, if growing in the Sydney district, would, as regards its bark, be judged to be Grey Gum *(E. punctata).*

Eremeran, near Dandaloo, "Stunted Gum; grows on stony ridges; seems to be allied to Mallee" (Forest Ranger Kidston).

Dubbo, Peak Hill and Harvey Range (J.H.M.). A scaly, half-barked tree, but sometimes with bark as smooth as normal *tereticornis.* The amount of scaly bark varies a good deal. Tree strikingly like Mr. Postlethwaite's "Cabbage Gum." Buds markedly yellow.

Gundong or Quandong Creek, a tributary of the Bogan (Rev. G. A. C. Innes. See Woolls' *Flora of Australia*, p. 255).

Hills near Mudgee (Woolls); New England (C. Stuart).

Speaking generally, it is found in much of the western interior,—southern, central and northern. It, however, is found east of the Dividing Range, *e.g.*, we have specimens from the Hawkesbury district.

The buds and young shoots of *E. tereticornis* (*e.g.*, from Williams River and Tenterfield) are sometimes glaucous; the trees do not otherwise answer to the description of var. *dealbata.*

E. TERETICORNIS, Sm., var. BREVIFOLIA (*B.Fl.* iii. 242).

Through the kindness of Mr. J. G. Luehmann, we have received an authentic specimen of this variety. It is that form of *E. tereticornis* figured in the left of the plate of this species in *Eucalyptographia.* It is the "Orange Gum" or "Lemon Gum" of the Port Macquarie district, according to Mr. Forest Ranger Brown. The tree is abundant at Honeysuckle Flat, under 10 miles south of Port Macquarie (J.H.M.), but the leaves from that locality are as long as those of the normal species, those of Mr. Clarendon Stuart (on which the variety was founded) being simply abnormally small, having been collected from very exposed situations at some elevation above the sea. We have seen other specimens, also collected by Clarendon Stuart, which connect the above with those from the coast (Honeysuckle Flat).

The variety is, however, so interesting that the following notes in regard to it will be acceptable :—

On ironstone and serpentine soil at Honeysuckle Flat, 8 to 10 miles south of Port Macquarie.

There are a few hundred trees, attaining no great size, say, 18 inches to 2 feet diameter, 12 feet to first fork, and 30 feet high. The timber is very deep red, especially when freshly cut. When cut the tree spirted out sap abundantly, admixed with brown decayed matter. The sap is sourish and unpleasant to the taste.

The bark of the trunk is not to be distinguished from Forest Red Gum, except perhaps at the butt, in which it shows a tendency to form a thin scaly white outer bark of a box-like character.

Habit of the tree spreading and less drooping than ordinary Forest Red Gum *(Eucalyptus tereticornis)*. The limbs are very brittle.

The rim of the calyx in this Gum is very marked. The operculum and calyx are full of oil-dots. The leaves are thinner than those of the normal species, while the veins are finer and less prominent; the intra-marginal vein is not so far distant. The peduncles are much broader and flatter than in the normal species; the pedicels likewise are broader and flatter. The operculum is subcylindrical, much longer than the calyx, but the calyx is larger and the operculum smaller than in the normal species. The operculum is narrower than the calyx, giving the appearance of "egg in egg-cup" or acorn and cup. This shape appears to be characteristic, and we offer it as a ready method of distinguishing this variety. The pedicels are flat and thick, running into the calyx without any very marked line of demarcation. The calyx therefore is subconical. The whole fruit is coarser in appearance than is that of the normal species.

The variety is a well marked one, although, as has been indicated, the name given by Bentham is unfortunate.

E. TERETICORNIS, Sm., var. LATIFOLIA, Benth. (*B.Fl.* iii. 242).

(Plate xli., fig. 9.)

"Leaves ovate to lanceolate. Flowers with a strong cimicine smell." The only locality in the *Flora* for this variety is Shoalwater Passage, Queensland (R. Brown), but the variety, or at all events one of its numerous links with the normal species, is tolerably abundant in the coast and coast mountain districts of the Colony, both north and south of Port Jackson.

"Flowers with a strong cimicine smell" appears to give the clue to the name "Stinking Gum" which in some parts of the Colony is given to *E. tereticornis* (see *Agric. Gazette N.S.W.* 1898, 593), though in the specimens collected in the Mount Seaview district the leaves were not specially broad. It is, however, not likely that bad odour is a character exclusively possessed by the flowers of the variety.

These broad-leaved forms are usually (though not exclusively) found in swamps and flats, hence the local names "Swamp Gum," "Red Swamp Gum," and here we would point out that the habitat "Forest Red Gum" *(E. tereticornis)* as compared with "River Red Gum" *(E. rostrata)* is only generally and not absolutely true. This is an instance of the difficulty and even impossibility of giving entirely satisfactory vernacular names to many species of *Eucalyptus*.

We may point out that the timber of the broad-leaved forms is of very inferior quality (Mr. Forest Ranger Rudder, *Agric. Gazette N.S.W.* 1896, p. 15, says "nearly worthless"), and this enables us to understand the conflicting statements sometimes published in regard to *E. tereticornis* timber, which normally is one of the most valuable timbers we have. As a general rule it may be stated that Eucalyptus timbers grown in moist situations are deficient in durability and strength.

EXPLANATION OF PLATES.

Plate xxxvii.—*E. acaciaformis*, sp.nov.

Fig. 1.—Twig with buds and flowers.
Fig. 2.—Twig (sucker) with crenulate marginal foliage.
Fig. 3.—Vertical section through bud.
Fig. 4.—Anther.
Fig. 5.—Fruits.

Plate xxxviii.—*E. macarthuri*, sp.nov.

Fig. 1.—Twig with fruits.
Fig. 2.—Twig (sucker) showing stem-clasping leaves.
Fig. 3.—Vertical section through bud.
Fig. 4.—Anther.
Fig. 5.—Buds.
Fig. 6.—Fruits.

Plate xxxix.—*E. quadrangulata*, sp.nov.

Fig. 1.—Twig with buds and fruits.
Fig. 2.—Twig (sucker) showing quadrangular stems and opposite foliage.
Fig. 3.—Transverse section of young twig, showing quadrangular and winged stem.
Fig. 4.—Vertical section through bud.
Fig. 5.—Anther.

Plate xl.—*E. rubida*, sp.nov.

Fig. 1.—Twig with buds and flowers.
Fig. 2.—Twig (sucker) showing nearly orbicular foliage.
Fig. 3.—Vertical section through bud.
Fig. 4.—Anther.
Fig. 5.—Fruits in threes, showing cruciform arrangement.

Plate xli., Figs. 1-4—*E. goniocalyx* (from Bathurst district).

Fig. 1.—Fruits.
Fig. 2.—Buds.
Fig. 3.—Sucker-leaf.
Fig. 4.—Fruits of var. *nitens*, (var. nov.)

Figs. 5-9—*E. tereticornis.*

Fig. 5.—Twig of Allan Cunningham's *E. dealbata*, collected by himself at Wellington Valley.

Fig. 6.—Leaf of same.

Fig. 7.—Usual size of fruit and pedicel in N.S.W. specimens.

Fig. 8.—Nearly sessile form, from Tenterfield.

Fig. 9.—Small-fruited, short-pedicelled form common in var. *latifolia.*

Plate xlii., Figs. 1-4—*E. saligna*, var. *parviflora.*

Fig. 1.—Mature leaf.

Fig. 2.—Half-grown leaf.

Fig. 3.—Sucker-leaf.

Fig. 4.—Fruits.

Fig. 5-7—*E. Gunnii*, var. *glauca.*

Fig. 5.—Mature leaf.

Fig. 6.—Buds.

Fig. 7.—Fruits.

NOTE ON THE OCCURRENCE IN VICTORIA OF A PHASE OF THE SUBSPECIES *PARDALOTUS ASSIMILIS*, RAMSAY.*

By Robert Hall.

(Communicated by the Secretary.)

The name *Pardalotus assimilis* was first used by Dr. Ramsay in his "Tabular List of all the Australian Birds at present known" (P.L.S.N.S.W. ii. Part 2, p. 180, 1877), without any description being given beyond what is contained in a footnote as follows:—"Tips of spurious wings *always orange-red*, never *yellow* as in *P. affinis*." The species is again dealt with in the same partial manner in the later edition of the "Tabular List" (1888, p. 4); and no detailed description appears yet to have been published.

In Vol. x. of the British Museum Catalogue of Birds (1885, p. 56), Dr. Sharpe ranks *P. assimilis* as a subspecies of *P. affinis*, and thus speaks of it: "I find, moreover, that all the birds for which I propose to adopt Ramsay's name of *P. assimilis* have, as a rule, the *third* and *fourth* primaries edged with white, the third for two-thirds of its length, the fourth only near the base, but varying in extent and sometimes extending a good way up the edge of the feather." But Dr. Sharpe omits to paticularise the

* The substance of this Note was contained in a Paper read at the Society's Meeting in May last, entitled "Description of a new Pardalote, its Nest and Eggs." At this time no opportunity of comparing the specimens treated of with undoubted specimens of *P. assimilis*, Rams., had offered. Subsequently, per favour of Mr. A. J. North, they were compared with the fine series of skins of *P. assimilis* in the collection of the Australian Museum, Sydney, with the result that there was no option but to consider them as a phase of *P. assimilis*. The paper was therefore, by permission of the Council, withdrawn.—Ed.

exceptional variation in the character mentioned which a bird may present, but to which he would still apply the name *P. assimilis.*

As already mentioned *P. assimilis*, a subspecies of *P. ornatus*, Temm., has previously been described as having portions of the third and fourth primaries partly edged with white on the inner webs, the third for nearly two-thirds its length, while the fourth is marked at its base, and that "variably." Hitherto no mention has been made of the case in which the third primary alone in all ages is edged with clear white for two-thirds of its length on the inner web. Such a phase has come before me in specimens collected in Victoria, denoting youth, immaturity and adult stages, and this I believe is the only record of the occurrence of the subspecies in Victoria. Briefly I may say that the third and fourth primaries strongly contrast in the blacks and whites in the young and mature birds, and that the alar speculum of the young bird appears to be as crimson as in the adult. Previously to having gained some knowledge of a series of skins in the Australian Museum, by favour of Messrs. North and Fletcher, I considered this phase a constant form and one which might be regarded as a new species or subspecies.

Following is a table of the distribution of the bird in Victoria as at present known to me:—

a. County Heytesbury, Vic. Adult female; 15-9-97.
b. County Mornington, Vic. Adult male; 15-7-96.
c. County Evelyn, Vic. Adult male; 4-11-93.
d. County Mornington, Vic. Adult female; 25-12-95.
e. County Bourke. Juv. male; 15-1-97.

Skins of the adults, almost matured, and young birds may be described as under, the female *(a)* showing the fullest development.

(a.) Adult female.—Dorsal colour is grey on the back, olive-grey on the rump and upper tail coverts, which are slightly fulvous on the terminals; scapulars in the upper parts are like the back, while in the lower they agree with the rump colour; greater and primary coverts black, the primary coverts being

tipped with crimson to form an alar speculum, the lesser coverts being olive-brown; quills brownish-black, tipped with white, the secondaries gradually getting whiter along the bases as they recede except towards the proximal ends, where they are reddish-brown; inner secondaries pure white on the edges of the outer webs. Along the edge of the outer primary web is a narrow line of white, and excepting on the third all the other primaries are brownish-black, the third primary having the broad edge of the outer web marked with clear white; fore part of the crown of head is black, while the hinder crown and nape are black with the middle line of each feather broadly marked with white, thus showing a streaked appearance; eyebrow clearly and broadly lined with white; above lores a full yellow stripe continuous with the eyebrow; lores blackish; cheeks ashy-white; upper ear coverts white feathers with narrow black edging; throat and upper breast yellow, bounded laterally with ashy-white which merges into brown on the rear parts; abdomen white; lower breast ashy across; flanks yellowish ventrally and brownish dorsally; tail black with tips white, each spot enlarging as the feathers are counted outwardly; under wing coverts light tawny, axillaries similar; quills light slate below; bill uniformly horn-black; legs and feet brownish; iris brownish.

Total length 4″; culmen ·30″; wing 2·60″; tail 1·35″; tarsus ·75″.

(b.) Adult male.—The centre whites of feathers on occiput appear to be narrower than in the other sex; other than this the sexes are alike.

(c-d.) Male and female, nearly matured birds (♂ found incubating eggs).—Yellow less strong than in adult and more full than in juv.; less olive on back than in adult; tips of primaries tawny, those of secondaries white; alar speculum crimson; the narrow outer web of first primary whitish, while the outer web of third primary is broadly margined with clear white; no other primary shows any trace of white as in adult; secondaries are outwardly edged with reddish-brown; abdomen and lower breast dirty white; bill not so black as in adult, although the culmens of all the stages are black.

(e.) Male (juv.).—Crown greyish, all feathers broadly edged with faint yellow, no trace of white shafts; forehead faint yellow at base connecting the lores at their anterior ends; line above lores prominent with a velvety yellow not so strong as in adult; lores greyish-white; superciliary stripe faint tawny-white; alar speculum as crimson as in adult; throat and flanks washed with yellow; abdomen impure white; primaries brownish-black tipped with fulvous, the anterior edge of the web of the third primary prominent by a clear white, highly contrasting; the narrow outer edge of first primary fulvous; secondaries edged with rufous-brown, including inner two secondaries, which are white in adult; tail as in adult, though less clear in the whites, coverts similar; bill a shade less robust than in adult and of a light horn-black except at base of lower mandible and along the edges of the mandibles.

NOTES AND EXHIBITS.

Mr. Stead exhibited specimens of a "Carpenter Bee," *Lestis æratus*, Smith, with the stem of a young eucalypt in which they had bored—a departure from the usual habit in accordance with which choice is made of the flowering-stalks of the Grass-Tree (*Xanthorrhœa*).

Mr. W. W. Froggatt exhibited specimens of "plague-caterpillars" attacked by a fungoid disease (*Entomophthora australiana*, McAlpine) in various stages of development, with a Note thereon. Millions of caterpillars or "cut worms" have overrun the Central Division of New South Wales during the last two months, eating off hundreds of acres of crops and thousands of acres of grass. They have been reported as more or less a pest right from Moree on the north to Albury on the south. They are probably the larvæ of *Agrotis munda*, Walk., or *A. infusa*, Boisd., as odd specimens of these moths have been obtained in the districts mentioned. Fortunately a disease has appeared among them, which bids fair to kill most of them off before they can pupate. Caterpillars infested with the fungus have been forwarded to Mr. McAlpine, who has identified the disease as due to an undescribed species of *Entomophthora*, a genus hitherto unrecorded from Australia, for which he proposes the name *E. australiana*. A second moth caterpillar has also appeared in great numbers more in the southern districts (Cootamundra and Wagga); but this keeps to the grass lands. It is most probably the caterpillar of *Apina callisto*, Dbld., as great numbers of this moth were noticed in the Wagga district some four months ago.

Mr. Froggatt also exhibited Oranges from Noumea affected with fig- or palm-scale, and for comparison Sydney samples showing the ordinary red scale.

Mr. R. Greig Smith, Macleay Bacteriologist, called attention to the recent experiments of Emmerich and Loew upon the digestive action of the enzyme of *Bacillus pyocyaneus* upon various pathogenic bacteria, and upon the production of artificial immunity against various diseases by the use of the one enzyme.

Mr. S. J. Johnston exhibited specimens of the marine annelid, *Palolo viridis*, Gray, known to the Samoans and Tongans as Palolo, and to the Fijians as Mbalolo; and he gave a résumé of what is known of this celebrated animal.

Mr. Maiden exhibited herbarium specimens of Eucalypts in illustration of the paper by Mr. Deane and himself.

Mr. Baker exhibited herbarium specimens and dried fungi in illustration of his paper.

Mr. R. Etheridge, Junr., exhibited a series of the wooden fishing hooks used in the Ellice group and elsewhere in the Pacific for catching the Palu or "Oil Fish" (*Ruvettus pretiosus*, Cocco); a mounted specimen of the Palu; and an example of the Tanna Spear-becket.

Mr. E. R. Waite reported that he had recently had the opportunity of visiting the Government hatchery at Prospect; and by the courtesy of Chief Inspector Brodie and Inspector G. Glading he exhibited specimens of the fry of the Rainbow Trout (*Salmo irideus*), some of them showing curious deformities or abnormal developments.

Dr. Cox showed specimens of the land mollusc described in his paper. It is allied to *Liparus brazieri*, Angas, and occurs abundantly about 50 miles east of Israelite Bay, W.A.

Mr. Palmer showed two aboriginal skinning knives found in a cave; a seedling apple tree illustrating the ravages of the woolly aphis upon the roots, without sign of the attack above ground; a specimen of the underground fungus *Mylitta australis* less indurated than usual; and a spider, *Amaurobius* sp.,—all from Lawson, Blue Mts.

WEDNESDAY, SEPTEMBER 27TH, 1899.

The Ordinary Monthly Meeting of the Society was held in the Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesday evening, September 27th, 1899.

The Hon. James Norton, LL.D., M.L.C., President, in the Chair.

Mr. E. C. Andrews, B.A., Department of Mines, Sydney; Mr. William Baeuerlen, Technological Museum, Sydney; Mr. W. S. Campbell, Department of Agriculture, Sydney; Mr. J. E. Carne, F.G.S., Department of Mines, Sydney; Mr. James B. Garland, Ashfield; Mr. J. Godwin, North Sydney; Mr. James Mair, Elizabeth Bay, Sydney; Mr. Ernest J. Robson, B.A., C. E. Grammar School, North Sydney; and Mr. John A. M. W. Thompson, West Maitland, were elected Ordinary Members of the Society.

DONATIONS.

Department of Agriculture, Brisbane—Queensland Agricultural Journal. Vol. v. Part 3 (Sept., 1899). *From the Secretary for Agriculture.*

Geological Survey of Queensland—Seven Reports. [B. Dunstan—Mount Clifford and other Mines near Anakie (1898): B. Dunstan—The Geology of Rodd Peninsula, Port Curtis (1898): R. L. Jack—Mount Morgan and other Mines in the Crocodile Gold Field (1898): A. Gibb Maitland—The Delimitation of the Artesian Water Area North of Hughenden (1898): B. Dunstan—The

Geology of Collaroy and Carmilla, near Broad Sound (1898): R. L. Jack—Report on a visit to the Palmer Gold Field (1899): Annual Progress Reports of the Geological Survey for the Years 1896-98]. *From the Director.*

Botanic Gardens and Domains, Sydney—Report for the Year 1898. *From the Director.*

Department of Mines and Agriculture, Sydney—Agricultural Gazette of New South Wales. Vol. x. Part 9 (Sept., 1899): Annual Report for the Year 1898: Mineral Resources. No. 6 (1899): Records. Vol. vi. Part iii. (July, 1899). *From the Hon. the Minister for Mines and Agriculture.*

Royal Society of New South Wales—Abstract, Sept. 6th, 1899. *From the Society.*

The Surveyor, Sydney. Vol. xii. No. 9 (Sept., 1899). *From the Editor.*

Australasian Journal of Pharmacy, Melbourne. Vol. xiv. No. 165 (Sept., 1899). *From the Editor.*

Department of Mines, Victoria: Geological Survey—Monthly Progress Report. New Series. April, 1899: Progress Report. No. xi. (1899). *From the Secretary for Mines.*

Field Naturalists' Club of Victoria—Victorian Naturalist. Vol. xvi. No. 5 (Sept., 1899). *From the Club.*

Public Library, Museums, and National Gallery of Victoria—Report of the Trustees for the Year 1898. *From the Trustees.*

Royal Society of South Australia—Memoirs. Vol. i. Part 1 (1899): Transactions. Vol. xxiii. Part 1 (1899). *From the Society.*

Department of Agriculture, Perth, W.A.—Report for the Half-year ending December 31st, 1898. *From the Secretary.*

Royal Society of Tasmania—Abstract of Proceedings. May, 1898-August, 1899. *From the Society.*

Two Anthropological Pamphlets (from Proc. Roy. Soc. of Tasmania, 1898). By W. R. Harper. *From the Author.*

New Zealand Department of Agriculture—Second, Third, Fourth and Fifth Reports (1894-97): Department of Lands and Survey—Report for the Year 1898-99. *From H. Farquhar, Esq.*

The Students' Flora of New Zealand and the Outlying Islands. By Thomas Kirk, F.L.S. (4to., 1899). *From the Government Printer, Wellington.*

Natural History Society of Montreal—Canadian Record of Science. Vol. vii. No. 8 (1898). *From the Society.*

American Museum of Natural History, New York—Bulletin. Vol. xii. Arts. vi.-ix. (pp. 149-156, June-Aug., 1899). *From the Trustees.*

Museum of Comparative Zoology, Harvard College, Cambridge, Mass.—Bulletin. Vol. xxxv. Nos. 1-2 (July, 1899). *From the Director.*

Perak Government Gazette. Vol. xii. Nos. 24-26 (July-Aug., 1899). *From the Government Secretary.*

Geological Society, London—Quarterly Journal. Vol. lv. No. 219 (Aug., 1899). *From the Society.*

Manchester Museum, Owens College—Report for the Year 1898-99 (Publication No. 28). *From the Museum.*

Linnean Society of London—Journal. *Botany.* Vol. xxxiii. No. 234 (Nov., 1898); Vol. xxxiv. Nos. 235-238 (Nov., 1898-July, 1899); *Zoology.* Vol. xxvi. No. 172 (Dec., 1898); Vol. xxvii. Nos. 173-175 (April, July, 1899): Transactions. 2nd Ser. *Botany.* Vol. v. Parts 9-10 (Feb.-April, 1899); 2nd Ser. *Zoology.* Vol. vii. Parts 5-8 (Oct., 1898-May, 1899); List of Members, &c., 1898-99: Proceedings 110th Session, from Nov., 1897-June, 1898 (Oct., 1898). *From the Society.*

Royal Society, London—Proceedings. Vol. lxv. No. 417 (July, 1899). *From the Society.*

Zoological Society of London—Proceedings. 1899. Part ii. (Aug.): Transactions. Vol. xv. Part 2 (1899): List of Fellows, &c., May, 1899. *From the Society.*

Medizinisch-naturwissenschaftliche Gesellschaft zu Jena—Jenaische Zeitschrift: Namen und Sachregister zu den Bänden i.-xxx. (1899). *From the Society.*

Naturwissenschaftlicher Verein in Elberfeld—Jahres-Berichte. Neuntes Heft (1899). *From the Society.*

Zoologischer Anzeiger. xxii. Band. Nos. 593-594 (July-Aug., 1899). *From the Editor.*

Naturwissenschaftlicher Verein für Steiermark—Mittheilungen. Jahrg. 1897 u. 1898. *From the Society.*

Société Géologique de Belgique—Annales. Tome xxvi. 3e Liv. (1899). *From the Society.*

Société Royale de Botanique de Belgique—Bulletin. Tome xxxvii. (1898). *From the Society.*

Société Royale des Sciences de Liége—Mémoires. 3e Série. Tome i. (1899). *From the Society.*

Three Pamphlets (Etudes Géologiques dans Paris, 1898: Observations Géologiques, 1898: La Caverne de Ratelstein, 1899). By G. Ramond. *From the Author.*

Nederlandsche Entomologische Vereeniging, Leiden—Tijdschrift voor Entomologie. xlii. Deel. 1-2 Afl. (1899). *From the Society.*

Société des Naturalistes de la Nouvelle-Russie, Odessa—Mémoires. Tome xxii. Fasc. ii. (1898); Section Mathématique. Tomes xvi. et xix. (1899). *From the Society.*

Videnskabs-Selskabet i Christiania—Forhandlinger. 1891, 1892, 1894, 1895, 1896, 1898, Nos. 1-5: Skrifter I. Mathematisk-Naturv. Klasse. 1894, 1895, 1896, 1898, Nos. 1-10. *From the Academy.*

R. Università degli Studi di Siena—Bullettino del Laboratorio ed Orto Botanico. Vol. ii. Fasc. ii. (1899). *From the University.*

Zoologische Station zu Neapel—Mittheilungen. xiii. Band. 3 Heft (1898). *From the Director*

REVISION OF THE GENUS PAROPSIS.

By Rev. T. Blackburn, B.A., Corresponding Member.

Part V.

[Continuing the treatment of the species forming Group VI. (as characterised in P.L.S.N.S.W. 1896, p. 638) of the genus.]

Subgroup v.

The difficulties of the genus *Paropsis* culminate in the present subgroup, and I have been much tempted to omit it from this "Revision." On full consideration, however, it seems best to include it, even though I can deal with it only in a fragmentary and uncertain manner. As no systematic treatise on these insects has yet appeared, this attempt of mine may at any rate serve as a point of departure for future observers. The most formidable difficulty that these species present arises from the fact that they are for the most part, on the one hand of very fragile texture drying into extremely variable shapes according to their condition at the time of death and very liable to be affected in respect of their sculpture by long immersion in spirits, and on the other hand adorned when living with bright metallic colours which fade after death into a uniform brownish or testaceous tint. These peculiarities have in very few instances been mentioned by (or probably known to) describers,—so that there are very few descriptions extant which can be confidently identified with actual specimens.

For the determination of species I find it indispensable to know something of the colours and markings of the living insect, but fortunately this is not an impracticable requirement since immersion for 24 hours in benzine (or even in water) always revives the colours of a mature specimen sufficiently for the purpose.

The preparation of the following tabular statement of the characters of the species in this subgroup has given me more trouble than that of any other tabulation of Australian *Coleoptera* that I have ever drawn up, and even now, after careful study of thousands of specimens of this subgroup, I am very far from being satisfied with it. I have completely failed to discover any very conspicuous reliable structural characters on which to break up the species into easily recognisable aggregates, and have, after many attempts at a more satisfactory grouping, been obliged to adopt a colour distinction for characterising the main divisions. And here it will be well to remark that I have found it necessary to absolutely set aside from consideration all *immature* specimens, of which there are many in all collections of these *Paropsides*, and which may generally be known by their elytra or abdomen being shrunken in such fashion that the two sides are not symmetrical in form. Hence it follows that the characters cited in the following table will not serve for the identification of immature examples of *Paropsis*, for which I can recommend no other course than severely throwing them away.

Among the species of this subgroup when living (or when their colours have been revived as specified above) there are three types of colouring. First, there are a number of species,—for the most part of less fragile texture than the others,—which have little (or even no) metallic colouring. Usually these have a more or less faintly golden tone about the base of the elytra and on the disc of the prothorax, and but little more. Then come species having what I call *diffused* metallic colouring which takes two forms on the elytra, those organs being (their expanded margins which are never, or at any rate only rarely, metallic excepted) either of a beautiful uniform green golden coppery or rosy lustre or uniformly tessellated with a vast number of small square silvery or golden spots. When the whole disc of the elytra is metallic the colour is usually shaded in a most curious manner, the deepest shades lying along the lines of punctures and producing the remarkable effect of making the elytra appear to a casual glance deeply sulcate, although in reality there is no sulcation whatever. I take this to be a very striking case of mimicry, though I am unable to offer any suggestion as to what is mimicked or what is the purpose of the mimicry. There remains to be mentioned a third type of marking, which consists in a sharply defined discal pattern of large brilliant green or golden spots and stripes which seem to be very little subject to variety. The species having this type of marking are among the most beautiful *Coleoptera* known to me, and it is almost impossible to believe when looking at one of these magnificent creatures alive that in a few hours all its glorious colours will disappear.

In tabulating I have separated the species having a sharply defined metallic pattern as forming a main division of the subgroup, but have not made separate main divisions of those presenting the other two types of colouring, as I find it difficult to draw a clear line founded on the possession of much or little diffused metallic colouring. It may be noted, however, that in general the species ending with *obovata*, Chp., in the tabulation, have little or no metallic colouring, and the remainder as far as *inconstans* (Chp.), Blackb., have metallic colouring diffused over the whole disc of the elytra either in the tessellated or pseudo-sulcate fashion.

The first main aggregate of subgroup v., then consists of species not having a sharply defined metallic elytral pattern, and among these it will be seen that in some the seriate punctures of the elytra do not run in single file and are very far from symmetrical, the succession of punctures being sinuous or zigzagged, or frequently interrupted by two or three punctures placed transversely, or even more placed in a cluster. These I have regarded as the first aggregate of species, but have been unable to find good structural characters suitable for tabulation to distinguish them *inter se.* The species (of the first main aggregate) having the elytral series symmetrical, or nearly so, are divisible into two sections by the presence or absence of lateral inequalities on the elytra. These consist of shallow transverse depressions by no means strongly marked, but quite discernible, and which more or less strongly interrupt the symmetry of the 10th elytral series.

It must be remembered, however, that this character is only reliable in mature specimens, immature examples often having their elytra so shrunk and distorted that it is impossible to determine whether they have or have not systematic inequalities. In such specimens, however, the inæqualities are usually different on the two elytra.

The species with symmetrical elytral series and elytra devoid of lateral inequalities fall into two sections fairly reliably to be distinguished (immature specimens and those very long immersed in spirits excepted) by the sculpture of the elytra. In one of these sections the elytral series are invariably fine, close, and extremely symmetrical, with interstices usually quite flat and very fine striæ if any; while in the other section the elytral sculpture is variable, the series in most of the species being considerably coarser and in very few species perfectly symmetrical throughout (some of the discal series being more or less zigzagged in places and the 10th series near the base being almost invariably much confused), the striæ when present distinctly less fine and less scratch-like, the interstices in many examples decidedly convex. Each of these sections moreover has its own type of prothoracic sculpture varying somewhat in degree (owing probably to length of immersion in spirits, age of specimen when killed, &c.), but after a little practice easily recognisable. In the species of the former section the disc of the prothorax is (normally) finely and closely punctulate and not or scarcely asperate; while in the latter the disc is either very sparsely punctured or strongly rugulose.

So far it is not difficult to go with moderate confidence in dealing with these most perplexing insects, but when one comes to divide into species the specimens pertaining to each section, the task is almost hopeless. It is a difficult matter to find two specimens that can be confidently asserted (apart from the circumstances of capture) to be identical, and it frequently happens that two specimens which one knows to be conspecific dry into the appearance of belonging to two species. I am of opinion that the determination of the species is *impossible*, except by the means of some student with plenty of leisure time at his command devoting himself to a study of their characters and habits in their larval and pupal stages. Under these circumstances I have had to content myself with breaking up the sections into a few aggregates which I feel confident are distinct (at least specifically) *inter se*, and applying a name to a typical example of each aggregate; though at the same time entertaining a strong suspicion that among the specimens to which I am applying the name, there are a good many more species in reality than one; so that in respect of many of the names tabulated below all I venture to assert is that specimens referable to it by their characters are distinct from the other species tabulated, and are either the species in question or one very close to it and not separable by any reliable character that I can find.

The number of names that I can ascertain to have been applied to species of this subgroup is 26. Of these there are two of which I am somewhat confident that I have not seen a specimen (viz., *albicans*, Chp., and *proxima*, Chp.), two that I can confidently assert to be synonyms (viz., *conferta*, Chp., = *læsa*, Germ., and *vulgaris*, Chp., = *obovata*, Chp.), three that I regard less confidently as synonyms (viz., *læsa*, Germ., = *amica*, Newm., *amœna*, Clk., = *captiosa*, Clk., and *debilis*, Chp., = *purpureo-aurea*, Clk.), and two concerning which I hesitate to say more than that I have not been able to connect them with any of the specimens I have examined (viz., *citrina*, Chp., and *tenella*, Chp.). After the elimination of the above names, then, there remain 17 names which appear to me to represent valid species of this subgroup and which are known to me; and to them I add (below) 8 new species, bringing up the number to 25. To speak more particularly concerning the species mentioned doubtfully above, I may say that *amica* is altogether insufficiently described, but the description contains the word "pravis" applied to the seriate puncturation of the elytra, which word certainly seems to point to one of the first four species in the tabulation (below); in that case the colours attributed to *amica* suggest identity with *læsa*, Germ., rather than with any of the others. If this conjectural synonymy is correct, Germar's name must yield to Newman's, but as the specimens before me are certainly *læsa* and only doubtfully *amica*, I retain Germar's name. *P. amœna*, Clk., and *purpureo-aurea*, Clk., will be found discussed (below) under the names *captiosa*, Clk., and *debilis*, Chp. *P. debilis* is a more recent name than *purpureo-aurea*, but I retain it on similar grounds to those on which I retain *læsa*, Germ. *P. citrina* is not unlikely to be a specimen of one of the forms that I have mentioned as local races of *hectica*, Boisd., but the description is not sufficient to justify any confident assertion of its identity. *P. tenella*, Chp., is, I suspect, a species having a metallic pattern when living, but if so it is not possible to form any idea of what that pattern is. The following is a tabulated statement showing the characters distinguishing the species of this subgroup:—

A. Elytra not having a sharply defined metallic pattern.	
B. The elytral series for the most part unsymmetrical.	
C. Elytra without well defined discal markings.	
D. Under surface and legs more or less black.	
E. Prothorax not having defined black markings.	
F. Elytra quite deeply striate throughout	variicollis, Chp.
FF. Elytra not, or scarcely, striate.	Cloelia, Stal.
EE. Prothorax with defined black markings, or even almost wholly black	agricola, Chp.
DD. Under side and legs testaceous.....	læsa, Germ.
CC. A black discal spot on each elytron..	Minerva, Blackb.
BB. The elytral series for the most part symmetrical.	
C. Elytra with systematic lateral inequalities.	
D. Prothorax with sharply defined black markings........................	bimaculata, Oliv.
DD. Prothorax not having sharply defined black markings.	

E. The elytral series similar *inter se* in respect of size of punctures... irrisa, Newm.
EE. The elytral series near the suture consist of punctures notably finer than those of the other series. .... obovata, Chp.
CC. Elytra even laterally.
D. Elytra (at least of ♂) non striate; all the series fine, close and very symmetrical; in 9th and 10th series three punctures in a length equal to the width of the adjacent interstice.
E. The series become black at a distance from their base about equal to the length of the scutellum...................................... basalis, Chp.
EE. The series not coloured as in *basalis*.
F. Very nitid species.
G. Suture blackish in its front half; colour of elytra (when alive) very brilliant golden aurea, Blackb.
GG. Suture not blackish; colour of elytra not golden .... hectica, Boisd.
FF. Surface notably less nitid.
G. Discal puncturation of prothorax rugulose.
H. The discal series of elytral punctures confused in places by equally large interstitial punctures...... Simsoni, Blackb.
HH. The discal series all quite distinct from the interstitial puncturation..... raucicollis, Blackb.
GG. Discal puncturation of prothorax non-rugulose.
H. Prothorax evenly convex from one lateral margin to the other.................. pallida, Oliv.
HH. Discal part of prothorax more convex than lateral inconstans (Chp.), Blackb.

DD. Elytral series notably less fine and symmetrical; their punctures less closely placed; elytra in many species more or less striate.

E. Sculpture of lateral part of elytra (as in *inconstans*, &c.) non-rugulose and comparatively fine, evenly distributed and close.

F. Prothorax closely rugulose....... decolorata, Chp.

FF. Prothorax non-rugulose and much less closely punctured captiosa, Clk.

EE. Sculpture of lateral part of elytra coarser and less evenly distributed, usually rugulose.

F. Series 9 and 10 almost confluent somewhat behind shoulder, and consisting of more or less quadrate punctures with narrow ridge-like interstices more or less continuous from series to series . ... fastidiosa, Chp.

FF. Series 9 and 10 continuously separated by a normal interstice, their structure not as in *fastidiosa*.

G. Antennæ short, much thickened towards apex, black or blackish except near base flaveola, Chp. (?)

GG. Antennæ less short and less thickened towards apex... rufescens, Chp. (?)

AA. Elytra having a sharply defined metallic pattern (in living specimens).

B. Head entirely black behind from slightly in front of level of hind margin of eyes; size large...... .. .. vittata, Blackb.

BB. Head black only at extreme base or with at most a narrow median black projection; size smaller.

C. The metallic markings include spots arranged in a circle common to the two elytra.................................. annularis, Blackb.

CC. The post-median metallic markings take the form of a wide oblique fascia on each elytron .... gloriosa, Blackb.

CCC. The post-median metallic markings run longitudinally near the suture.

D. These longitudinal marks are two narrowly connected spots on each elytron .... nobilitata, Er.

DD. These longitudinal marks are a continuous sinous band on each elytron.................................. debilis, Chp.

P. VARIICOLLIS, Chp.

Of this species I have examples from the Chapuis collection which bear a printed label "type," and agree well with the description. It is of less fragile texture than most of its allies. Its colour is yellowish-brown, with the base of the head, the underside, legs and apical part of the antennæ mostly black. The scutellum is more or less outlined with black, and the seriate and lateral punctures of the elytra are usually blackish. The form is obovate and rather strongly convex. The prothorax is rugulose and coarsely and closely punctulate. The elytra are exceptionally strongly and regularly striate, the striæ near the suture being as well defined quite to their base as the dorsal ones. The sides of the elytra are shallowly and vaguely but distinctly impressed a little behind the shoulder. The punctures in the striæ are rather large, closely packed and strongly crenulate and are decidedly non-symmetrical, many of the punctures being out of line with the adjacent ones and two or three being placed in a transverse row here and there. The confused lateral punctures are about the same size as those of the series and are rather closely placed, the interstices between them being rugulose. Owing to the blackish colouring of the punctures being confined to the *bottom* of each puncture, the punctures from a certain point of view appear round, non-crenulate and much smaller than from another point of view (this is of course not the case in specimens not having their punctures black). The interstices between the striæ are more or less convex and are rather closely and very distinctly punctulate. The prothorax is something less than three times as wide as long. The general surface is not very nitid. The antennæ are filiform, joints 5-10 very little dilated towards the apex. I have not found much variety in the colouring of this species except in the seriate punctures; it is to be noted, however, that the basal black colouring of the head is not visible unless the head is considerably extruded. The cloudy fuscous blotches on the prothorax are in some examples scarcely traceable. There is not much difference between the sexes apart from the characters common to the genus. The 4th joint of the antennæ is quite noticeably (but not much) shorter than the 3rd joint.

P. Cloelia, Stäl.

This species is really very close to *P. variicollis*, Chp., varieties of it differing very little from *variicollis* even in colour, except in the black at the base of the head being absent, or at least much further back, and the upper surface being of a *livid* testaceous tone (not of the yellowish or reddish tint that appears to be invariable in *variicollis*). Typical examples are testaceous on the upper surface except the elytra which are piceous or black with the basal, lateral and apical margins more or less conspicuously testaceous, the undersurface and legs more or less black, the antennæ testaceous becoming piceous or black beyond the middle. Apart from colour, the head (including the antennæ), prothorax and scutellum do not differ much from those of *variicollis*; but the elytra are scarcely striate, their seriate punctures notably finer and non-crenulate, and their interstices flat and more feebly punctulate. I possess an example of this species from the Chapuis collection ticketed '*Paropsis Cloelia*,' and some others which I took in the Alpine district of Victoria. Its measurements are: long. 4, lat. $3\frac{1}{2}$ lines. Living specimens show some obscure golden colouring chiefly on the disc of the prothorax and around the scutellum.

P. agricola, Chp.

This name was unfortunately given to an extreme form of a species whose ordinary form does not appear to have been described at all. I possess an example of the ordinary form from the Chapuis collection ticketed '*bimaculata*,' from which I suppose that Dr. Chapuis regarded the ordinary form as being *P. bimaculata*, Oliv.; but he was certainly mistaken in that case, as the ticketed specimen does not agree with Olivier's description, and I have before me an undoubtedly distinct species which agrees with that description perfectly. No doubt Chapuis had not seen the true *bimaculata*, and thought that the specimen he ticketed '*bimaculata*' was a variety of it (which, indeed, I should have thought quite possible myself if I had not seen the species mentioned below as *bimaculata*, Oliv.). My example of the form described by Chapuis was taken in Tasmania (the locality cited by the author) in company with numerous examples of the ordinary form.

P. agricola is closely allied to *Cloelia*, Stål, from which (excluding colour) it differs principally by its considerably less convex form and somewhat shorter and stouter antennæ. Its upper surface is testaceous or reddish-testaceous, the marginal part of the elytra more or less conspicuously inclining to a distinctly yellowish or red colour. The base of the head is broadly black (the black colour usually reaching forward to the level of the middle of the eyes) and the disc of the prothorax bears a transverse series of irregular but sharply defined black blotches (usually more or less confluent). The undersurface is black, with the prosternum in some examples testaceous, and the legs are testaceous (in some examples more or less marked with black). The antennæ are testaceous (becoming blackish from about the middle in most examples). The sculpture in all parts closely resembles that of *P. Cloelia*. Living specimens are obscurely golden, chiefly around the scutellum.

This is an extremely variable species, the variation usually taking the form of increase in dark colouring,—so that it is difficult to find two specimens absolutely alike. In some the elytra are dark brown, with the margin widely red; in some the elytra light or dark piceous, with the margins more or less widely testaceous; till at last we reach the form described by Chapuis, in which the upper surface may be described as black, with the prothorax and elytra narrowly edged with testaceous. The elytra of some examples are uneven through some of the interstices being irregularly costate, but I take them to be merely abnormally developed specimens. The males are more depressed than the females. Long. 4-4½, lat. 3½-3⅗ lines.

Victoria and Tasmania.

P. LÆSA, Germ. (*conferta*, Chp.).

This species is named *chlorotica*, Oliv., in the Chapuis collection, but *chlorotica* (which I have already dealt with) was evidently described from a much smaller species. Dr. Chapuis places *læsa* among the species he had been unable to identify. Germar's description of *læsa* fits the present insect very well, and moreover I have before me examples taken in the exact locality whence Germar's specimens came.

It is a species of wide subcircular form and moderate convexity (a trifle less convex than *P. variicollis*), and entirely of testaceous or pale ferruginous colour except that in some examples the antennæ are somewhat infuscate towards the apex, and that the prothorax is generally faintly blotched with fuscous, while the head and prothorax are not infrequently blotched with whitish colouring and (rarely) the elytra bear a few small fuscous spots; there is also a tendency towards whitish colouring along the base of the elytra. The surface is only moderately nitid. The head is flat, with fine close puncturation tending to become longitudinally confluent. The prothorax is a little less than three times as wide as long, moderately narrowed in front, with the front margin only feebly bisinuate, its disc rather coarsely rugulosely and closely but irregularly punctured (its lateral portion evidently more coarsely and closely, with a large feeble depression), its sides gently arched, the front angles prominent but scarcely sharp, the hind angles quite rounded off. The scutellum is nitid and not or scarcely punctured. The elytra are non-striate (scarcely striate in the ♀) and bear 10 extremely unsymmetrical rows (the 5th, 6th and 7th more symmetrical than the rest) of moderately fine round punctures, the interstices of the striæ flat and finely somewhat closely punctulate; the lateral portion of the elytra is impressed with close and not particularly coarse puncturation, the interstices of these punctures not or scarcely rugulose. The elytra are devoid of lateral unevenness. The antennæ are slender and filiform, their 3rd joint very evidently longer than the 4th joint. The males are a little less convex than the females. Long. $3\frac{1}{2}$-4, lat. $2\frac{4}{5}$-3 lines.

The principal variation that I observe in this species is in the presence of more or less fuscous colouring in the punctures of the lateral portion of the elytra.

I suspect that *P. amica*, Newm., is a variety of this species, but the description is altogether insufficient for identification.

When alive this species bears a good deal of ill-defined green or golden metallic colouring, consisting of spots and lines on the head and prothorax, and suffused over the elytra but generally much brighter about the base than on the hinder part.

Specimens taken by the Horn Expedition in Central Australia have the head less flattened and the prothorax somewhat less closely punctulate, with its front margin more strongly bisinuate; they may represent a distinct very closely allied species.

I have a specimen named *conferta* by Dr. Chapuis which I cannot separate from the present insect.

N.S. Wales, Victoria, S. Australia, and Tasmania.

P. Minerva, sp.nov.

Latissime ovalis; convexa; testacea (exemplo typico sicco), elytris pone medium prope marginem disci externum macula majori nigra ornatis; capite crebre subtilius punctulato; antennis elongatis gracilibus; prothorace quam longiori ut $2\frac{1}{3}$ ad 1 latiori, antice minus angustato, in disco dupliciter (subtiliter et subfortiter) minus crebre nullo modo rugulose (ad latera grosse subrugulose) punctulato, angulis anticis fortiter productis sat acutis posticis rotundatis, lateribus minus arcuatis; scutello lævi; elytris æqualibus, antice haud (postice leviter) striatis, puncturis minus subtilibus (fere ut *P. læsæ*, Germ.) (his 10-seriatim nullo modo symmetrice dispositis) ornatis, interstitiis subtiliter nec crebre punctulatis; parte laterali puncturis (quam serierum paullo majoribus) sat crebre sat æqualiter nec rugulose impressa. Long. $2\frac{1}{2}$, lat. $2\frac{1}{10}$ lines.

An isolated species standing alone in this subgroup in having well-defined black markings on the elytra. Structurally it is near *P. læsa*, Germ., but is much smaller and more nitid, with prothoracic puncturation non-rugulose, interstitial puncturation of elytra much less close, &c.

Australia; I do not know its exact habitat.

P. BIMACULATA, Oliv.

This species has much superficial resemblance to the ordinary form of *P. agricola*, Chp., and as both of them are variable in colouring it is difficult to specify any sharply defined colour difference. In the present species, however, judging from the somewhat numerous examples before me, the dark marks on the prothorax are only two (a vitta abbreviated at each end, on either side of the middle), while in *agricola* the dark marks are almost invariably more numerous often occupying almost the whole surface of the segment. The under surface and legs moreover in the present species are rarely so dark in colour as in *agricola*. *P. bimaculata*, however, is a manifestly less convex species than *P. agricola;* with elytra less nitid, notably less distinctly striate, and having the seriate punctures much more symmetrical [*i.e.*, running in single file, the regularity of the lines not (or scarcely anywhere) disturbed by two or three of the punctures being placed in a *transverse* row]. Long. 4-$4\frac{1}{2}$ lines.

Tasmania.

P. IRRISA, Newm.

The Victorian *Paropsis* which I have little doubt is the subject of this name is extremely like *P. variicollis*, Chp.; indeed, I know not how to distinguish it from that species except by the sculpture of the elytra, which are distinctly less strongly striate and especially have their seriate punctures running in single file without (or almost without) any interruption of their symmetry through some punctures being placed out of line with the others. The elytra of this species are much more strongly striate than those of the following species (*P. obovata*).

Victoria.

P. OBOVATA, Chp. (*vulgaris*, Chp.).

Of this species I have a pair named by Dr. Chapuis. Presuming them to be really conspecific, the insect is distinguished (among the species having the elytral series symmetric, the elytra with a shallow depression behind the humeral callus, and the prothorax devoid of black markings) by the following characters in combination, viz., antennæ with the joints of their apical half cylindric or nearly so, female with the interstices of the elytral series more or less convex, elytra of male not quite non-striate. In the examples of *obovata* before me the elytra are of a pale testaceous colour faintly tessellated with small whitish spots, and I think they had (when alive) some obscure golden colouring about the base of the elytra. I have also an example in my collection (from Queensland) which seems to be *P. obovata*. The colour of dried specimens is no doubt variable. I have examples named *vulgaris* by Dr. Chapuis which I am unable to separate from those named *obovata* by the same learned author, nor do I find any definite distinction of characters in the descriptions under the two names.

P. BASALIS, Chp.

With this insect commences a series of species distinguished by the following characters:—Elytra devoid of well-defined metallic pattern, having their seriate punctures extremely symmetrical, devoid of systematic lateral inequalities, and with the punctures of the series fine and close (in the 9th and 10th series three punctures in a length not or scarcely greater than the width of the interstice between those series). The lateral confusedly punctured part of the elytra is absolutely non-rugulose, and its sculpture (disregarding the fine puncturation exactly like that of the interstices of the series, which is continued evenly over its surface) consists of isolated punctures of very equal size very evenly distributed and not (or but little) larger than the punctures of the series. The surface of the disc of the prothorax is invariably non-rugulose and the puncturation of the same close and fine (or, at any rate, by no means coarse), though in some specimens more or less asperate. Most of the species with the above mentioned characters are decidedly more nitid than those that follow them.

P. basalis I have identified from Dr. Chapuis' description, where mention is made of the remarkable colouration of the elytra (consisting in the elytral series becoming abruptly black at a short distance from the base) to which I have seen no approach in any other species of this subgroup. With the exception just mentioned, the whole insect is of testaceous-brown colour. The antennæ are long and slender, the size notably larger (long. 5-$5\frac{3}{4}$ lines) than that of any of its immediate allies. Dr. Chapuis gives Sydney as the locality where this species is found, but all that I have seen were taken in Western Australia. The punctures of the elytra (both seriate and interstitial) are rather strong as compared with those of most allied species, but those of the series are quite as closely packed as in the following species. The striation of the elytra also is better marked than in most of the allied species, and in the female the interstices are distinctly convex.

P. AUREA, sp.nov.

Late (♂) vel minus late (♀) ovalis; modice (♂ quam ♀ minus fortiter) convexa; nitida; testacea, sutura antice sat late infuscata vel nigricanti (nonnullorum exemplorum elytris prothoraceque ad latera pallidioribus, antennis apicem versus infuscatis, corpore subtus pedibusque plus minusve nigricantibus, capite postice nigro); exemplorum vivorum elytris in disco splendide aureis; antennis sat gracilibus sat elongatis; capite subtiliter sat crebre punctulato; prothorace quam longiori ut $2\frac{1}{2}$ ad 1 latiori, antice modice angustato et fortiter bisinuato, crebre subaspere nullo modo grosse (latera versus subgrosse) punctulato, angulis anticis obtusis posticis nullis, lateribus modice arcuatis; scutello vix manifeste punctulato; elytris æqualibus, haud striatis, puncturis seriatis rotundis parvis valde regulariter dispositis, in seriebus confertim impressis (sicut puncturæ circiter 3 longitudinem interstitii latitudini æqualem occupant), interstitiis planis puncturis crebris minus subtilibus impressis, parte laterali nullo modo rugulosa ut interstitia punctulata et puncturis majoribus (his quam serierum puncturæ paullo minus subtilibus) confuse nec acervatim impressa. Long. $3\frac{1}{2}$-$4\frac{1}{2}$ lines.

This and the following species are closely allied *inter se*, but are distinguishable from *P. Simsoni* and its allies by their very evidently more nitid surface. When alive, the present insect is quite unmistakable on account of the brilliant golden-yellow gloss of its elytra; when dried, however, it is not very easily distinguishable, but is distinctly of narrower form than *hectica*, and specimens in good condition (*i.e.*, neither immature nor unduly affected by the action of spirit) have the suture—at least in its front half—infuscate (in some examples quite widely black). The 10th elytral series in this species is usually more darkly coloured than the rest, but this is also the case in many specimens of *hectica*. There are few species of *Paropsis* more beautiful than this is when alive.

Tasmania; Hobart.

P. HECTICA, Boisd.

This species I believe to be an extremely variable one, and if I am right in grouping together the various forms that I include under the name it is easily distinguishable from all other species except the preceding *(P. aurea)*. It is decidedly more nitid than any of its following allies and has the seriate punctures of its elytra extremely symmetrical and very closely placed *(inter se)* in the series, the short subsutural and the 10th series being in many examples conspicuously blackish in contrast to the other series. The specimens from a given locality usually resemble each other more closely than they resemble specimens from distant localities, so that it is possible to distinguish in the species certain types which appear to appertain to local races; these "local races" may perhaps in reality be valid species. Living specimens have the disc of the elytra suffused with metallic colouring of a more or less brilliant green tint and present in a high degree the pseudo-sulcate appearance referred to above in the general remarks on this subgroup. Dried specimens are of uniform brown or testaceous colour on the upper surface, except some dark colouring present (at any rate on most specimens) on the back of the head but only visible when the head is considerably extruded, and some dark colouring always (as far as my observations go) on some at least of the elytral series, which latter dark colouring is in rare examples vaguely extended to the interstices. The following notes indicate the special characteristics of some local forms, as I believe them to be.

The type (assuming Dr. Chapuis' identification to be correct, I have an example named by that learned author) occurs in N.S. Wales, but in my experience is rare. Its special characters consist in the under surface, legs and antennæ being entirely of pale brown colour, the dark colouring of the elytral series limited to the 1st and 10th series, the convexity of form in the ♂ at its maximum, and the closeness of puncturation on the prothorax and in the elytral series at its minimum.

Another race occurring in N.S. Wales has the under surface, the femora and the outer joints of the antennæ more or less black or infuscate, other elytral series (besides the 1st and 10th) tending to be of dark colour, the form (especially of the male) tending to be less convex than in the type, the puncturation of the prothorax evidently closer than in the type and slightly asperate, and the punctures of the elytral series (especially in the male) somewhat more closely disposed.

In Victoria (as far as I have observed only in the mountainous regions) occurs a form coloured like the last mentioned except that the dark colouring of the elytral series tends to be faintly suffused over the interstices. In this race the convexity of form is at its minimum (especially in the male) and the closeness and asperity of the prothoracic puncturation is at its maximum.

In S. Australian specimens the colouring is as in the type, except that all the elytral series are of dark colour (rarely extending to the interstices) and the humeral calli are of dark colour also: the convexity of form is as in the 2nd of the races described above, and the prothoracic puncturation is as in the Victorian race.

It should be noted that the distinction I have attributed to each of these races cannot be said to be in all respects invariable, rare examples from the Victorian mountains (*e.g.*) showing *only very feebly* the characters that distinguish the Victorian Alpine race from the 2nd of the races enumerated.

Dr. Chapuis cites Tasmania as one of the localities of *P. hectica* (and curiously enough omits N.S. Wales,—Boisduval's locality). I have before me a specimen from Tasmania named "*hectica*" by Dr. Chapuis, but I am of opinion that it is *aurea:* though unfortunately it is so extremely old an example that I have been unable to bring out its natural colours in even the slightest degree, and its form being considerably distorted the determination of its species is impracticable. I have, however, not seen *hectica* among the numerous specimens of *Paropsis* that I have collected in Tasmania, or received from Tasmanian collectors.

P. Simsoni, sp.nov.

Late (♂) vel minus late (♀) ovalis; modice convexa; modice nitida; tota testacea; exemplorum vivorum elytris in disco roseo- vel aureo-roseo-nitentibus; antennis sat gracilibus sat elongatis; capite crebre aspere nec ullo modo grosse punctulato; prothorace fere ut *P. aureæ* sed sat ruguloso; elytris ut *P. aureæ* sed interstitiis multo magis fortiter punctulatis, in his puncturis nonnullis quam serierum puncturæ vix subtilioribus, sicut series minus perspicuæ sunt. Long. $2\frac{3}{4}$-$3\frac{1}{2}$ lines.

This species differs from *aurea* by its constantly smaller size, its different colouring (in dried examples the whole insect pale testaceous, in living ones the disc of the elytra suffused with a rosy or golden-rosy metallic gloss), its somewhat less nitid surface, its rugulose prothorax, and especially the very different sculpture of its elytral interstices, which are closely impressed with confused punctures, many of which are scarcely smaller than the seriate punctures, so that the latter do not appear very conspicuous to a casual glance. This last named character distinguishes the present insect readily from all its near allies.

With this insect commences a short series of species agreeing with the preceding two in most of their characters, but differing in their less nitid upper surface.

Tasmania.

P. RAUCICOLLIS, sp.nov.

Late (♂) vel minus late (♀) ovalis; convexa; minus nitida; tota testacea (exemplorum vivorum elytris in disco plus minusve viridi-nitentibus); antennis sat gracilibus minus elongatis; capite crebre rugulose punctulato; prothorace quam longiori ut $2\frac{1}{2}$ ad 1 latiori, antice modice angustato, grosse rugulose (ad latera etiam magis grosse) punctulato, ad latera late oblique leviter impresso, angulis anticis sat acutis posticis nullis, lateribus sat arcuatis; scutello punctulato; elytris æqualibus, haud vel vix striatis, puncturis seriatis rotundis parvis valde regulariter dispositis (in seriebus confertim dispositis sicut puncturæ 3 longitudinem interstitii latitudini æqualem occupant), interstitiis planis confertim subaspere minus subtiliter (sed quam series multo subtilius) punctulatis, parte laterali nullo modo rugulosa ut interstitia punctulata et puncturis majoribus (his quam serierum puncturæ paullo minus subtilibus) confuse nec acervatim impressa. Long. 3-4, lat. $2\frac{2}{5}$-3 lines.

Rather closely allied to the preceding (*P. Simsoni*) but differing from it *inter alia* by its still more rugulose prothorax and by the sculpture of its elytra, there being considerable difference in size between the seriate and interstitial punctures, in consequence of which the elytral series are very much more conspicuous in the present insect than in *Simsoni*.

S. Australia; near Adelaide.

P. PALLIDA, Chp. (? Oliv.)

I regard it as very doubtful whether this is really *pallida*, Oliv., but as I have before me an example so named by Dr. Chapuis it seems convenient to accept the determination. The present insect and the next (*P. inconstans*) are evidently allied to the preceding two (*raucicollis* and *Simsoni*) but are at once distinguished from them by the non-rugulose surface of the disc of their prothorax, and also from *Simsoni* by the puncturation of their elytral interstices being notably finer than that of the series. *P. pallida*, Chp., is very close to *inconstans*, but is certainly in my opinion distinct from it inasmuch as its prothorax is of perfectly even convexity from one lateral margin to the other, while on the prothorax of *inconstans* there is an evident wide, shallow, oblique impression on either side marking the difference between the disc and the lateral portion, the latter, moreover, even independently of the said impression, being slightly flattened as compared with the strong convexity of the disc. The specimen from Dr. Chapuis' collection ticketed '*pallida*, Oliv.,' has no locality label attached to it; the other specimens that I have seen are from S.W. Australia.

P. INCONSTANS, Chp., MS.

Late (♂) vel minus late (♀) ovalis; convexa; minus nitida; tota testacea (exemplorum vivorum elytris in disco viridi-nitentibus); antennis sat gracilibus minus elongatis; capite crebre subtiliter vix subaspere punctulato; prothorace quam longiori ut $2\frac{1}{2}$ ad 1 latiori, antice sat angustato, subtiliter sat crebre nullo modo rugulose (sed ad latera grosse) punctulato, ad latera late oblique leviter impresso, angulis anticis sat acutis posticis nullis, lateribus arcuatis; scutello leviter sparsim punctulato; elytris æqualibus, haud (vel valde subtiliter) striatis, puncturis seriatis rotundis parvis valde regulariter dispositis (in seriebus confertim dispositis sicut puncturæ 3 longitudinem interstitii latitudini æqualem occupant), interstitiis planis confertim haud vel vix subaspere subtilius (sed quam series multo magis subtiliter) punctulatis, parte laterali nullo modo rugulosa ut interstitia punctulata et puncturis majoribus (his quam serierum puncturæ paullo minus subtilibus) confuse nec acervatim impressa. Long. 3-4$\frac{1}{4}$, lat. 2$\frac{3}{5}$-3$\frac{1}{2}$ lines.

I am doubtful whether I may not include several closely allied species under this name, but I do not think the point could be decided without breeding some extensive series. There is a considerable difference in size and in the distinctness of the traces of elytral striæ among the specimens before me, the latter, however, being very possibly due to the action of spirits. I have an example from Dr. Chapuis ticketed '*inconstans*,' but cannot find that he has published any description of it. It is a small ♀ specimen (long. 3 lines) with non-striate elytra.

This species has been differentiated from *pallida* under the heading of that species. From the other allied species preceding its non-rugulose prothorax, combined with a surface only slightly nitid and interstitial elytral puncturation notably finer than the seriate, readily distinguishes it; and from the following species (of those not having a defined metallic pattern) its elytral series both fine and very regular furnish a satisfactory distinction.

South and Western Australia and N.S. Wales.

P. decolorata, Chp.

Under this name again it is quite possible that I am including a batch of very closely allied species. It is fairly easy to recognise among its congeners of this subgroup by the lateral part of its elytra being sculptured after the manner of the preceding aggregate (*P. aurea*, *hectica*,—and especially *inconstans*,—&c.), while its elytral series are notably less symmetrical (some of them more or less sinuous or jagged, the 10th in its front part evidently out of order,—yet very much more symmetrical, it must be remembered, than in *variicollis* and its allies) and not particularly fine or closely placed. Although the seriate punctures are notably larger and sparser than in preceding allies (*e.g.*, *inconstans*) they vary in size sufficiently to suggest the possibility already mentioned that I am mixing more than one species under the name. The elytra are rather distinctly striate and their striæ are not of the fine scratch-like character of those of *P. inconstans*, &c. The colour is extremely variable. In living specimens the head and prothorax usually bear some golden markings and the disc of the elytra is tessellated with a great number of small square blotches of silvery or somewhat golden metallic colouring (these were the markings in life of a specimen sent to me from Dr. Chapuis' collection), but in some examples (possibly not truly conspecific) the tessellation is almost wanting or is disposed to a greenish tone, or is more or less suffused over the whole disc, but I think there is always some indication of metallic tessellation at any rate near the external margin of the disc. In dried specimens the colour of the upper surface varies from pale to red-testaceous, in some examples overspread with livid brown which occasionally is not uniform but is concentrated into two faintly defined blotches—one before, the other behind, the middle. The prothorax is frequently variegated with more or less defined markings which tend to the form of the letter U (with its two extremities dilated externally) occupying the disc with or without some blotches near the lateral margin. The example from the Chapuis collection has this marking feebly defined but quite distinct. The underside and legs vary from entirely testaceous to nearly entirely black. This variation of the underside occurs in examples that are certainly conspecific. In the Chapuis example the underside is almost entirely testaceous, the legs entirely so. The antennæ are moderately long and slender, resembling those of *P. inconstans;* the prothorax does not differ much from that of *P. inconstans* (apart from the markings already mentioned) except in the sculpture of its disc tending towards more or less rugulosity, with puncturation of less even appearance owing to the individual punctures being of very unequal size *inter se.* In my specimens from the Chapuis collection the prothorax is *decidedly* rugulose with the punctures of the disc at a maximum of inequality.

I have before me a specimen ticketed '*maculicollis*' by Dr. Chapuis which is decidedly identical with that ticketed '*decolorata*' by the same learned author. It has the dark markings of the prothorax exceptionally pronounced, a dark marking on the middle of the head (of which there are distinct traces in other specimens before me), and the underside very dark; I can state positively that none of these characters are specific or even sexual, —from observation of specimens taken under circumstances that allowed no doubt of specific identity. I do not, however, regard it as the genuine *maculicollis*, Clk., which I have not seen, but have little doubt is a good species. The size of *P. decolorata* is long. 3-4 lines, and it is found all over Australia and Tasmania.

P. CAPTIOSA, Clk.

Of the Rev. H. Clark's descriptions of *Paropsis* only three seem to be founded on species belonging to the portion not having a distinct elytral pattern of this subgroup,—viz., *amœna*, *captiosa*, and *maculicollis*,— all from Western Australia. *P. maculicollis* is a small insect (long. $2\frac{1}{2}$ lines) which I am satisfied that I have not seen, and which (as noted above) Dr. Chapuis identified (wrongly I doubt not) with a much larger species that I cannot separate, otherwise than as a colour var., from *decolorata*, Chp. I cannot find any definite difference between the descriptions of *amœna* and *captiosa*, but have before me examples from W. Australia (one of them from Champion Bay, the habitat cited by Clark) which seem to be certainly *captiosa*, whether that species is or is not distinct from *amœna*. Other specimens before me, which I cannot separate by any definite characters from the W. Australian ones, are from S. Australia and N.S. Wales. Fresh specimens have some feeble metallic colours vaguely diffused on the prothorax and the base of the elytra. Dried specimens are testaceous with some rosy or brown variegation, the prothorax usually brownish-yellow with some more or less distinct paler vittæ, the antennæ becoming infuscate or even piceous towards the apex. I distinguish the species among its immediate allies (*i.e.*, those of the subgroup not having a sharply defined metallic pattern, nor systematic lateral inequalities on the elytra, nor the elytral series of punctures either unsymmetrical or very close and fine) by the following characters, viz., lateral sculpture of elytra not particularly coarse or rugulose, disc of prothorax smoothly, not very closely, and somewhat finely punctured. *P. captiosa* and *amœna* are species that Dr. Chapuis mentioned as unknown to him.

P. FASTIDIOSA, Chp.

I have a specimen of this insect named by Dr. Chapuis. It is distinguishable among its immediate allies by the extreme coarseness of the lateral sculpture of its elytra, the 9th and 10th series consisting of large quadrate punctures separated (puncture from puncture in their series) by narrow elevated ribs, some of which are continuous across the interstice between the series and from a certain point of view appear as continuous wrinkles running transversely from the external edge of the 10th series to (or even beyond) the 8th series. The insect is entirely testaceous or reddish-testaceous in colour except the antennæ which (except the basal three or four joints) are black. The antennæ are not very elongate and are very stout. The puncturation of the prothorax is double, consisting of coarse and considerably finer punctures intermingled, the former of somewhat variable closeness on the disc and becoming extremely coarse near the margins. The confused puncturation of the lateral part of the elytra is very coarse and rugulose, that of the interstices of the series very well defined and comparatively coarse, but not very close. The size is, long. $3\frac{1}{2}$-$3\frac{3}{4}$ lines. The species is widely distributed. Living specimens show very little metallic colouring, usually a faint golden tone about the base of the elytra.

P. FLAVEOLA, Chp. (?).

Of this species I have not seen an example named by Chapuis, and therefore am not certain in my identification. I have before me, however, two specimens from N. Queensland (the locality cited by Chapuis) which agree with the description (such as it is) of *flaveola*. The description mentions only two characters that are of any real value, viz., "puncturation of prothorax fine and very sparse" and "elytral seriate punctures remote." With the former of those characters the examples before me agree well. The latter of the two characters is ambiguous, as the phrase Chapuis uses might suggest that his species belonged to subgroup ii. of this group (containing *stictica*, Marsh., and its allies), but as the description of *flaveola* occurs in Chapuis' memoir several pages away from the descriptions of *stictica*, *inspersa*, &c., the phrase probably means merely that the punctures of the elytral series are less close to each other than in the species among which *flaveola* occurs, which is the case in the specimens before me.

The present species is much like *captiosa*, Clk., in general appearance and is similarly coloured except in the antennæ (the base excepted) being distinctly *black*. It differs from *captiosa* by its much stouter antennæ, its more sparsely punctured prothorax, the coarser and especially less even sculpture of the lateral part of its elytra, and the notably less closely placed punctures of the elytral series. It appears to have had, when fresh, some large ill-defined feebly metallic blotches of a golden-rosy tone on its elytra.

P. RUFESCENS, Chp. (?).

This species is one of which I do not possess any specimens named by Chapuis, and therefore I cannot be certain that my identification is correct. The specimens which I group together under this name may probably represent more than one species, a doubt which can only be solved, probably, by breeding an extensive series and studying the insects in their larval and pupal stages. Among the feebly metallic *Paropses* (of this subgroup) having the elytral series of punctures symmetrical or nearly so, the elytra devoid of systematic lateral inequalities, the elytral series not of very fine and perfectly symmetrical type (as they are in the *hectica* aggregate) and the lateral puncturation of the elytra not of the evenly distributed non-rugulose type (which they are in the *hectica* aggregate and also in *decolorata* and *captiosa*), this species is distinguished from *fastidiosa* by, *inter alia*, the 9th and 10th elytral series not being subconfluent through the coarseness of their punctures (which moreover are not or scarcely of quadrate form), and from *flaveola* by the comparative closeness of the punctures in its elytral series as well as by the less robustness of its antennæ. It is an insect of moderate size (long. 3-4 lines), of short subglobular *Coccinella*-like form, and entirely testaceous or rufo-testaceous in colour saving the antennæ, which (except near the base) are usually infuscate or even blackish. Living specimens usually have some ill-defined golden blotches on the head and prothorax, and the elytra more or less distinctly tessellated with feeble golden or silvery colouring. I have numerous examples before me from S. Australia, Victoria, and N S. Wales.

P. VITTATA, sp.nov.

Late ovalis, fere semicircularis; modice convexa; testacea, antennis apicem versus infuscatis, capite rufescenti postice nigro, prothorace medio indeterminate obscuro, elytris vittis latis binis (altera subsuturali ante medium subinterrupta, altera submarginali antice abbreviata) ante apicem conjunctis aureis vel viridibus (areis inter vittas piceis) et macula humerali concolori ornatis (exemplorum siccatorum coloribus fere obsoletis capite et prothorace medio rufescentibus, elytris indeterminate obscure umbratis, capite postice nigro, antennis apicem versus infuscatis, ceteris partibus testaceis vel viriditestaceis); antennis elongatis sat gracilibus; capite subfortiter crebrius subrugulose punctulato; prothorace quam longiori triplo latiori, antice fortiter angustato, fere ut caput (sed ad latera multo magis grosse) punctulato, latera versus late sat fortiter impresso, angulis anticis acutis posticis nullis, lateribus arcuatis; scutello sublævi; elytris leviter striatis, puncturis rotundis minus parvis sat symmetricis sat crebre in seriebus 10 positis (fere ut *P. decoloratæ*, Chp., sed serie 10ª antice symmetrica), interstitiis minus subtiliter minus crebre punctulatis (his maris planis feminæ leviter convexis), parte laterali haud rugulosa ut interstitia punctulata et puncturis majoribus (his quam serierum puncturæ manifeste minus subtilibus et sat æqualiter dispositis) confuse impressa. Long. 4-4$\frac{1}{2}$, lat. 3$\frac{2}{5}$-3$\frac{4}{5}$ lines.

This species is very easily recognisable when alive by the metallic pattern of its elytra, which consists of a well defined wide subsutural vitta (more or less completely interrupted in front of the middle of the length of the elytra) and a similar vitta placed just within the lateral margin of the discal portion of the elytra (this vitta abbreviated in front), the two of a metallic golden or green colour and confluent at the apex of the discal part of the elytra. There is also a small metallic patch on the shoulder. The parts (of the discal portion of the elytra) that are not metallic are of a piceous tone; the marginal portion is testaceous.

Dried specimens may be at once distinguished from nearly all other species of the subgroup by the head being black at its base, the black colour extending forward far enough to reach beyond the level of the back of the eyes. The head is similarly coloured in the species that I have called *bimaculata*, Oliv., but the latter is not at all closely allied to the present insect, being of a much less wide form, notably less strongly convex, with the punctures of the elytral series less symmetrical and notably finer, &c., &c. Apart from colour, *P. vitatta* is closely allied to *P. decolorata*, Chp., from which, however, it differs by its evidently wider form, metallic elytral pattern (in the living specimen), extensively black base of head, and (in dried examples) generally darker tone of colour.

Victoria and N.S. Wales; on the Australian Alps.

P. ANNULARIS, sp.nov.

Late ovalis; modice convexa; testacea, capite postice macula mediana nigra ornato, elytris maculis 5 discoidalibus et vitta (hac ter dilatata ad disci marginem lateralem sita) aureis ornatis (e maculis discoidalibus 2 basalibus, 3 ita positis ut cum alterius elytri maculis figuram nonnihil circulum simulantem formant); antennis elongatis sat gracilibus; capite crebre subtilius subrugulose punctulato; prothorace quam longiori ut $2\frac{1}{2}$ ad 1 latiori, sparsius subtilius (ad latera grosse rugulose) punctulato, angulis anticis sat acutis posticis nullis, lateribus arcuatis; elytris vix striatis, puncturis parvis sat symmetrice sat crebre in seriebus 10 positis, interstitiis sat planis crebre subtiliter punctulatis, parte laterali ut *P. gloriosæ;* exemplis siccis fere totis testaceis. Long. 3, lat. $2\frac{2}{5}$ lines.

The metallic markings on the disc of each elytron are—two basal spots (the inner one not quite touching the base, and smaller than the corresponding spot in *gloriosa* and *nobilitata*); an elongate spot placed near the suture (slightly in front of the middle of the elytron) and directed from the suture outward and slightly *forward* (the corresponding blotch in *gloriosa* and *nobilitata* is much larger and is directed outward and *hindward*); a small elongate spot placed longitudinally on the 5th interstice considerably behind the middle of its length; a still smaller spot placed about on the 3rd interstice near its apex; and a vitta margining the disc externally and somewhat angularly dilated in front of, at, and behind, the middle of its length. Dried specimens are extremely like *nobilitata* and *gloriosa*, but are distinguishable by the presence of a basal black spot on the head (reaching forward about to the level of the hind margin of the eyes). I have seen a good many specimens of this insect and do not find its markings variable. The discal markings of the elytra (exclusive of the basal ones) are so placed that they would all lie on the circumference of a circle having its centre on the suture about half-way between the middle and the apex.

N.S. Wales; Queanbeyan (Mr. Lea).

P. GLORIOSA, sp.nov.

Late ovalis; modice convexa; testacea, elytrorum disco abdomineque rufescentibus, illis maculis nonnullis splendide aureo- vel viridi-metallicis ornatis [sc. macula magna basali prope scutellum altera parva basali prope humerum sitis, fascia lata obliqua vix pone medium sita (hac extrorsum et retrorsum directa, nec suturam nec disci marginem lateralem attingenti), fascia subapicali (hac fasciæ submedianæ simili sed angustiori), et maculis 2 in disci margine laterali sitis], antennis apicem versus plus minusve infuscatis; antennis elongatis sat gracilibus; capite crebre subtiliter nec rugulose punctulato; prothorace quam longiori fere ut $2\frac{1}{2}$ ad 1 latiori, fere ut caput sed ad latera grosse rugulose punctulato, angulis anticis acutis posticis nullis, lateribus arcuatis; elytris (♂ haud, ♀ leviter) striatis, puncturis parvis sat symmetrice sat crebre in seriebus 10 positis, interstitiis planis vel vix convexis crebre subtiliter punctulatis, parte laterali haud rugulosa puncturis quam serierum puncturæ sat majoribus crebre æqualiter impressa; exemplis siccis fere totis testaceis. Long. $3\frac{1}{2}$-$3\frac{3}{4}$, lat. $2\frac{1}{2}$-3 lines.

The metallic markings on the disc of each elytron of living specimens are—two basal spots, a wide fascia-like blotch running obliquely hindward and outward (abbreviated at both ends and placed immediately behind the middle of the elytron), a similar but narrower blotch placed near the apex and two spots on the lateral margin (of the disc). Dried specimens are not very easy to distinguish from *P. nobilitata*, Er., but they are of somewhat wider form with the testaceous colour of their elytra more or less clouded with infuscation.

Victoria; mountainous districts.

P. NOBILITATA, Er.

The metallic markings of this species (in life) are of green or golden colour and are placed as follows:—a blotch on each side of the prothorax; and on each elytron a large basal blotch close to the scutellum and a small one near the humeral angle, a vitta (abbreviated in front and having its inner edge sinuous) on the disc close to its external margin from close to the hinder end of which a short branch is given off obliquely (forward and towards the suture), and on the apex of this branch a blotch bearing a rough resemblance to an axe in shape (the handle of the axe standing on the aforesaid branch and the edge of the axe-head being directed obliquely forward and towards the suture). The non-metallic portions of the disc of the prothorax and elytra are of various shades of red and their margins are testaceous. The under surface, legs and antennæ are testaceous, more or less tending to red. The above is a description of a living specimen, and as far as my experience goes the markings are scarcely variable (I have not, however, taken the insect in large numbers); it is by no means the case, however, that all the markings described can invariably be brought out by artificial means in all dried examples; very old examples, also any that were not quite mature when killed, and also such as have been previously treated several times for temporarily restoring the colours, are less responsive to treatment than others (as far as my experience extends); but in reasonably fresh and mature specimens I rarely am unable to recall sufficient markings for identification. The species is of moderate size (long. 3-3½ lines) and as yet has been recorded from Tasmania only. Dried examples are entirely testaceous in colour. There can be no reasonable doubt about this being the insect Erichson describes as *nobilitata*. He gives the metallic markings on each elytron as "three rather large spots placed longitudinally near the suture, of which the posterior two are confluent, and a lateral vitta";—the three spots being, no doubt, those which I have indicated as "a large basal blotch close to the scutellum," "a blotch bearing a rough resemblance to an axe in shape," and "a short branch given off from the lateral vitta." The best character that I can find (apart from colours) to distinguish *nobilitata* from its near allies (*e.g.*, *debilis*, Chp., and *decolorata*, Chp.) consists in the lateral portion of its elytra being slightly gibbous close to its line of contact with the discal portion, causing the 10th series of punctures (looked at obliquely from the side) to appear as placed in a distinct stria.

P. DEBILIS, Chp.

I have an example from the Chapuis collection (ticketed with this name) which is evidently a very old one (probably considerably more than 20 years old) on which treatment with benzine brings out distinct though feeble traces of a metallic elytral pattern; and I have also examples taken in Western Australia (Chapuis' locality) by Messrs. Meyrick and Lea that are manifestly the same species, the metallic pattern of which I have developed very clearly. The metallic pattern is extremely like that of *nobilitata*, but differs in that portion which Erichson describes as the hinder two of the 3 spots placed longitudinally near the suture. In the present species they are represented by a single elongate patch of continuously equal width and very sinuous form (somewhat resembling the shape of a sickle) running parallel with the suture, its hind extremity in contact (close to the apex of the elytra) with the extremity of the lateral vitta. Dried specimens scarcely differ from dried specimens of *nobilitata* except in being evidently more convex and without the stria-like structure (mentioned above) of the 10th elytral series; they also resemble dried specimens of *decolorata*, but are easily distinguished from the latter by the non-rugulose puncturation of their prothorax. It is possible that this species is identical with *purpureoaurea*, Clk., but I cannot quite reconcile the pattern of its elytra with that attributed by its author to the latter species which is said to have two rings of metallic colour on each elytron besides the lateral vitta. As far as I can gather this description was furnished to Mr. Clark by the collector from whom he received the species, and may have been somewhat of an "off-hand" nature. I have seen examples of *debilis*, Chp., from diverse localities in W. Australia, and their markings do not seem to be variable.

Subgroup vi.

This subgroup is very easily distinguished by the head in front of the eyes being strongly produced and much narrowed forward. The species known to me are all of small size and of firm texture, non-metallic in colouring (so far as my observations go) and not or but little liable to fade after death. The shape of the head is the only character I can find to separate them from subgroup iv., some of the species of which resemble them closely in size and in colour and markings (*e.g.*, *festiva*, Chp., and *delicatula*, Chp.); indeed I look upon it as a merely artificial arrangement to separate subgroups iv. and vi., but nevertheless one that is of great convenience in monographing so difficult a genus as *Paropsis*. Moreover there are undeniably gradations in the development of the character on which this present subgroup is founded, for, while the anterior prolongation of the head in *rostralis*, Blackb., is so great as to suggest the idea of even *generic* distinction from *Paropsis*, that prolongation is less strongly marked in the other species. The distinction, however, is not entirely a matter of degree of prolongation of the clypeus, for I find that in all the species I place in this subgroup there is a certain point of view from which the portion of the head in front of a line joining the front margin of the eyes appears to have an outline formed by three straight lines (the front one horizontal, the lateral ones oblique), while from a similar point of view the outline of the corresponding portion of the head in the allied species of subgroup iv. appears as an almost even and continuous curve. I cannot ascertain that more than one species of this subgroup has been described hitherto :—viz., *P. Hamadryas*, Stäl, of which *flavitarsis*, Chp., is a variety.

The following tabular arrangement will assist in identifying the species described below :—

A. Clypeus punctured uniformly (or nearly so) with the rest of the head.	
B. The puncturation of the prothorax (except the usual coarsely punctured lateral area) uniformly fine.	
C. Antennæ moderately long and slender (joints 8-10 much longer than wide)	Hamadryas, Stäl.
CC. Antennæ stouter and generally shorter (joints 8-10 not, or scarcely, longer than wide).	
D. Antennæ not having their dilated portion beginning abruptly at the 7th joint.	
E. Eyes quite flat	Dryope, Blackb.
EE. Eyes distinctly prominent	Lucina, Blackb.
DD. Dilated portion of the antennæ beginning abruptly at the 7th joint	Pandora, Blackb.
BB. The coarse lateral puncturation of the prothorax beginning sparsely near the middle of the disc	Vesta, Blackb.
AA. Clypeus scarcely visibly, the rest of the head coarsely, punctured	rostralis, Blackb.

P. Hamadryas, Stäl. (var. *flavitarsis*, Chp.).

This is perhaps the most variable species in the genus *Paropsis*, its variation being so great that it is no easy matter to find two similar specimens, and in many examples the two elytra are dissimilar *inter se*. Presuming that I am not confusing more than one species under the name (which I am fairly confident is the case), *P. Hamadryas* is easily recognisable, for the structure of its head refers it unmistakably to the small aggregate that I have called "subgroup vi.," and it is the only species known to me of that aggregate in which the antennæ can rightly be called even moderately elongate and slender. These organs are much like those of *P. subfasciata*, Chp.; directed backward they extend considerably beyond the base of the prothorax; all the joints, especially the apical 5, are notably longer than wide; and there is very little compression or dilatation of the apical portion—such as there is commencing somewhat doubtfully at the 6th or 7th joint and the 6th and 7th joints being scarcely appreciably narrower than any of those that follow them. The head is much flattened, and is closely and rather strongly punctulate (less closely in rare examples) and longitudinally rugate in front. The prothorax is finely and not closely punctulate except at the sides where it is coarsely rugulose; its length is somewhat less than half its width, and it is not much narrowed in front, with sides feebly rounded, front angles somewhat acute, and hind angles (viewed from above) well defined but obtuse. The elytra are non-striate except near the apex where feeble striæ are visible; their 10 series of punctures are close-set and not particularly fine, but are rendered somewhat inconspicuous by the presence on the interstices of numerous punctures (mingled among smaller punctures) not much smaller than those of the series. Some examples are entirely testaceous in colour. The head usually bears a bifid black patch which varies in size up to the extent of invading the whole surface except the labrum. The prothorax varies (so far as I have observed) only by the usual presence of a more or less developed black spot at the middle of the base. The scutellum is often black. The elytra vary by the usual presence of black markings; beginning with two subbasal short lines and a single median one on each elytron, through a form in which the subbasal lines are 3 and the median 2, and a form in which in addition the suture is (more or less widely) black, and another in which the subbasal and median lines are connected into fasciæ, and another in which a subapical fascia is added, and others in which these various markings increase in size, the black colouring gradually invades the whole elytra except a narrow margin (*flavitarsis*, Chp.), and at last does not leave any testaceous colouring at all; in many examples the undersurface and legs are more or less marked with black, and in some the antennæ are blackish near the apex The species is a small one (long. $1\frac{4}{5}$-$2\frac{1}{4}$ lines), and I have seen examples from S. Australia, Victoria, N.S. Wales, and Tasmania.

P. DRYOPE, sp.nov.

Late ovalis; minus convexa; modice nitida; testacea, varie nigro-notata (exempli typici capitis ad basin summam macula antrorsum biloba, scutello toto, elytrorum macula communi post-scutellari, in utroque elytro macula basali maculaque subapicali annulari, et in corpore subtus maculis plurimis, nigris), capite rufescenti, antennis apicem versus infuscatis; capite ante oculos elongato, crebrius dupliciter (subtiliter et subfortiter) punctulato; oculis depressis, antennis parum elongatis, articulis 5°-8° gradatim latioribus, 8°-10° inter se sat æqualibus quam latioribus parum longioribus; prothorace quam longiori ut $2\frac{1}{2}$ ad 1 latiori, antice valde bisinuato, in disco subtilissime (ad latera grosse crebrius) punctulato, angulis anticis acutis posticis obtusis, lateribus leviter arcuatis; elytris haud striatis, puncturis magnis sat symmetrice (in seriebus 10 dispositis) impressis, interstitiis planis sparsius punctulatis, parte laterali puncturis quam serierum puncturæ vix majoribus crebre sat æqualiter impressa. Long. $1\frac{3}{5}$-2, lat. $1\frac{1}{10}$-$1\frac{2}{5}$ lines.

Extreme specimens of this insect are entirely testaceous except 3 or 4 faint fuscous spots on each elytron; others have 5 or 6 small black spots on each elytron; others have similar spots increasing in size and running into each other more or less until they assume the form and disposition described above. The black markings on the head when present vary up to the degree of suffusing nearly the whole surface. The prothorax is usually testaceous, but in some examples there are faint fuscous blotches which in rare specimens become a transverse discal row of distinct black spots. The insect is easily recognisable among its allies by the characters indicated in the tabulation.

S. Australia and Victoria.

P. LUCINA, sp.nov.

Sat late ovalis; minus convexa; sat nitida; supra rufo-testacea, capite (clypeo excepto) scutello et elytrorum notulis nonnuliis (sc. macula communi pone scutellum et in utroque elytro macula magna ad callum humeralem anuloque anteapicali) nigris, antennis apicem versus infuscatis, subtus plus minusve picescens; capite ante oculos minus elongato; oculis sat convexis; prothoracis angulis anticis parum acutis; cetera ut *P. Dryope.* Long. $1\frac{1}{2}$-$1\frac{7}{10}$, lat. 1-$1\frac{1}{5}$ lines.

Resembles some varieties of *P. Dryope* closely in respect of colours and pattern, and is rather close to that species in most of its structural characters, but differs from it in its very evidently shorter head, much more prominent eyes, and less acute front prothoracic angles. Its head is less produced in front than that of the other species of this subgroup, but is evidently more elongate than in the allied species of subgroup iv. I have seen only two examples (they have identical markings), which were sent to me by Mr. Masters. If they had come from a less accurate collector I should be doubtful as to the correctness of the locality cited for them, as the insect is not in any S. Australian collection known to me.

S Australia.

P. PANDORA, sp.nov.

Sat late ovalis; minus convexa; modice nitida; testacea, varie piceo-notata (exempli typici in elytrorum disco fascia contorta mediana suturam haud attingenti antrorsum prope suturam et prope disci marginem lateralem producta, macula elongata in medio pone basin longitudinaliter sita, et fasciis maculari-bus contortis 2 inter se approximatis ante apicem sitis, piceis), capite rufescenti, antennis apicem versus parum infuscatis; capite ante oculos sat elongato, subfortiter (antice crebre postice sparsim) punctulato; oculis depressis; antennis brevi-bus, articulis ultimis 5 sat abrupte dilatatis, 7°-10° fere transversis; prothorace quam longiori ut $2\frac{1}{2}$ ad 1 latiori, in disco sublævi, ad latera grosse punctulato, angulis anticis sat acutis posticis obtusis, lateribus arcuatis; elytris vix manifeste striatis, puncturis sat magnis symmetrice (in seriebus 10 dispositis) impressis, interstitiis sat planis sub-tiliter punctulatis, parte laterali puncturis quam serierum puncturæ vix majoribus crebre sat æqualiter impressa. Long. $1\frac{1}{5}$, lat. $\frac{4}{5}$ lines.

The head when unduly extruded is seen to be blackish at the base. The markings of the elytra vary from the above description by the faintness or even absence of some or nearly all of them. The species is nearest to *Vesta*, from which, however, it is readily distinguishable (apart from differences of colour and markings) by its notably smaller size, feebler elytral striation, less strongly granulate eyes, and the very much larger area of its prothorax, on which the punturation is fine—that area being, in fact, about half the entire surface, and extends on either side evenly to the lateral area on which the puncturation is evenly coarse, crowded, and rugulose (as is the case in the others of the subgroup excepting *Vesta*), whereas in *Vesta* there is only a narrow median area without coarse punctures, and outside that area coarse puncturation begins sparsely and becomes gradually closer in approaching the lateral areas.

W. Australia; Swan R. district (Mr. Lea).

P. VESTA, sp.nov.

Late ovalis; minus convexa; sat nitida; supra dilute brunnea, colore obscuriori sat indeterminate suffusa (sc. in prothorace versus margines anticum et posticum; et in elytris trans basin maculatim, ad medium fasciatim, pone medium et ante apicem transversim maculatim, maculis fasciaque varie connexis); subtus picescens testaceo-maculata, capite rufescenti; hoc ante oculos sat elongato, sparsius sat fortiter punctulato; oculis sat prominulis; antennis sat brevibus, articulis 7°-11° sat abrupte dilatatis, 7°-8°que quam latioribus haud (9°-10°que parum) longioribus; prothorace quam longiori ut $2\frac{1}{2}$ ad 1 latiori, antice modice bisinuato, in media parte angusta sparsim subtiliter (latera versus gradatim magis crebre magis grosse) punctulato, angulis anticis subacutis posticis obtusis, lateribus leviter arcuatis; elytris 10-striatis, striis crebre fortiter punctulatis, interstitiis subconvexis subtiliter minus crebre punctulatis, striis externis 3 fere confluentibus, parte laterali puncturis inæqualibus sat crebre impressa. Long. $1\frac{3}{5}$, lat. $1\frac{1}{10}$ lines.

Of this species I have seen 4 examples, and do not find much variation in their colouring and pattern: the markings in some being, however, of deeper colour than in others and some of the elytral spots which are isolated in some examples being obscurely connected together in other examples. The peculiar sculpture of the prothorax is described under the heading of the preceding species (*P. Pandora*). This insect is remarkably like *P. delicatula*, Chp., (in subgroup iv.), but differs from it by its larger size, elongated head, and prothoracic sculpture,—the prothoracic sculpture of *delicatula* being of the same kind as that of the other species of this subgroup.

Victoria: Black Spur.

P. ROSTRALIS, sp.nov.

Late ovalis; minus convexa; sat nitida; supra testacea, elytris obsolete fusco-irroratis (nonnullorum exemplorum elytris concinne fusco- vel piceo-notatis,—notulis plus minusve 4-fasciatim dispositis, fasciis anticis 2 ad disci marginem lateralem connexis), capite rufescenti, antennis apicem versus infuscatis; subtus testacea vel picescens; capite ante oculos fortiter elongato subrostriformi, parte postica crebre sat grosse (parte ante oculos subtilissime) punctulato; oculis prominulis; antennis brevibus, articulis 7°-11° sat abrupte dilatatis, 7°-10° quam latioribus haud (11° vix) longioribus; prothorace quam longiori circiter triplo latiori, antice modice bisinuato, sparsius subtiliter (ad latera crebrius fortiter) punctulato, angulis anticis subacutis posticis fere rectis, lateribus leviter arcuatis; elytris haud striatis, puncturis sat magnis sat symmetrice (in seriebus 10 dispositis) impressis, parte laterali puncturis quam serierum puncturæ haud majoribus crebre sat æqualiter impressa. Long. $1\frac{1}{3}$, lat. 1 line.

Although the difference between the almost entirely testaceous and the darkest specimens of this insect is very great, yet there are intermediate forms which connect the two by gradations that allow no doubt of their specific identity. The species is quite incapable of confusion with any other owing to its very remarkable head,—coarsely punctulate behind the level of the front of the eyes and strongly produced in front as a nearly impunctulate almost rostriform clypeus.

S. Australia: Eyre's Peninsula.

Addendum.

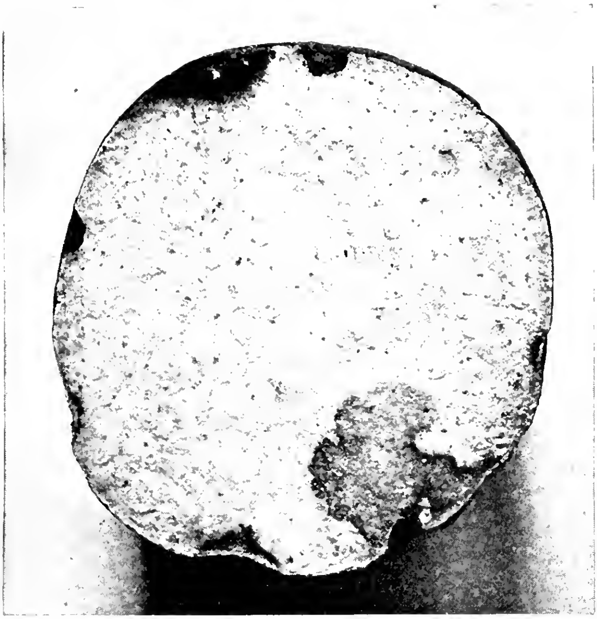
As this present memoir completes my Revision of Group vi., it seems convenient here to enumerate and remark on the species (attributable to the Group) that for various reasons I have been unable to assign to any subgroup. First, however, it should be noted that two species appearing in Mr. Masters' Catalogue as *Paropses* (and referable to Group vi. if they belonged to the genus at all) are almost certainly not members of the genus,—viz., *P. (Paropsipacha) metallica*, Motsch., and *P. (Notoclea) splendens*, W. S. Macl. The former I take to be the insect since called *Cyclomela nitida* by Dr. Baly, and the latter to be a *Cyclomela* or *Augomela* (probably *A. hypochalcea*, Germ.). Excluding those two there remain 10 names, not yet dealt with in this Revision, of species attributable to Group vi. They are as follows :—

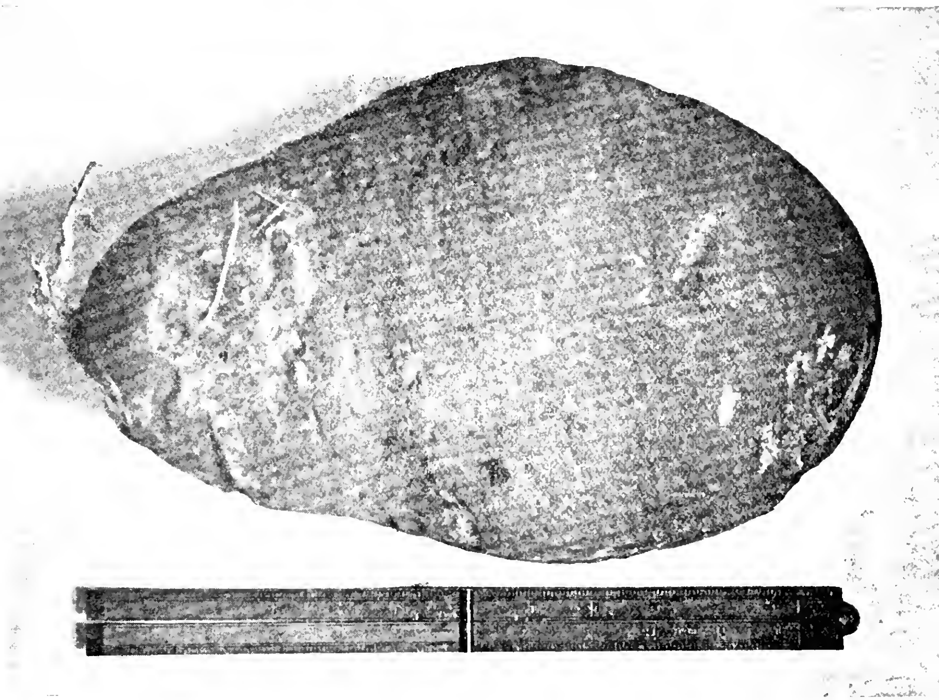
HEDYSCEPE CANTERBURYANA, *F.v.M.*

HEDYSCEPE CANTERBURYANA, *F.v.M.*

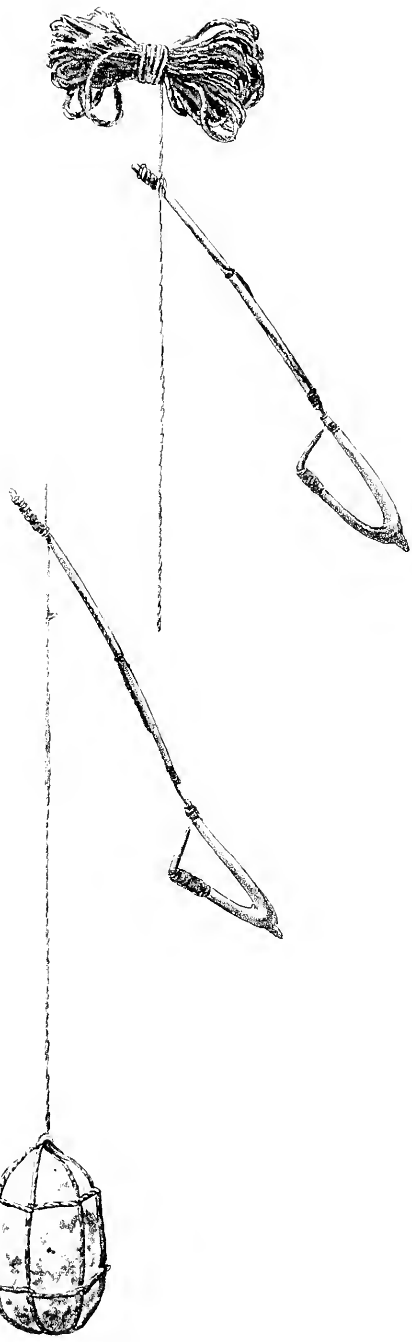
R T B. del.

PARSONSIA PADDISONI, RTB.





PARSONSIA PADDISONI, *R.T.B.*

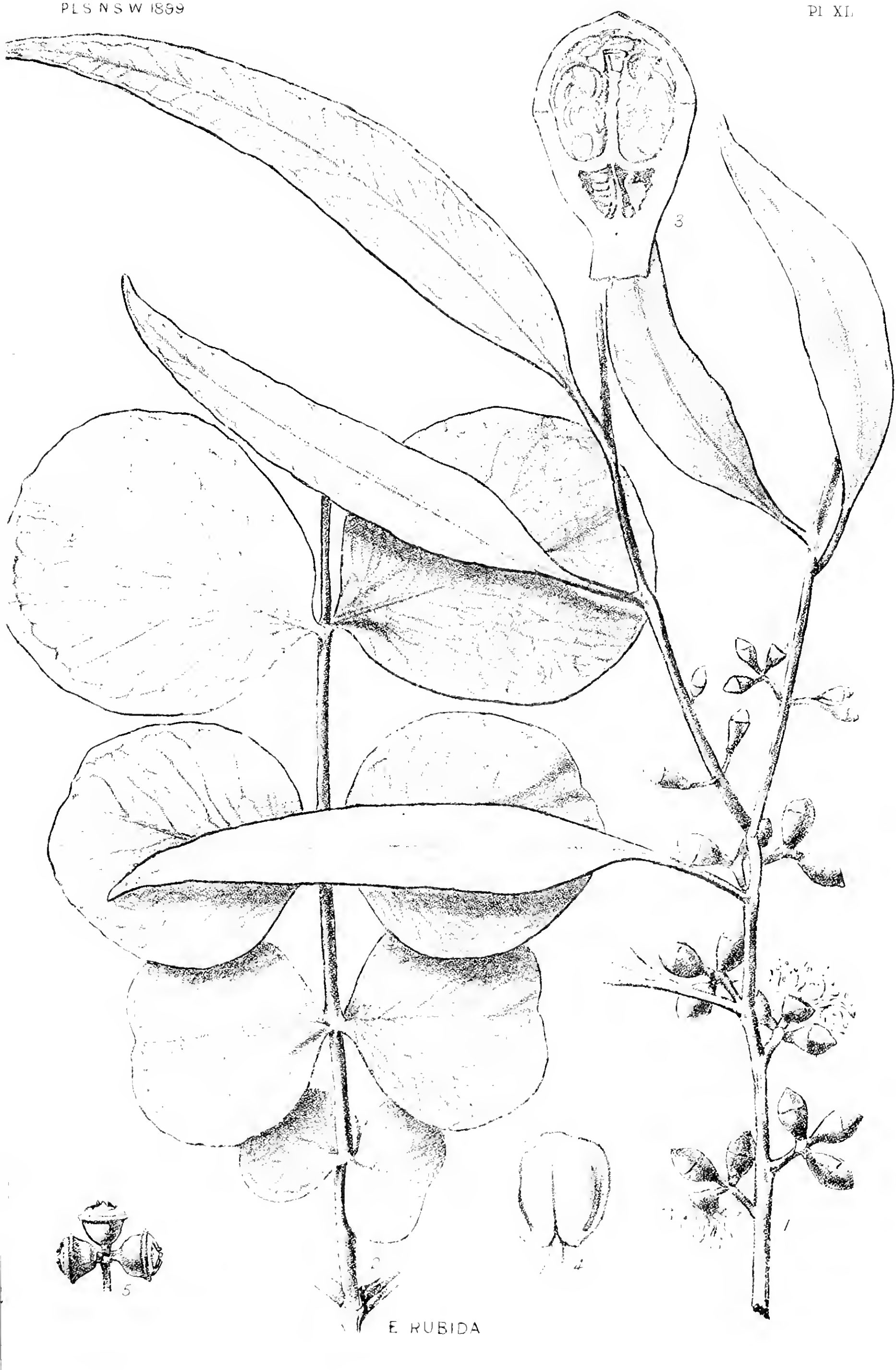


PALU FISHING LINE

E. ACACIAEFORMIS.

E. MACARTHURI

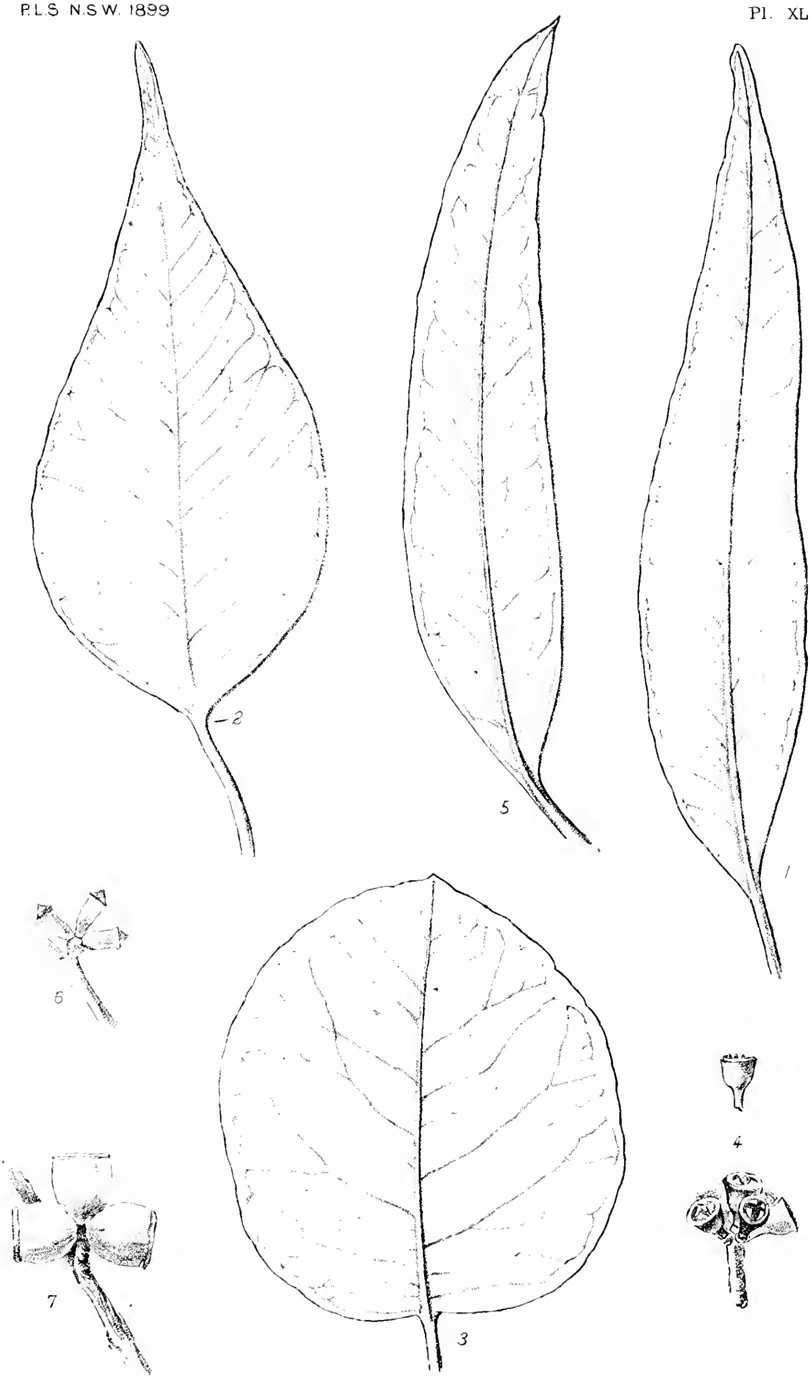
E. QUADRANGULATA



E. RUBIDA

Figs 1-4 E. GONIOCALYX

Figs 5-9 E. TERETICORNIS



Figs 1-4 E. SALIGNA v. PARVIFLORA   Figs 5-7 E. GUNNII v GLAUCA

EUCALYPTUS OREADES R.T.B.

P. nigrita. Chp.—This species belongs to subgroup i. The description does not indicate the characters necessary for that determination, but I have recently obtained a specimen from Chapuis' locality (S. Australia) which is evidently his insect. In my tabulation (P.L.S.N.S.W., 1898) the name should stand on p. 226 under "B. General colour black or brassy or bluish-black," but as my specimen is a female I cannot say whether it belongs to the aggregate "C" or "CC." It, however, differs, *inter alia*, from *irina* by its very much finer elytral series of punctures, from *circumdata* and *subseriata* by the very much closer puncturation of its elytral interstices, and from all three by its much greater convexity and entirely black colouring (except the under surface of its tarsi and of the base of the antennæ).

P. cassidoides, Boisd., *punctulata*, Boisd., *testacea*, Oliv., and *vicina*, Boisd.—The descriptions of these are such that it is impossible to connect them with any insect unless the types could be examined.

P. ustulata, Oliv.—This is in almost the same condition of uncertainty as the preceding four. The description of the colours, however, suggests the possibility of its being founded on a variety of the insect that Germar described as *P. suturalis*. This is little more than a guess, but varieties of *suturalis* are the only *Paropses* I have seen agreeing with the colours attributed to *ustulata*.

P. æmula. Chp., *mitis*, Chp., *maculicollis*, Clk., and *venusta*, Er. All these are names that I cannot associate with any insect, and the descriptions do not furnish the necessary information for placing them in my subgroups. All are small species (long $2\frac{1}{2}$ lines or less) and they appear to me likely to be members of my subgroup iv.

In dealing with Group vi. I have enumerated 191 names which have been applied to its species. Of these I have recognised and tabulated 133 as representing valid species known to me, have indicated 32 as more or less certainly synonyms, and have been unable to furnish definite information concerning 26. The species of my own naming are 42.

REVISION OF THE AUSTRALIAN CURCULIONIDÆ BELONGING TO THE SUBFAMILY *CRYPTORHYNCHIDES*.

By Arthur M. Lea.

Part IV.

This instalment deals with *Psepholax* and allied genera, forming a group not only remarkable on account of the form and sculpture of its members, but on account of their peculiar distribution. *Psepholax* resembles many of the *Scolytidæ* (*e.g.*, *Hylesinus*, *Hylastes*) not only in shape, but in structure of limbs, parts of under surface, &c. In all, the tibiæ (especially the intermediate pair) are very remarkable. Great diversity exists in the mesosternal receptacle. In *Oreda* and *Zeneudes* the walls of the pectoral canal terminate in front in teeth-like processes. *Zeneudes* is the only genus of the subfamily as yet described in which the scape terminates considerably before the eye; in several other genera (*e.g.*, *Neozeneudes*, *Oreda*) the scape when drawn out at right angles to the rostrum does not appear as if it would extend back to the eye, but when at rest it can be seen to touch its lower extremity. *Hybomorphus*, the only apterous member of the group, is perhaps the most remarkable genus of all the Australian weevils.

Pectoral canal not acutely margined.
  Rostrum very short.. .... PSEPHOLAX.
  Rostrum long.......................... .... HYBOMORPHUS.
Pectoral canal acutely margined.
  Scape not attaining the eye .... ZENEUDES.
  Scape attaining the eye.
    Mesosternal receptacle open.
      Receptacle with oblique sides.
        Eyes finely faceted.

Intermediate tibiæ bidentate externally.... NEOZENEUDES.
Intermediate tibiæ (except at apex) normal THEREBUS.
Eyes coarsely faceted.......................... PSEUDOTHEREBUS.
Receptacle with parallel sides....................... THEREBIOSOMA.
Mesosternal receptacle cavernous.
Walls of pectoral canal dentate in front............ OREDA.
Walls simple.
Pectoral canal terminated between four anterior coxæ.. PSEPHOLACIPUS.
Pectoral canal terminated almost at metasternum DERBYIA.

Genus PSEPHOLAX, White.

Voy. Ereb. & Terr., Ins. p. 15; Lacordaire, Gen. Col. vii. p 72: Pascoe, Journ. Linn. Soc. Zool. xi. 1872, p. 481; Broun, Man. N.Z. Col. p. 478.

Pteroplectus, Schönherr, Mant. Sec. p. 50 (sp. inedit.).

Head large, not at all concealed by prothorax; forehead flat. *Eyes* ovate, finely faceted, distant. *Rostrum* short, wide. Mandibles large, stout, feebly dentate internally. *Antennæ* moderately stout; scape inserted nearer apex than base of rostrum, the length of funicle; two basal joints of funicle slightly longer than wide, the others transverse: club ovate, the length of four or five preceding joints. *Prothorax* convex, narrowed in front, apex scarcely produced and slightly emarginate in middle; sides rounded, strongly in front of middle, feebly to base; ocular lobes obtuse. *Scutellum* moderately large. *Elytra* convex, subcordate, closely applied to and slightly or not all wider than prothorax, sides decreasing with a more or less rounded outline to apex. *Pectoral canal* wide, shallow, walls rounded in front and not at all precipitous or ridge-like, emargination widely transverse. *Mesosternal receptacle* not excavated, either flat or slightly convex, slightly rounded behind. *Metasternum* large, slightly shorter than basal segment of abdomen; episterna very large. *Abdomen* large, sutures distinct, segments of variable size. *Femora* variable; posterior coxæ strongly transverse, almost touching elytra; tibiæ compressed, curved, in addition to the terminal hook with a small subapical tooth, the intermediate* strongly bidentate externally, the posterior feebly dentate at external apex; tarsi long and thin, 3rd joint moderately wide, deeply bilobed, feebly spongiose beneath, claw-joint elongate; claws widely separated. Elliptic or elliptic-ovate, convex, squamose, winged.

An extraordinary genus abundantly represented in New Zealand. One species has been described from Norfolk Island and three from Eastern Australia, and two are here added. It is probable that others have yet to be discovered in the forests of New South Wales and Queensland, as all the specimens I have myself taken have been chopped out from solid and freshly felled timber.

Rostrum and head between eyes densely setose.
  Elytra fasciate beyond middle... .. .. *egerius*, Pasc.
  Elytra non-fasciate.................................... .... *Mastersi*, Pasc.
Rostrum not densely setose.
  Rostrum wider than long.......... .... *latirostris*, Pasc.
  Rostrum longer than wide.
    Elytra with large claw-like tubercles in middle.... ... *leoninus*, n.sp.
    Elytra without large tubercles........ .... *humeralis*, n.sp.

PSEPHOLAX MASTERSI, Pasc.; Mast. Cat. Sp. No. 5409.

Dark reddish-brown; upper surface subopaque, under surface shining. Sparsely clothed with small ochreous scales. Head between eyes with a tuft of golden-brown erect setæ continued in rostral grooves almost to antennæ. Under surface with whitish elongate scales, longer on anterior coxæ and metasternum than elsewhere.

Head rather strongly punctate on flattened part. *Rostrum* slightly longer than head, sides parallel, polished and very finely punctate, sides grooved. *Prothorax* transverse, base feebly bisinuate; rather densely punctate, punctures small and shallow, basal third granulate-punctate. *Elytra* more than twice the length of prothorax; striate-punctate, striæ feeble, punctures close

* Except in *latirostris*.

together at sides, more distant towards suture; interstices feebly convex, wider along middle than at sides or suture, finely punctate, seriate-granulate, granules small and irregular at base, becoming larger and more acute towards and terminating before apex. *Under surface*, except apical segment of abdomen, sparsely punctate. Mesosternal receptacle flat. *Femora* moderately stout, not grooved, feebly dentate, teeth of the anterior very feeble; posterior extending to apex of elytra. Length $8\frac{1}{2}$, rostrum $1\frac{1}{2}$; width 4 mm.

Hab.—Q.: "Wide Bay" (Pascoe)—N.S.W.: Richmond River (Lea).

PSEPHOLAX LEONINUS, n.sp.

Dark reddish-brown; subopaque above, shining below. Clothed with ochreous scales sparsely distributed and small on head, rostrum and prothorax, rather denser and suberect on elytra. Under surface with elongate and almost white subsetose scales. Ciliation of ocular lobes long and golden-yellow.

Head finely punctate on vertex, densely between eyes and on rostrum to antennæ, punctures separated by narrow transverse short ridges. Rostrum slightly longer than head, slightly wider near apex than at base; scrobes shallow and open near eyes, rather deep in front. *Prothorax* transverse, base bisinuate; densely punctate, punctures rather small, shallow and round, towards base separated by feeble transverse ridges. *Elytra* scarcely twice the length of prothorax; seriate-punctate, punctures small, at sides in feeble striæ, on disc more or less interrupted; each elytron with four distinct shining claw-like tubercles, one on the 5th interstice about the middle, and three on the 3rd, of which the one nearest the base is separated from the others by a distinct transverse impression which is continuous from suture to 7th interstice; towards base with numerous small transverse ridges from sides; about middle to near apex with numerous small acute tubercles, all of which are directed backwards. *Pectoral canal* feebly transversely wrinkled. Mesosternal receptacle feebly convex, and, with the rest of the under surface, sparsely punctate; the apical segment, however, moderately densely punctate.

Femora stout, not grooved or dentate, the anterior about twice as long as wide; the posterior about thrice, somewhat compressed and passing apex of elytra. Length $7\frac{1}{3}$, rostrum $1\frac{1}{2}$; width $3\frac{1}{2}$ mm.

Hab.—N.S.W. (Herr J. Faust), Richmond River (Lea)—Q.: Wide Bay (Sydney Museum).

Differs from all previously described species, except the New Zealand *Helmsi*, by the large claw-like tubercles of the elytra; these, however, are not constant as regards their number, as on one specimen there are four on the right elytron and three on the left, and on another three on the right and four on the left; on another there are but three on each.

PSEPHOLAX LATIROSTRIS, Pasc.; *l.c.* No. 5410.

Dark reddish-brown; upper surface subopaque, under shining. Moderately clothed with dingy yellowish scales, denser on abdomen than elsewhere.

Cylindrical. *Head* with dense round punctures; ocular fovea small. Rostrum very short and wide, being slightly wider than long; the sides feebly decreasing to apex; punctures as on head, but rather denser. Scape less than half the length of funicle and club combined. *Prothorax* feebly transverse, apex not much narrower than base; with somewhat round and rather dense punctures, at sides and base separated by short ridges; with a feebly elevated shining median carina. *Elytra* almost thrice the length of prothorax; striate; interstices regular, gently convex, with numerous small shining granules placed more or less transversely. *Under surface* (except at sides) rather indistinctly punctate. *Femora* moderately stout, indistinctly grooved and feebly dentate; intermediate tibiæ not wider than posterior and not externally bidentate. Length $9\frac{1}{2}$, rostrum $1\frac{1}{2}$; width 3 mm.

Hab.—N.S.W.: "Illawarra" (Pascoe), Manning River—Lord Howe Island (Macleay Museum).

The rostrum and intermediate tibiæ are at variance with the other species of the genus, but these are scarcely sufficient to warrant a genus being erected to receive the species.

Psepholax egereus, Pasc.; *l.c.* No. 5408.

Piceous-brown, upper surface opaque, under shining. Moderately clothed with dingy yellowish (in places setose) scales; a distinct fascia of sooty scales on the elytra just beyond middle. Under surface and legs with long thin yellowish setæ. Between eyes and on base of rostrum densely clothed with long erect yellowish setæ.

Elliptic, subcylindrical. *Head* flattened and with round and rather dense punctures on vertex. Rostrum about once and one-third as long as wide; apical half highly polished and impunctate, basal portion concealed. Scape inserted nearer apex than base, almost the length of funicle. *Prothorax* moderately transverse, apex rather suddenly constricted; densely punctate, punctures (except in middle) separated by small ridges. *Elytra* about twice the length of prothorax, subcordate: punctate-striate, punctures (except towards apex) almost concealed; interstices gently convex, almost regular, with minute granules becoming larger on sides towards apex, and numerous at base on each side of scutellum; 5th interstice dilated in middle. *Under surface* indistinctly punctate except at sides and the apical segment *Femora* moderately grooved, edentate. Length $7\frac{3}{4}$, rostrum $1\frac{1}{2}$; width 4 mm.

Hab.—"Queensland" (Pascoe), Wide Bay—N.S.W.: Clarence River (Macleay Museum).

Psepholax humeralis, n.sp.

Piceous; upper surface opaque, under shining. Irregularly clothed with dingy yellowish scales; each side of elytra at base with a distinct patch of long yellowish setæ. Under surface and legs with long thin setæ.

Somewhat elliptic-ovate. *Head* flattened; basal portion finely punctate, elsewhere coarsely punctate and with short transverse curved ridges which are continued to apical third of rostrum but gradually becoming feebler. Rostrum twice as long as wide; apical portion of scrobes visible from above. *Prothorax* as in the preceding species, but the ridges separating the punctures much more pronounced. *Elytra* about twice the length of prothorax; very irregular about middle where the 3rd and 5th interstices (although raised above their fellows) scarcely attain the general level; sides and base with numerous small granules, less numerous but rather larger towards apex, and entirely absent in middle. *Femora* feebly grooved and edentate, posterior strongly compressed. Length $6\frac{1}{2}$, rostrum $1\frac{1}{2}$; width $3\frac{1}{2}$ mm.

Hab.—Q. : Wide Bay (Macleay and Sydney Museums).

Closer to *P. leoninus* than to any other species here described.

PSEPHOLAX PASCOEI, Oll.: P.L.S.N.S.W. 1887, p. 1008. *Hab.*—Norfolk Island.

I have not a specimen of this species under examination, but when looking at the type some time ago I noticed that it was allied to *latirostris*, but differed in the alternate interstices of the elytra.

Genus HYBOMORPHUS, Saunders and Jekel.

Ann. Soc. Ent. Fr. 1855, p. 301; Lacordaire, Gen. Col. vii. p. 141.

Head small, almost concealed by prothorax; ocular fovea small, deep. *Eyes* small, subovate, not very finely faceted, distant. *Rostrum* long, thin, slightly curved, sides very feebly incurved to middle. *Antennæ* slender; scape inserted nearer apex than base of rostrum and passing apex, almost the length of funicle and club combined; two basal joints of funicle elongate; club small, oblong-ovate. *Prothorax* convex, transverse, sides and base rounded, ocular lobes obsolete; junction of pronotum and prosternum ridge-like. *Scutellum* absent. *Elytra* scarcely longer than wide, base widely and semicircularly emarginate and slightly wider than prothorax, rounded from near base to apex, each side with a distinct epipleural fold. *Pectoral canal* wide in front, narrow and deep between anterior coxæ and terminated between the intermediate, walls rounded in front of anterior coxæ, and not at all precipitous or keeled. *Mesosternal receptacle* slightly transverse, sides slightly raised above metasternum, middle open and excavated. *Metasternum* about half the length of 1st abdominal segment, very narrow between four posterior coxæ; episterna very narrow in middle. *Abdomen* moderately large, sutures distinct; two basal segments large, 1st slightly longer than 2nd, intercoxal process wide, almost truncate, apex raised in middle, three apical segments small, apical slightly shorter than 2nd and noticeably longer than the intermediates combined. *Legs* rather short and thick; femora feebly grooved and obsoletely dentate, posterior terminated just before apex of abdomen; posterior coxæ transverse, almost touching elytra; tibiæ rounded, straight beneath, somewhat sinuous above and thickened at apex, terminal hook short and stout, each with a small subapical tooth on each side of which is a tuft of elongate setæ: tarsi rather slender, 3rd joint short, not much wider than 2nd, deeply bilobed, claw-joint moderately elongate; claws feeble. Briefly elliptic, convex, apterous.

A remarkable genus, the true position of which I believe to be close to *Psepholax*. M. Lacordaire places each in a separate "groupe," the latter in the *Ithyporides*, the former in the *Cryptorhynchides vrais*. I have not seen the original description.

HYBOMORPHUS MELANOSOMUS, S. & J., *l.c.* p. 302.

Black, softly shining; antennæ and tarsi dull reddish-brown. Prothorax with a very minute and indistinct scale in each puncture, sides and base margined with ochreous scales. Elytra with small scattered ochreous scales on apical half and condensed on sides about apex and on the 4th interstice beyond the middle. Each puncture of under surface with a small scale. Tibiæ and apex of femora with ochreous scales

Head with small shallow punctures. Rostrum thin, subparallel, shorter than prothorax and more than twice the length of head; punctures somewhat similar to those on head but less rounded, and here and there interrupted by small impunctate spaces. Funicle with first joint the length of 2nd-4th, 2nd equal to 3rd-4th, 5th-7th slightly transverse. *Prothorax* transverse (8 × 10½ mm.), with a very feeble impression in middle of base; with small, round, shallow punctures, not very close together but remarkably regular. *Elytra* as wide as length of suture ($11\frac{1}{2}$ mm.) and but little shorter than greatest length ($12\frac{3}{4}$ mm.); with small feeble punctures and towards the sides feebly wrinkled; a moderately distinct subsutural stria, scarcely visibly striate elsewhere; 5th interstice feebly raised from near base almost to apex; epipleuræ feebly wrinkled at base, dilated and more oblique behind middle, from middle to near apex with two rows of moderately distinct punctures. *Under surface* with somewhat similar but larger punctures than those on prothorax, punctures larger on basal segment of abdomen and coxæ than elsewhere. Length $17\frac{1}{2}$, rostrum $5\frac{1}{2}$; width $11\frac{1}{2}$ mm.

Hab.—Lord Howe Island.

I am indebted to Mr. George Masters for the specimen described.

Since the specimen described above was examined, I have obtained a smaller specimen (15 mm.) from the Sydney Museum. It differs in having the elytral ridges less pronounced, the rostrum more coarsely punctate, and in having a deep and large pear- (or top-) shaped fovea on the under surface of the head immediately behind the rostrum. In the larger specimen this fovea is entirely absent, the convexity of that part of the head being uninterrupted.

Genus ZENEUDES, Pascoe.

Journ. Linn. Soc. Zool. xii. 1873, p. 35.

Head rather small, convex, not concealed; ocular fovea small, narrow. *Eyes* small, subreniform, finely faceted, distant. *Rostrum* rather long and stout, arched at base. *Antennæ* stout; scape short, scarcely half the length of funicle, inserted slightly nearer apex than base of rostrum, termination distant both from eye and apex of rostrum: funicle stout, 1st joint as long as wide, 2nd wider and larger than first, the others strongly transverse; club short, subconical. *Prothorax* subdepressed, apex produced and narrow, behind it subquadrate, base feebly bisinuate; ocular lobes almost rectangular. *Scutellum* small, subtriangular. *Elytra* no wider than and scarcely twice the length of prothorax, sides parallel to near apex, apex feebly produced and rounded. *Pectoral canal* not very deep or wide, terminated nearer anterior than intermediate coxæ, in front acutely margined, each margin just behind the ocular lobe produced in a tooth-like process. *Mesosternal process* level with metasternum, flat except that it is slightly scooped out in front, the sides being produced forwards so as to touch the anterior coxæ. *Metasternum* large, the length of basal segment of abdomen; episterna large. *Abdomen* large, sutures distinct; basal segment longer than 2nd, apex incurved to middle, intercoxal process rather narrow and rounded; intermediates slightly sloping from apex to base, their combined length equal to that of 2nd and slightly more than that of apical. *Legs* moderately long and thin; femora edentate, narrowly and very feebly grooved for half their length, posterior terminated before apex of abdomen; posterior coxæ transverse, almost touching elytra; tibiæ thin, compressed, grooved, bisinuate beneath, each in addition to the terminal hook with a small sub-apical tooth both above and below; tarsi moderately narrow, 3rd joint not much wider than long, deeply bilobed; claw-joint elongate; claws strongly curved. Cylindrical, squamose, punctate, winged.

Of the described Australian genera this is the only one in which the scape does not extend to the eye; and there is no scrobe behind, the rostrum in its position being flattened and shining back to the eye; in front, however, there is a groove so that the side appears somewhat as a boar's tusk. The dilated 2nd joint of the funicle reminds one somewhat of the antennæ in many of the *Pselaphidæ*. As Mr. Pascoe has remarked, it is allied to the New Zealand *Oreda*, which has the teeth-like projections of the margins of the pectoral canal more acute and longer than in *Z. sterculiæ*: this character is a most remarkable one and it is singular that it should have been overlooked by Mr. Pascoe; does it denote an approach to such forms as *Chirozetes* and *Mecopus*? *Oreda* agrees in many unusual features with *Zeneudes*, but is separated on account of the mesosternal receptacle being cavernous and the scape extending back to the eye.

ZENEUDES STERCULIÆ, Pasc.; Mast. Cat. Sp. No. 5411.

Dark piceous-brown, legs and antennæ somewhat paler; feebly shining, rostrum highly polished. Head sparsely squamose; rostrum glabrous except in lateral grooves; prothorax with ochreous scales about base and apex and a few on disc, elsewhere with small sooty scales; elytra more densely clothed, the scales larger and the ochreous rather more numerous than the sooty ones. Under surface with sparse ochreous or whitish scales, denser on mesosternal receptacle than elsewhere. Pectoral canal with fine silken pubescence, giving it a somewhat misty appearance.

Head with rather small punctures. Rostrum almost the length of prothorax, feebly widening from base to apex; very finely punctate; grooved on each side, the grooves terminating before antennæ; a shallow groove on each side in front of antennæ. *Prothorax* as long as wide; punctures rather small, those at summit of lateral declivity bounded by small acute ridges; a shining rounded carina very indistinct near base and apex, but distinct along middle. *Elytra* seriate-punctate, punctures large, oblong, each decreasing in depth to base and apex and more or less replete with scales; interstices raised, the width of or narrower than punctures. *Metasternum* with rather large shallow punctures on flanks; episterna each with a single row of punctures but becoming confused at apex. Abdomen with rather sparse punctures except on apical segment, the basal with a semicircular row of very large punctures. Length $10\frac{1}{2}$, rostrum 3; width $4\frac{1}{2}$ mm.

Hab.—Gayndah (on "bottle-trees," *Sterculia rupestris*: Mr. George Masters).

I have recently obtained a specimen from the Sydney Museum which differs from the one above described in being smaller (8 mm.), rostrum shorter and termination of scape less distant from eye; it is perhaps a female.

NEOZENEUDES, n.g.

Head moderately large, convex, not concealed; ocular fovea small. *Eyes* ovate, distant, finely faceted. *Rostrum* the length of prothorax, moderately stout in ♂, thinner in ♀, slightly curved; scrobes shallow; base on each side with a shallow groove. *Antennæ* stout, scape inserted almost in exact middle of rostrum, shorter than funicle, apparently (only) not extending back to eye; 1st joint of funicle obtriangular, 2nd compressed, longer and wider than 1st, the others widely transverse; club subconical. *Prothorax* feebly transverse, slightly convex, apex produced and narrow, sides towards apex strongly towards base feebly rounded, base bisinuate; ocular lobes rectangular. *Scutellum* moderately large, somewhat round. *Pectoral canal* deep and wide, terminated between intermediate coxæ. *Mesosternal receptacle* not raised, scooped out in front, sides decreasing to base; open. *Metasternum* large, slightly shorter than basal segment of abdomen; episterna large. *Abdomen* moderately large, 1st segment as long as 2nd and 3rd combined; intercoxal process somewhat triangular; 3rd and 4th combined slightly longer than 2nd or 5th. *Legs* moderately long; femora stout, the anterior shorter and stouter than the others, anterior feebly dentate, the four posterior grooved and strongly dentate, posterior terminated before apex of abdomen; posterior coxæ transverse, bounded at sides by metasternal episterna; tibiæ compressed, grooved, bisinuate beneath, each in addition to terminal hook with a small subapical tooth both above and below; the intermediate strongly ridged above, the ridge excavated in middle and causing the tibiæ to appear bidentate as in *Psepholax*. Subcylindrical, squamose, punctate, winged.

This genus is clearly intermediate in position between *Zeneudes* and *Oreda*, differing from the former in the scape extending back to the eye, and from the latter by the open mesosternal receptacle.

NEOZENEUDES DIVES, n.sp.

♂. Reddish-brown or black, feebly shining, apical half (or two-thirds) of rostrum highly polished. Densely clothed with soft scales varying in colour from pale yellow (or even white) to dark brown or black: head and basal half of rostrum with pale ochreous and reddish-brown scales: prothorax more densely clothed than elsewhere—scales on each side at base and apex paler, sometimes silvery white: on disc the dark brown scales more or less condensed into spots; on one specimen the dark scales almost black and forming the letter O with a median spot; the yellow scales have frequently a golden lustre; scales of elytra variable in colour and pattern, but usually forming a moderately distinct small pale spot on each side about middle and another and more feeble one on each side of apex. Under surface with paler scales than above and denser on two basal segments of abdomen and flanks of metasternum than elsewhere. Legs moderately densely clothed.

Head densely and rather strongly punctate. Rostrum slightly dilated and grooved on each side between base and antennæ; between grooves strongly and subseriately punctate, sides towards apex with rows of small punctures. *Prothorax* with small and shallow punctures; those in middle of summit of lateral declivity bounded by feeble ridges; a feeble shining median carina not continuous to base or apex, and more or less concealed. *Elytra* striate-punctate, punctures moderately large, long and narrow; interstices gently convex, much wider than punctures. *Metasternum* rather sparsely punctate in middle, base with a semicircular row of large punctures, a similar row on basal segment of abdomen, apical segment densely and strongly punctate, elsewhere with sparse and moderately large punctures. *Femora* stout, the anterior very feebly, the four posterior strongly dentate. Length $8\frac{3}{4}$, rostrum $2\frac{1}{5}$; width $3\frac{3}{4}$; variation in length $5\frac{1}{2}$-$8\frac{3}{4}$ mm.

♀. Differs in having the rostrum thinner, not dilated between base and much less coarsely punctate; the antennæ also are noticeably thinner.

Hab.—New South Wales (Herr J. Faust), Illawarra (Macleay Museum).

The scales are sometimes very beautiful, having frequently a golden, silvery or purplish lustre.

Genus Therebus, Pascoe.

Journ. Linn. Soc. Zool. xi. 1872, p. 480.

Head not concealed; ocular fovea shallow and indistinct. *Eyes* subreniform, finely faceted, distant. *Rostrum* the length of prothorax, comparatively slender, feebly curved; mandibles prominent and rather acute. *Antennæ* moderately stout; scape shorter than funicle, inserted at exact middle of rostrum; 1st joint of funicle elongate, the others short, 7th strongly transverse; club moderately large, ovate. *Prothorax* convex, transverse, apex narrow, feebly produced, sides strongly rounded behind apex but straight on basal half, base truncate; ocular lobes almost rectangular. *Scutellum* moderately large and subtriangular. *Elytra* subcylindrical, wider than and about thrice the length of prothorax: base feebly bisinuate, sides parallel to near apex, apex rounded. *Pectoral canal* not very deep or wide, terminated in front of intermediate coxæ. *Mesosternal receptacle* depressed between intermediate coxæ, raised in front, and at apex vertically truncate. *Metasternum* large, shorter than 1st abdominal segment; episterna large. *Abdomen* large, basal segment about once and one-third the length of 2nd, straight at apex, intercoxal process rounded; intermediates large, their combined length equal to that of 2nd and more than that of 5th. *Legs* moderately long; femora moderately stout, not grooved or dentate, posterior terminated considerably before apex of abdomen; posterior coxæ transverse, at sides bounded by metasternal episterna; tibiæ slightly compressed, not bisinuate beneath, widened at apex, in addition to terminal hook each with a small subapical tooth both above and below; tarsi moderately wide, 3rd joint wide, deeply bilobed, claw-joint elongate, setose. Subelliptic, convex, squamose, punctate, winged.

This genus appears to be allied to *Psepholax*, but I do not think that the imagines of the only known species are borers.

Therebus cepuroides, Pasc., *l.c.* p. 480, Plate xii. fig 13.

Brownish-red; prothorax darker than elytra, head and rostrum darker than prothorax; antennæ dull red. Moderately densely clothed with scales, having a rather dingy appearance to the naked eye but under a lens having a soft golden gloss; whitish scales on flanks of prothorax and scattered about in small patches on the elytra. Under surface with moderately elongate and elongate scales, denser on abdomen than elsewhere except on mesosternal receptacle where they are all elongate, and obscure its form. Pectoral canal with moderately stout elongate scales in front.

Head and rostrum densely and strongly punctate, punctures rather smaller and deeper towards apex of rostrum than elsewhere. Head feebly impressed between eyes. Rostrum parallel-sided, grooved on each side between base and antennæ. *Prothorax* with rather large, perfectly round and shallow punctures, larger in middle and towards base than elsewhere; from apex to beyond middle with a feeble shining carina. *Scutellum* punctate. *Elytra* about once and one-fourth the width of prothorax; striate-punctate, punctures large, suboblong; interstices feebly rounded, considerably wider than punctures, densely and rather strongly punctate. *Under surface* moderately densely punctate, punctures small and round but not regular in size, apical segment densely punctate. Length 7, rostrum 2; width $3\frac{1}{2}$ mm.

Hab.—"Western Australia" (Pascoe), Geraldton (Lea).

The prothoracic punctures are peculiar, for, though shallow, they are very acutely bordered.

PSEUDOTHEREBUS, n.g.

Head rather small, moderately convex; ocular fovea indistinct. *Eyes* ovate, coarsely faceted, distant. *Rostrum* thin, moderately long, almost straight. *Antennæ* moderately stout; scape inserted almost in exact middle of rostrum, curved and dilated at apex, slightly shorter than funicle; 2nd joint of funicle slightly longer than 1st, 3rd-7th transverse; club briefly ovate *Prothorax* feebly transverse, rather flat, sides rounded, apex feebly produced and more than half the width of base but rather suddenly narrowed, base bisinuate; ocular lobes obtusely rounded. *Scutellum* small and round. *Elytra* cylindrical, slightly but noticeably wider at base than prothorax, shoulders slightly rounded. *Pectoral canal* rather narrow and shallow, its termination not very evident, but if considered at receptacle then at base of anterior coxæ. *Mesosternal receptacle* not raised, triangular, widely and feebly emarginate in front, scarcely visibly concave; open *Metasternum* slightly longer than basal segment of abdomen; episterna rather large. *Abdomen* large, 2nd segment almost as long as 1st, as long as 3rd and 4th combined, and noticeably longer than 5th. *Legs* moderately long and rather thin; posterior coxæ not extending to sides; femora not grooved, all distinctly dentate, posterior terminating about apical segment; tibiæ compressed, bisinuate beneath, in addition to the (rather strong) terminal hook with a small subapical tooth both above and below; tarsi moderately narrow. Subcylindrical, squamose, punctate, winged.

Allied to *Therebus*, but differs in the facets of eyes, dentition of femora, and to a certain extent in shape of mesosternal receptacle.

PSEUDOTHEREBUS SCULPTIPENNIS, n.sp.

Piceous, antennæ and tarsi feebly diluted with red. Not very densely clothed with dull ochreous mingled in places with sooty-brown scales. Under surface with sparser scales (moderately dense, however, on anterior coxæ and sides of apical segments) of a more uniform colour.

Head densely and coarsely punctate, punctures partially concealed. Rostrum densely punctate on basal fifth, elsewhere highly polished and with fine punctures subseriate in arrangement, a very indistinct groove on each side at base. *Prothorax* with perfectly round, large, shallow, sharply defined punctures and with a raised shining carina continuous from base to apex. *Elytra* striate-punctate; punctures oblong, deep, each separated by a thin transverse ridge except at sides; interstices scarcely convex, slightly rugose, wider than striæ and with small shining granules scarcely visible except where scales have been abraded.

Under surface irregularly and in places rather densely punctate; metasternal episterna each with a single row of punctures. Length $8\frac{2}{3}$, rostrum $1\frac{3}{4}$; width $3\frac{1}{2}$; variation in length $7\frac{1}{2}$-$8\frac{2}{3}$ mm.

Hab.—Q.: Mount Dryander (Mr. A. Simson, No. 2229).

With a good lens and in suitable lights the whole of the under surface may be seen to be densely covered with very minute punctures.

THEREBIOSOMA, n.g.

Eyes finely faceted. *Rostrum* feebly curved. Two basal joints of *funicle* equal in size; club normally ovate. *Prothorax* decidedly transverse. *Pectoral canal* rather narrow and deep, terminated almost at metasternum. *Mesosternal receptacle* quadrate, sides very narrow; open. *Femora* edentate. Other characters as in the preceding genus.

Allied to the preceding genus and to *Therebus*, from both of which it may be readily distinguished by the shape of the mesosternal receptacle.

THEREBIOSOMA RHINARIOIDES, n.sp.

Dull reddish-brown, rostrum darker; antennæ and tarsi reddish. Moderately densely clothed with dingy ochreous scales, the elytra with a feebly maculate appearance owing to spots of sooty scales. Under surface and legs more regularly clothed with paler scales. Head and basal third of rostrum squamose.

Head densely but indistinctly punctate. Rostrum densely punctate on basal third, elsewhere shining and with small but deep and distinct punctures; from base to near antennæ a feeble groove; on each side from just behind antennæ to apex a shining impunctate median space. *Prothorax* with dense, round, clearly cut punctures, which, however, are partially obscured by scales; a small shining carina continuous from base to apex, close to which the punctures are smaller and slightly compressed. *Elytra* striate-punctate; punctures deep, oblong, and each containing a scale; interstices much wider than striæ and densely punctate.

Under surface (including metasternal episterna) and legs densely punctate; 3rd and 4th abdominal segments slightly produced at sides. Length $7\frac{1}{2}$, rostrum 2 (vix); width $3\frac{1}{2}$ mm.

Hab.—N.S. Wales (Mr. George Masters).

This species bears a remarkable resemblance to *Rhinaria tibialis*, Blackb.

Genus Oreda, White.

Voy. Ereb. & Terr. Ins. p. 16; Lacord. Gen. Col. vii. p. 113; Broun, Man. N.Z. Col. p. 486.

Head moderately large, partially concealed, moderately convex; ocular fovea feeble. *Eyes* ovate, finely faceted, distant. *Rostrum* shorter than prothorax, feebly curved, wide or moderately wide; scrobes open towards base. *Antennæ* rather short and stout; scape inserted nearer apex than base of rostrum, slightly shorter than funicle; 1st joint of the latter moderately long, 3rd-7th strongly transverse; club ovate, free. *Prothorax* moderately convex, subtriangular, apex largely but scarcely suddenly narrowed, base bisinuate; ocular lobes almost rectangular. *Scutellum* small, subtriangular. *Elytra* convex, subcylindrical, shoulders feebly rounded. *Pectoral canal* moderately wide and deep, terminated just before base of anterior coxæ, walls in front produced into a dentate or spiniform process. *Mesosternal receptacle* feebly raised, rugosely punctate, sides dilated in middle, apex widely and feebly emarginate; cavernous. *Metasternum* slightly longer than basal segment of abdomen; episterna rather large. *Abdomen* moderately large; 1st segment slightly shorter than 2nd and 3rd combined, its apex incurved and base rounded; 3rd and 4th combined longer than 2nd or 5th. *Legs* moderately short and strong; posterior coxæ almost touching sides; femora shallowly and very feebly grooved and edentate, posterior almost reaching apex of abdomen; tibiæ feebly compressed, in addition to the strong terminal hook with a small subapical tooth below and a moderately strong one above, intermediate ridged above, the ridge largely excavated in middle and causing the tibiæ to appear bidentate; tarsi shorter than tibiæ, 3rd joint wide, deeply bilobed, claw-joint long and thin, claws small and thin. Elliptic, squamose, winged.

This genus, of which Captain Thos. Broun records four species for New Zealand, is now first recorded for Australia.

On the species described below there is a small node on each of the anterior femora, but these could scarcely be called dentate.

ОREDA DUBIA, n.sp.

Dark piceous-brown (almost black); antennæ and tarsi paler. Rather densely clothed with sooty-brown scales; with clear ochreous-yellow scales forming a distinct spot on each side of base and apex of prothorax, a patch at base of elytra, an irregular fascia at and a still more irregular one below summit of posterior declivity, with small spots towards the base. Under surface less densely clothed than upper, the ochreous scales clothing meso-sternal receptacle, sides of abdomen and part of posterior femora.

Head with dense punctures continued on to basal half of rostrum; flat between eyes. Rostrum distinctly shorter than prothorax, sides incurved to middle; apical half less densely punctate than basal half, but punctures of moderate size and well defined. *Prothorax* with dense round punctures almost concealed by clothing. *Elytra* striate-punctate, both striæ and punctures almost concealed. *Under surface* irregularly punctate, punctures of basal segment of abdomen and flank of metasternum rather large and round. *Legs* densely punctate. Length $8\frac{1}{3}$, rostrum 2 (vix); width $3\frac{1}{2}$ mm.

Hab.—N.S. Wales (type in Macleay Museum).

I have described the specimen under examination as new, although it is possible that it may be the New Zealand *O. notata*, White. Not being at liberty to dissect the specimen I cannot be sure of its sex; if ♂ (as I believe it to be) it will undoubtedly represent a distinct species; but if ♀ this may not be the case. Compared with an undoubted male specimen of *O. notata* from New Zealand (for which I am indebted to Mr. R. Helms) the specimen above described differs in having the prothorax less transverse, the teeth of the pectoral canal much shorter and terminating considerably behind the ocular lobes (in the N.Z. specimen they are somewhat curved and terminate level with the lobes); the ocular vibrissæ are shorter, denser and more decidedly golden; the eyes are very distinctly more prominent; the rostrum is narrower with a more regular outline, and the punctures at the base are denser and less clearly defined; from the sides it is seen to be narrow and very gently curved throughout, whilst in the other specimen it is stouter and very decidedly elevated immediately in front of the ocular fovea.

Genus PSEPHOLACIPUS, n.g.

Head not concealed; ocular fovea indistinct. *Eyes* large, subreniform, coarsely faceted, not separated the width of rostrum. *Rostrum* slightly shorter than prothorax, wide, curved, dilated and truncate at apex; mandibles almost concealed. *Antennæ* moderately slender; scape inserted nearer apex than base of rostrum and passing apex; 1st joint of funicle moderately elongate; club ovate, subadnate to funicle. *Prothorax* transverse, convex, sides rounded, apex much narrower than base but not suddenly lessened, base subtruncate; ocular lobes obtuse. *Scutellum* oblong-elliptic. *Elytra* elongate-subcordate, wider than prothorax, shoulders and apex rounded. *Pectoral canal* wide and moderately deep, terminated between four anterior coxæ. *Mesosternal receptacle* depressed between intermediate coxæ, raised in front, the sides rather narrow; emargination widely transverse; cavernous. *Metasternum* large, the length of 1st abdominal segment; episterna large, truncate posteriorly. Basal segment of *abdomen* considerably larger than 2nd, apex almost truncate, intercoxal process narrow and rather strongly rounded, intermediates rather large and flat, their combined length noticeably more than that of 2nd or apical. *Legs* not very long; femora comparatively stout, edentate, narrowly grooved, the groove usually concealed, posterior terminated before apex of abdomen; posterior coxæ feebly transverse, bounded by metasternal episterna; tibiæ compressed, terminal hook, except of anterior, feeble, each with a very feeble subapical tooth; above ridged, the ridge largely excavated so that each of the tibiæ appears to be very strongly bidentate; tarsi rather slender; 3rd joint wide, deeply bilobed, claw-joint elongate; claws rather feeble. Subelliptic, convex, squamose, winged.

A peculiar genus, the tibiæ of which are entirely different to those of all other Australian genera except *Psepholax* and *Neozeneudes*; I am inclined therefore to place it in the vicinity of those genera. The mesosternal receptacle is cavernous, but it is also cavernous in *Oreda*, an undoubted ally of *Zeneudes*.

Psepholacipus fossilis, n.sp.

Dark reddish-brown; elytra obscurely variegated with red; claw-joints and antennæ dull red. Rather sparsely clothed with dingy ochreous scales, denser on tibiæ and under surface of femora than elsewhere, each puncture of prothorax containing a scale; round on disc, moderately elongate at sides; interstices of elytra with regular scales.

Head and rostrum coarsely punctate; the latter feebly grooved on each side between base and antennæ. *Prothorax* subglobular; densely punctate, punctures large, round and moderately deep. *Elytra* striate-punctate, striæ rather wide, punctures rather shallow, each containing a scale; interstices convex, rounded, each appearing as a row of granules owing to numerous and regular transverse impressions. *Under surface* with large punctures irregularly distributed; metasternal episterna with a double row. Posterior *tibiæ* (including teeth) wider at apex than near base, intermediate wider near base, anterior slightly wider near base than at apex, its terminal hook directed inwards almost at a right angle. Length $7\frac{1}{3}$, rostrum $1\frac{1}{2}$; width $3\frac{1}{2}$ mm.

Hab.—N.Q.: Cooktown (Herr J. Faust, 5 specimens).

Psepholacipus minor, n.sp. or var.

Differs from the preceding species in being smaller; scales rather larger, paler and more distinct; eyes more prominent; prothoracic punctures larger, less rounded and more or less interrupted by feeble longitudinal ridges; elytral interstices much narrower, and though similarly transversely impressed the granules are very much longer than wide; the tibiæ have the large outer teeth much less prominent and the excavation shallower. Length $3\frac{3}{4}$, rostrum 1 (vix); width $1\frac{3}{4}$ mm.

Hab.—N.Q. : Cooktown (Herr J. Faust).

Perhaps a small variety of the preceding species. I have seen but one specimen.

DERBYIA, n.g.

Head rather small and convex, not concealed; ocular fovea large, suboblong and deep. *Eyes* large, subreniform, coarsely faceted, widely separated above, almost touching below. *Rostrum* long, moderately thin and curved. *Antennæ* stout; scape inserted nearer apex than base of rostrum, the length of funicle; 1st joint of the latter moderately long, 3rd-7th transverse; club elliptic-ovate. *Prothorax* transverse, convex, sides strongly rounded, apex narrow, less than half the width of base, base scarcely bisinuate; ocular lobes somewhat rounded. *Scutellum* moderately small, round. *Elytra* slightly wider than prothorax, subcylindrical, shoulders rounded. *Pectoral canal* rather narrow, deep, terminated between middle of intermediate coxæ. *Mesosternal receptacle* narrowly transverse, cavernous. *Metasternum* slightly shorter than basal segment of abdomen ; episterna moderately large. *Abdomen* moderately large; 1st segment as long as 2nd and 3rd combined; 3rd and 4th combined slightly longer than 2nd and noticeably longer than 5th. *Legs* stout ; femora edentate, indistinctly grooved, posterior not extending to apex of abdomen; tibiæ somewhat compressed, dilating to apex, all more or less serrate externally; anterior suddenly dilating outwards at apex, intermediate semicircularly emarginate at apex on outer portion, posterior more deeply emarginate, the emargination commencing at one-third from apex; claw-joint long and moderately stout. Convex, subcylindric, feebly clothed, winged.

The eyes, ocular fovea, mesosternal receptacle and tibiæ are the strongest features of this genus. The receptacle is very indistinctly separated from the metasternum so that on a first glance it (on account of its small size) appears to be absent; on probing with a pin it is seen to be cavernous, although unless very closely examined appearing to be very decidedly open. The species described below resembles a number of species belonging to *Tranes*. The ciliation of the ocular lobes is remarkably short.

DERBYIA LAMINATUS, n.sp.

Dark reddish-brown, shining. Sparsely clothed with yellowish setæ; on prothorax a seta in each puncture not (except at sides) rising to general level; on elytra forming a single series on each interstice. Under surface with paler and sparser setæ. Legs (especially the tibiæ) more densely setose; tibiæ fringed beneath.

Head with rather dense, round, shallow punctures. Rostrum moderately curved, slightly wider at apex than at base; feebly grooved above scrobes; basal two-thirds coarsely punctate and very feebly tricarinate; apical portion with sparse but distinct punctures. *Prothorax* with moderately large round and well defined but not deep or very dense punctures, punctures larger and more crowded at summit of flanks than elsewhere. *Elytra* striate, striæ moderately deep and almost impunctate, a few small punctures at sides; interstices convex, wider than striæ, with numerous transverse impressions. *Metasternum* with punctures similar to but rather less numerous than those on disc of prothorax. Two basal segments of abdomen each with two irregular rows of smaller punctures, 3rd and 4th segments each with a single row of still smaller ones; apical segment densely punctate. Length 8, rostrum $2\frac{1}{6}$; width 4 mm.

Hab.—N.W. Australia (type in Macleay Museum).

The elytral interstices have the appearance of being formed by successive slightly overlapping plates; the striæ (except at sides) are without distinct punctures.

Postscript.—By the unintentional misplacement of several lines, some confusion has been introduced into the tabulation of *Melanterius* given in Part ii. of this Volume, pp. 207-208. It should have appeared as follows (after line 4, p. 207):—

Femoral emargination normal.
  Scape inserted nearer base than apex of rostrum .... *aberrans*, n.sp.
  Scape inserted nearer apex than base.
    Elytra with irregular interstices. .... *semiporcatus*, Er.
    Elytra with regular interstices.
      Intermediate segments of abdomen each larger than 2nd........ .. .. *ventralis*, n.sp.
      Intermediate segments each equal to 2nd.... *aratus*, Pasc.
      Intermediate segments combined about equal to 2nd.
        Interstices flattened or rounded on basal half of elytra.*
          Punctures sometimes concealed by clothing.................. .... *floridus*, Pasc.
          Punctures not at all concealed.
            Interstices similar throughout.
              More than 3 mm. in length..... .... *compactus*, n.sp.
              Less than 3 mm........................ *castaneus*, n.sp.
            Interstices triangularly raised posteriorly.
              Elytra on basal half scarcely striate, punctures clearly defined.
                Apical segment of abdomen with a few large punctures......... *adipatus*, n.sp.
                Apical segment densely punctate *porosus*, n.sp.
              Elytra striate, punctures not sharply defined.
                Prothorax clothed.
                  Scape passing apex of rostrum *impolitus*, n.sp.
                  Scape not passing apex......... *tenuis*, n.sp.
                Prothorax not at all or scarcely visibly clothed.
                  Metasternum with a pad of white hairs on each side... *pectoralis*, n.sp.
                  Metasternum normally clothed.
                    Metasternal episterna with regular punctures.

* This does not include the lateral interstices, which are sometimes triangularly raised: *tristis* is intermediate, only the suture and two interstices on each side of it being flattened on the basal half.

Elliptic.... .... *interstitialis*, n.sp.
Ovate........... .... *incomptus*, n.sp.
Metasternal episterna with regular punctures only in middle.... .... *tristis*, n.sp.
Interstices more or less carinate or triangularly raised on basal half.*
Antennæ comparatively stout†... .... *antennalis*, n.sp.
Antennæ slender.
Separation of eyes less than width of rostrum at base.
Derm reddish.... .... *cordipennis*, n.sp.
Derm black.
Ridging of interstices continued to extreme base................. *unidentatus*, n.sp.
Ridging interrupted before base.
Less than 4 mm. in length...... *vulgivagus*, n.sp.
More than 4 mm.................. *strabonis*, n.sp.
Separation of eyes equal to or more than width of rostrum at base.
Shoulders not at all produced...... *serrulus*, Pasc.
Shoulders feebly produced on to prothorax.
Elytra maculate.
Very decidedly so....... .... *vinosus*, Pasc.
Feebly..... .... *maculatus*, n.sp.
Elytra not at all maculate.
Prothorax with median carina. *solitus*, n.sp.
Prothorax without median carina.
Scape of ♀ not passing apex of rostrum......... .... *parvidens*, n.sp.
Scape of ♀ passing apex.
Apical segment of abdomen with a transverse impression .... *cinnamomeus*, Pasc.
Apical segment with a circular impression.... *acaciæ*, n.sp.

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* Not always including extreme base.

† This character is quite sufficient to distinguish this species amongst those with which I have placed it.

NOTES AND EXHIBITS.

Mr. Hedley exhibited *Neothauma*, *Paramelania*, and *Typhobia*, freshwater shells from Lake Tanganyika, and explained the views of Mr. J. E. S. Moore, who regards these forms as survivals of a marine Jurassic fauna.

Mr. Whitelegge exhibited fresh specimens of two rare Orchids, *Caladenia tesselata*, Fitzgerald, from Maroubra Bay; and *Dendrobium Kingianum*, Bidwell, from the head of the Bellinger River, collected by Mr. B. Lucas, of the Australian Museum.

Mr. J. R. Garland exhibited specimens of *Epacris purpurascens*, R.Br., with double flowers, from Beecroft. Similar specimens were noticed many years ago by the late Sir William Macarthur, near Parramatta (see a paper by Dr. Woolls on "Double Flowers," P.L.S.N.S.W. for 1885, Vol. x., p. 455).

Mr. R. T. Baker, Technological Museum, communicated the following note in explanation of the vernacular name "Cut-Tail" applied to *Eucalyptus fastigata*, Deane and Maiden:—

There has long been a doubt as to the meaning of the term "Cut-Tail" as applied to *Eucalyptus fastigata* of Deane and Maiden. These authors interpret it as an abbreviation of curtailed (P.L.S.N.S.W. 1896, p. 809); but Mr. Bäuerlen of this Museum, who is familar with the species, having collected it as far back as 1884 at Delegate, N.S.W., states that the origin of the term is as follows (and as the explanation seems quite feasible I think it should be placed on record):—'The origin of the term "Cut-Tail" is as follows, and refers to the fissile properties, it being considered the best timber for splitting in the districts where it occurs. Amongst the splitters in the south, at least about Delegate and parts of Gippsland, there used to be much ambitious rivalry as to who could cut the thinnest and finest shingles of this timber, and soon some of them went beyond the thinness of shingles, and split it even thinner. Then if a splitter showed such very thin pieces to other splitters, naturally some would say that it was mere accident to get those pieces so thin, and there was nothing remarkable about it. The result of that was that some splitters would set to work and cut out pieces the length of a shingle and somewhat longer; these they would split as fine as they possibly could, taking care to leave a short portion of it solid; this solid portion they called the "tail." If a splitter had such a piece, then of course he had evident proof that it was not mere accident but downright dexterity in splitting which accomplished the feat. This fine splitting was carried so far that (given a good tree) they would split a piece into such thin portions that one could bend them like the leaves of a book, which it roughly resembled, with the solid part at one end resembling the back of the book. Those pieces were called "Cut-tail," and the splitters were very proud of them, as it required a delicate touch for a rough working man to split so thin and yet stop short at the right moment, so as not to run the piece out in its whole length, else of course it would not be a "Cut-tail" From the piece itself the name was transferred to the tree, and a splitter would point out to you that such and such a tree is a "Cut-tail." This is the origin of the name, which is certainly at first sight puzzling and meaningless enough.'

Mr. Baker also exhibited cultures of the Fungus *Empusa acridii*, received from South Africa where it is used in the extermination of the predatory locusts.

Messrs. Baker and H. G. Smith exhibited botanical specimens and chemical products obtained from certain Eucalypts, and stated a case for discussion. Herbarium specimens were shown of a Eucalypt which is to be found at Berrima and also at Lawson, Blue Mts., and these are regarded by botanists as referable to one and the same species, *E. stricta*, Sieb. When their essential oils and other constituents are examined these are found to differ, the yield of the trees from one locality being worthless, of those from the other valuable. The question was raised, how should these Eucalypts be distinguished by name? Another instance brought forward was that of *E. Sieberiana*, as botanists would call it, from different localities. Messrs. Baker and Smith contended that in such cases it is almost, if not quite, impossible to specifically determine botanical material without the aid of chemistry. Discussion followed.

Mr. W. J. Rainbow exhibited, by kind permission of the Curator of the Australian Museum, a living specimen of the beautiful spider *Dicrostichus magnificus*, together with one of its "egg-bags" or cocoons. This species was described and figured, from a spirit specimen, in the Proceedings for 1897 (pp. 523-4, pl. xvii. figs. 8, 8*a*, 8*b*, and the nest and egg-bags were figured in the text on pages 537 and 538). In addition to the yellow patches on the abdomen mentioned in the description, it is now to be noticed that the animal has, when alive, a group of large red spots in front, and at the centre a series of small red spots and markings.

Mr. Froggatt exhibited a shoe-horn destroyed by the larvæ of the "Museum beetle" *(Anthrenus)*; and a collection of the cocoons of an apparently undescribed case-moth *(Entometa* sp.) upon a piece of the central portion of a hollow tree from North Queensland. The cocoons are covered with sand and grass stalks.

Mr. Stead exhibited a series of beautifully mounted Port Jackson Crustaceans and their appendages, and gave a brief description of the habits of the animals. The following species were represented :—*Grapsus variegatus*, Latr.; *Plagusia chabrus*, Miers; *P. glabra*, Dana; *Ozius truncatus*, M.-Edw.; *Chasmagnathus lævis*, Dana; *Leptodius exaratus*, M.-Edw.; *Myctetris longicarpus*, Latr.; *Helœcius cordiformis*, Dana; and *Petrolisthes*.

WEDNESDAY, 25TH OCTOBER, 1899.

The Ordinary Monthly Meeting of the Society was held at the Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesday evening, October 25th, 1899.

P. N. Trebeck, Esq., in the Chair.

Mr. SYDNEY J. WOOLNOUGH, Burwood, was elected an Ordinary Member of the Society.

By direction of the Council the Second Report of the British Association Committee on Zoological and Botanical Publication (Toronto Meeting, 1897), was brought under the notice of the Meeting, and the co-operation of Members invited in respect of propositions 4-7 (see page 4 of the Abstract for October).

DONATIONS.

Department of Agriculture, Brisbane—Queensland Agricultural Journal. Vol. v. Part 4 (October, 1899). *From the Secretary for Agriculture.*

Department of Agriculture, Sydney—Agricultural Gazette of NewSouth Wales. Vol. x. Part 10 (October, 1899). *From the Hon. the Minister for Mines and Agriculture.*

New South Wales Chamber of Mines, Sydney—Journal. Vol. i. No. 1 (October, 1899). *From the Hon. Secretary.*

Royal Society of New South Wales—Abstract of Proceedings, October 4th, 1899. *From the Society.*

The Surveyor, Sydney. Vol. xii. No. 10 (October, 1899). *From the Editor.*

Australasian Journal of Pharmacy, Melbourne. Vol. xiv. No. 166 (October, 1899). *From the Editor.*

Field Naturalists' Club of Victoria—Victorian Naturalist. Vol. xvi. No. 6 (October, 1899). *From the Club.*

Gordon Technical College, Geelong—The Wombat. Vol. iv. No. 4 (July, 1899). *From the College.*

Department of Mines, Hobart—Report of the Government Geologist on the Deep Shaft of the Volunteer Gold Mining Company (1899; No. 63). *From the Secretary for Mines.*

Montreal Society of Natural History—Canadian Record of Science. Vol. vii. T.p. &c. (1897): Vol. viii. No. 1 (1899). *From the Society.*

American Museum of Natural History, New York—Bulletin. Vol. xii. Art. x. (pp. 157-160; August, 1899). *From the Director.*

American Naturalist (Cambridge). Vol. xxxiii. No. 392 (August, 1899). *From the Editor.*

Four Botanical Pamphlets. By A. D. Selby, Worcester, U.S.A. *From the Author.*

U.S. Department of Agriculture, Washington: Division of Biological Survey—North American Fauna. No. 15 (Aug., 1899). *From the Secretary of Agriculture.*

Museo Nacional de Costa Rica—Informe del Segundo Semestre fin de Año Economico, 1898 á 1899. *From the Director.*

Perak Government Gazette, Taiping. Vol. xii. No. 27 (September, 1899). *From the Government Secretary.*

Manchester Literary and Philosophical Society—Memoirs and Proceedings. Vol. xliii. Part 4 (1898-99). *From the Society.*

Royal Microscopical Society, London—Journal. 1899. Part 4 (August). *From the Society.*

Royal Society, London—Proceedings. Vol. lxv. No. 418 (August, 1899). *From the Society.*

Zoologischer Anzeiger, Leipzig. xxii. Band. Nos. 595-597 (August-September, 1899). *From the Editor.*

Société Royale Linnéenne de Bruxelles—Bulletin. 24^{me} Année. No. 9 (July, 1899). *From the Society.*

Botanical Garden, Tiflis (Caucasus)—Report Series iii. (1899). *From the Minister of Agriculture and Domains for the Caucasus.*

STUDIES IN AUSTRALIAN ENTOMOLOGY.

No. IX.

New Species of Carabidæ (with Notes on some previously described Species, and Synoptic Lists of Species).

By Thomas G. Sloane.

Tribe **HARPALINI**.

Genus Gnathaphanus.

First group of species with third interstice of elytra seriate-punctate.

Synoptic List of the Australian species of *Gnathaphanus* with the third interstice of the elytra seriate-punctate—*Gn. alternans*, Casteln., and *Gn. montanus*, Casteln., which are unknown to me in nature, being omitted.

A. Elytra strongly sinuate on each side of apex.
  b. Posterior angles of prothorax rounded off, colour black.... .... *Gn. læviceps*, Macl.
  bb. Posterior angles of prothorax marked, colour cupreous.
    c. Posterior angles of prothorax obtuse at summit............. .... *Gn. pulcher*, Dej.
    cc. Posterior angles of prothorax rectangular................. .... *Gn. rectangulus*, Chaud.
AA. Elytra lightly sinuate on each side of apex.
  D. Prothorax with sides lightly rounded and oblique posteriorly, basal angles wide but marked.
    E. Third interstice of elytra only seriate-punctate.

F. Prothorax wholly lævigate, or at most with only a few punctures in basal foveæ.	
g. Prothorax with sides evidently narrowed to base, basal foveæ strongly impressed ..	*Gn. riverinæ*, Sl. *Gn. latus*, Sl.
gg. Prothorax with sides hardly narrowed to base, basal foveæ wide and shallow....	*Gn. picipes*, Macl.
FF. Prothorax rugulose-punctate on each side near base........	*Gn. adelaidæ*, Casteln.
EE. Third and fifth interstices of elytra seriate-punctate.	
H. Size large; form wide, depressed (elytra green, legs black)	*Gn. herbaceus*, Sl.
HH. Size rather small; form narrow (elytra dark bronze, legs testaceous)|............	*Gn. impressipennis*, Casteln.
DD. Prothorax rotundate on sides, basal angles rounded off (interstices of elytra convex).	
i. Third interstice of elytra only seriate-punctate.....................	*Gn. froggatti* Macl.
ii. Third, fifth and seventh interstices of elytra seriate-punctate	*Gn. aridius*, Blkb

Synonymy.

In order to render the table given above complete, it is necessary to deal with the synonymy of this group of species.

GN. PICIPES.

Harpalus picipes, Macl., Trans. Ent. Soc. N.S.W. 1864, i. p. 117; *Diaphoromerus sexpunctatus*, Macl., P.L.S.N.S.W. 1888, (2), iii. p. 466; *D. sulcatulus*, Macl., *l.c.* p. 467.

I have found from examination of the types in the Macleay Museum that *Diaphoromerus sexpunctatus* and *D. sulcatulus* are founded on the same species; and after comparing specimens taken by Mr. R. Helms on the Upper Ord River, Kimberley District, W.A., with a cotype of *D. sulcatulus* from the Macleay Museum, I compared all these with a specimen from Queensland in my possession, which I had formerly identified as *Harpalus picipes* by comparison with Macleay's type, with the result that I am compelled to consider it is impossible to maintain them as distinct.

GN. ADELAIDÆ.

Harpalus adelaidæ, Casteln., Trans. Roy. Soc., Victoria, 1867, viii. p. 194; *H. melbournensis*, Casteln., *l.c.* p. 183; *H. paroensis*, Casteln., *l.c.* p. 184; *H. marginicollis*, Casteln., *l.c.* p. 189; *H. æneo-nitens*, Macl., Trans. Ent. Soc. N.S.W. 1871, ii p. 102; *H. angustatus*, Macl., *l.c.*, p. 102; *H. gayndahensis*, Macl., *l.c.* p. 102; *H. planipennis*, Macl , *l.c.* p. 101; *Mirosarus insularis*, Bates, Cist. Ent. 1878, ii. p. 319.

I have examined the types of Macleay's species mentioned above and have arrived at the conclusion that they are conspecific with *Gn. adelaidæ*, Casteln , which appears to be found over the whole of Australia and also in Tasmania.

GN. IMPRESSIPENNIS.

Harpalus impressipennis, Casteln., Trans. Roy. Soc. Victoria, 1867, viii. p. 186; *Diaphoromerus multipunctatus*, ? Macl., P.L.S. N.S.W. 1888 (2), iii. p. 467; *Gn. darwini*, ? Blkb., *l.c.* p. 808.

A specimen of *Diaphoromerus multipunctatus*, Macl., (a cotype from the collection made by Mr. Froggatt for the late Sir William Macleay) is in my possession, and after comparing it with the description given by Baron Chaudoir Ann. Mus. Genov. 1878, xii. p. 510 of *Gn. impressipennis*, Casteln., I feel little doubt but that it is a synonym of that species, while a comparison of it with Mr. Blackburn's description of *Gn. darwini* convinces me of the identity of that species with *H. multipunctatis* and therefore with *Gn. impressipennis*.

GNATHAPHANUS LATUS, n.sp.

Broad, depressed; head of ordinary size; prothorax nitid, transverse, basal angles obtuse, lateral basal impressions strongly impressed and obsoletely punctate; elytra striate, third interstice pluripunctate, apical curve lightly sinuate on each side; mentum with median tooth short, wide, obtuse. Head black: prothorax black, sometimes with a greenish tinge towards base; elytra blackish-green: under surface and legs piceous-black; antennæ ferruginous, second and third joints clouded with black: palpi reddish-piceous.

Head smooth, convex; frontal impressions well marked; clypeal suture distinct; eyes prominent; orbits a little swollen behind eyes. Prothorax subquadrate (4 × 5 mm.), widest about middle (at marginal setigerous puncture), depressed, roundly declivous on each side anteriorly; sides rounded, more strongly so anteriorly than posteriorly; anterior margin emarginate; base truncate (sub-emarginate in middle); anterior angles obtuse; basal angles widely obtuse; border narrow, wanting only on middle of anterior margin; median line fine. Elytra wider than prothorax (10 × 6·3 mm.), strongly striate; striole at base of second interstice elongate; interstices subnitid, minutely shagreened, hardly convex on dorsal surface, becoming convex towards apex (especially interstices 6-8), third with about seven widely placed punctures along its course. Length 15·7-17·3, breadth 5·7-6·4 mm.

Hab.: N.S. Wales—Wilcannia (R. Helms).

Allied to *Gn. riverinæ*, Sl., from which it differs conspicuously by its larger size, broader and more depressed form, interstices of elytra hardly convex on dorsal surface, sides of prothorax more ampliate in middle, etc.

Gnathaphanus herbaceus, n.sp.

Broad, depressed; head not large; prothorax shagreened, opaque near base, posterior angles obtuse; elytra with third and fifth interstices pluripunctate, apical curve lightly sinuate; mentum with median tooth feebly developed (short, wide, obtuse). Head greenish-black, prothorax blackish-green, elytra green; under surface shining black with faint greenish reflections in places; legs black; antennæ subpiceous, basal joint testaceous; palpi reddish-piceous.

Head of moderate size ($2 \times 2 \cdot 2$ mm.), smooth; frontal impressions small, light, clypeal suture distinct between them; eyes not prominent, convex; orbits a little convex behind eyes. Prothorax depressed, lightly declivous on sides anteriorly, explanate near basal angles, subquadrate ($3 \cdot 2 \times 4 \cdot 7$ mm.), widest at marginal puncture (about middle), wider across base than apex; sides lightly rounded, lightly and obliquely narrowed posteriorly, strongly and roundly narrowed anteriorly; anterior margin deeply emarginate; base truncate; anterior angles prominent, obtuse; basal angles widely obtuse; border narrow, wanting only on middle of anterior margin; lateral basal foveæ lightly impressed, feebly punctate. Elytra depressed, wider than prothorax ($8 \cdot 5 \times 5 \cdot 5$ mm.), subparallel on sides, very feebly sinuate on each side of apex; striæ linear, strongly impressed; striole at base of second interstice elongate; interstices subopaque, shagreened, depressed but becoming convex near apex (especially interstices 6-8), third and fifth with finely impressed widely placed punctures along their course. Length 14-14·5, breadth 5·5-5·8 mm.

Hab.: North Queensland (sent to me by Mr. C. French as from the Winton District, N.Q.).

A distinct species which may be readily distinguished from its nearest allies *Gn. latus*, Sl., and *Gn. riverinæ*, Sl., by its more depressed form, the pluripunctate fifth interstice of elytra, etc.

PSILONOTHUS, n.gen.

Head smooth, wide, convex; front not impressed; eyes small, distant from buccal fissure beneath. *Mandibles* short. *Mentum* deeply emarginate; sinus edentate, oblique on each side. *Palpi:* maxillary stout, two apical joints together oval and pointed; labial thick, penultimate joint short with two setæ in front, apical joint short, swollen. *Metasternal episterna* (without epimera) subquadrate. *Facies* robust, short, convex. *Apterous;* elytra connate. *Anterior tarsi* of ♂ not dilatate or clothed beneath.

The position of this genus among the Australian Harpalini is near *Thenarotidius.* It is distinguished at once from *Notophilus* and allied genera by the eyes being distant from the buccal fissure beneath; from *Thenarotidius* it differs by its shorter and more convex form, elytra more sinuate on each side of apex, short metasternal episterna, ♂ with anterior tarsi not clothed with spongiose tissue beneath; from *Harplaner* by its much smaller size, shorter form, prothorax without impressions on each side of base, short metasternal episterna, &c. The type is a very small glossy black beetle.

Psilonothus ovalis, n.sp.

Robust, convex, oval, lævigate. Black, nitid. Prothorax convex, transverse, cordate-quadrate, widest before middle; sides rounded anteriorly, obliquely and lightly narrowed posteriorly; apex truncate, angles obtuse; base truncate, angles obtuse; lateral basal impressions wanting; border entire, narrow and reflexed on sides. Elytra convex, smooth, oval; derm minutely punctate under a lens; humeral angles rounded; apical curve short, widely and lightly sinuate on each side; a few submarginal setigerous punctures behind humeral angles and towards apex. Length 2·5-2·8, breadth 1·1-1·3 mm.

Hab.: N.S. Wales—Grenfell, Junee, and Urana Districts; Victoria—Melbourne (Sloane).

Habits.—Found under logs and débris usually away from water, not uncommon.

Genus Thenarotes.

Thenarotes bicolor, n.sp.

Depressed, elongate-oval, nitid, subiridescent. Head black; prothorax reddish-testaceous; elytra bicolorous—black, with base (widely), apex (narrowly) and first interstice reddish; under surface piceous, becoming reddish at apex of abdomen and on episterna of prosternum; legs and two basal joints of antennæ pale testaceous; antennæ a little infuscate; labrum reddish.

Head convex, biimpressed between base of antennæ. Prothorax transverse (1 × 1·3 mm.), lightly narrowed to base; posterior angles obtuse; a wide, shallow, feebly punctate impression on each side of base. Elytra fully striate (as in *Th. tasmanicus*, Bates); second interstice not striolate at base, third unipunctate behind the middle. Anterior tarsi of ♂ with joints 2-4 widely dilatate, intermediate tarsi with joints 2-4 lightly dilatate. Length 4·5, breadth 1·6 mm.

Hab.: Victoria—Mordialloc, near Melbourne (French).

Allied to *Th. tasmanicus*, Bates, from which it is readily differentiated by its black head. A species which seems certainly *Th. tasmanicus*, Bates, is widely distributed in South Eastern Australia, and comparing *Th. bicolor* with that species the following differences are noted apart from colour :—prothorax shorter, with posterior angles far less strongly marked and more obtuse, the basal puncturation much finer and less conspicuous. From *Th. australis*, Blkb., it offers the following evident differences :—size larger, form wider; anterior tarsi of ♂ dilatate; elytra fully striate, the base reddish right across, the black discoidal areas extending to the margin at sides, &c.

Thenarotes tachioides, n.sp.

Subconvex; head short, lightly biimpressed between base of antennæ; mandibles short, hardly projecting beyond labrum; prothorax concavely impressed on each side of base, basal angles subrectangular; elytra fully striate, second interstice not striolate at base, third interstice unipunctate about apical third; posterior tarsi with first joint about as long as two succeeding joints together. Testaceous-brown, nitid; elytra more or less clouded with black; head black, antennæ infuscate; inflexed margin of elytra, labrum, palpi and basal joint of antennæ pale testaceous; under surface of body piceous, becoming testaceous towards apex (two apical ventral segments); prosternum brownish-testaceous.

Head wide, convex, a short, light, oblique impression on each side of front; eyes large, lightly inclosed at base. Prothorax transverse (0·7 × 1 mm.), widest before middle, a little narrowed to base, wider across base than apex, widely and lightly convex on disc, depressed near base; margins explanate near basal angles; sides bordered, lightly rounded on anterior two-thirds, very lightly oblique posteriorly; anterior margin truncate, angles obtuse; base truncate, angles obtusely rectangular; median line lightly impressed; lateral basal impressions strongly developed, widely foveiform. Elytra ovate ($2 \times 1 \cdot 4$ mm.), a little convex on disc, gently declivous to sides, more strongly so to apex; base truncate, humeral angles rounded; apical curve short; striæ lightly impressed, seventh distinct for whole length, eighth strongly impressed; interstices depressed. Length 3·2, breadth 1·4 mm.

Hab.: N.S. Wales—Mulwala (Sloane; three specimens under bark of trees where they had taken refuge from the flood waters of the Murray River, July 11th, 1894.)

The affinity of this small species is evidently to *Th. brunnicolor*, Sl., which it resembles in facies. Differences to which attention may be directed are its less robust form, smaller size, lighter colour; the prothorax with the sides less subsinuate near the basal angles (these less rectangular), the concave depression at each side of the base (in *Th. brunnicolor* the prothorax is flattened near each basal angle); the elytra less strongly striate and without a striole at base of second interstice. In none of my specimens are the anterior tarsi dilatate. It has a decided superficial resemblance to *Tachys transversicollis*, Macl.

Thenarotes marginatus.

Harplaner marginatus, Macl., P.L.S.N.S.W. 1888, (2) iii. p. 472.

A specimen of *Harplaner marginatus*, Macl., a cotype from the Macleay Collection, is before me; it is a *Thenarotes*. The dilatation of the four anterior tarsi in the ♂ is as in *Thenarotes tasmanicus*, Bates, except that the fourth joint of the anterior tarsi is deeply excised (almost $<$-shaped) and the corresponding joint of the intermediate tarsi a little more lightly so; the fourth joint of the posterior tarsi is entire.

Tribe CHLÆNIINI.

Genus Anatrichis.

Anatrichis sexstriatis, n.sp.

Short, oval. Labrum with anterior margin tripunctate; maxillary palpi with penultimate joint shorter than apical; prothorax with upper surface densely and finely punctulate; elytra convex, simply striate, seventh stria wanting, striole at base of first interstice elongate, punctulate, seventh interstice not carinate near apex, humeral angles obtuse; ♂ having anterior tarsi with four basal joints lightly dilatate and a little squamulose beneath. Black, elytra nitid; sides of prothorax piceous near basal angles; antennæ fuscous, basal joint piceous.

Head small, cylindrical behind eyes; clypeal suture distinct; front not punctate behind angles of clypeus; eyes hemispherical, prominent, hardly truncate behind; orbits not swollen and hardly inclosing eyes posteriorly. Prothorax transverse (1·9 × 2·9 mm.), widest about posterior third, greatly narrowed anteriorly; sides rounded; apex lightly emarginate, angles obtuse; base truncate, angles obtuse; basal impressions shallow, distinct. Elytra wide, ovate (5·2 × 3·6 mm.), convex; base truncate; apex widely rounded; striæ strongly impressed, simple; interstices depressed, seventh and eighth confluent, ninth visible (and punctate) in marginal channel near base and apex, third bipunctate. Under surface shagreened; prosternum margined between coxæ. Length 8, breadth 3·6 mm.

Hab.: N.S. Wales—Mulwala, Grenfell (Sloane; two specimens under a stick on the edge of a pool near Grenfell, August, 1899.)

According to Baron Chaudoir, the genus *Anatrichis* is chiefly distinguished by the nature of the puncturation of the upper surface, and differs from *Oodes* by several characters: the anterior margin of the ligula is lightly emarginate between the setæ which are very far apart; the penultimate joint of the maxillary palps is shorter than the last; the apex of the maxillæ is less hooked; there are only three punctures on the anterior margin of the labrum, the middle one is more or less broad, and bears from four to two setæ; the form of dilatation is different in the anterior tarsi of the male.*

The total absence of the seventh elytral stria and the consequently wide seventh interstice is the characteristic feature of *A.*

* *Vide* Monograph. Ann. Soc. Ent. Fr., 1882 (6), ii. p. 318.

sexstriatis; and this, together with the absence of any crenulation in the striæ, differentiate it thoroughly from the four species of the genus noticed by Chaudoir.

Note.—I have a second species of *Anatrichis* from Mulwala which agrees with Chaudoir's brief description of *A. australasiæ*, and which I believe to be that species; it differs from *A. sexstriatis* by its slightly smaller size, the front with a fine but distinct puncture on each side behind the angles of the clypeus, the elytra with all the striæ present and strongly crenulate, the humeral angles subdentiform, the episterna of the metasternum punctulate, &c.

Tribe NOMIINI.

Genus Meonis.

Meonis convexus, n.sp.

Elongate, convex, robust, lævigate: head narrowed behind eyes: mandibles long, porrect, a setigerous puncture at anterior extremity of scrobe; prothorax pyriform, sides lightly sinuate posteriorly, basal angles obtuse; elytra oval, deeply 4-striate on each side of suture, fifth stria strongly impressed on apical declivity; metasternal episterna (with epimera) wide, much longer than broad. Black.

Head strongly transversely impressed behind vertex; occiput cylindrical; vertex convex; front and clypeus deeply and widely biimpressed; the space between the frontal concavities convex; eyes small, hemispherical, distant from buccal fissure Sinus of mentum wide, truncate at bottom, oblique on sides. Labrum deeply emarginate, a large setigerous puncture on each side of emargination. Prothorax much wider than head, widest before middle, as long as broad (3·8 x 3 8 mm); sides rounded, narrowed to base, lightly sinuate near base; anterior margin truncate; angles obtuse, very near head: base truncate, a little rounded near each angle; lateral border thick, equal, lightly reflexed; marginal channel strongly impressed; median line very strongly impressed, sulciform, reaching base in full depth; lateral basal impressions strongly impressed, elongate, wide; spaces between these impressions and border and median line convex. Elytra oval, considerably wider than elytra (7·8 × 4·8 mm.), convex; sides gently ampliate behind shoulders; base truncate; humeral angles rounded; apex sinuate on each side; four inner interstices convex, first narrow, third impunctate; lateral interstice placed in the deep marginal channel, narrow, punctate along its course. Length 14·5, breadth 4·8 mm.

Hab.: N. S. Wales—Blue Mountains (Springwood, Sloane; Wentworth Falls, Fletcher.)

A specimen from the Tweed River has been sent to me by Mr. A. Lea under the name of *M. ater*, Casteln.; from which *M. convexus* differs by its narrower and more convex form; the prothorax with the sides less ampliate at their widest part, and much less strongly sinuate posteriorly, the anterior angles projecting less from the sides of the neck, the base narrower with the angles less sharply rectangular, the lateral basal impressions shorter; the elytra proportionately narrower, the sides less ampliate behind the humeral angles and less rounded, the fifth stria impressed near apex; the metasternal episterna longer.

Note.—Meonis ovicollis, Macl., is not a member of this genus; I have examined the type and found it to be a species of *Darodilia*.

Genus CYCLOTHORAX.

CYCLOTHORAX CORDICOLLIS, n.sp.

Robust; head narrow, lævigate; prothorax convex, cordate; elytra punctate-striate, base (narrowly), lateral and basal declivities smooth. Black, nitid; legs testaceous, tibiæ sometimes a little infuscate; antennæ infuscate, basal joint testaceous.

Head convex; front biimpressed, bicarinate on each side, inner carina extending backward to level with middle of eyes, wide anteriorly, very narrow posteriorly near anterior supra-orbital puncture; eyes hemispherical, prominent. Prothorax much wider than head, a little broader than long (1·2 × 1·3 mm.), widest before middle (at anterior marginal puncture), greatly narrowed to base; sides roundly ampliate, lightly sinuate just before base;

apex truncate, angles not marked, very near sides of head; base roundly truncate, angles marked, obtuse at summit; border narrow, hardly reflexed near basal angles; punctate basal area not depressed below plane of prothorax, not rugose; the punctures fine, separate (poriform); a light basal impression on each side; median line strongly impressed, not reaching base or apex. Elytra much wider than prothorax, truncate-oval (3 × 2 mm.), convex, lightly declivous to base; shoulders widely and evenly rounded; apical curve lightly sinuate on each side; six inner striæ on each elytron well marked, rather strongly punctate, not reaching base, first entire, others successively shorter; striole at base of first interstice formed by a rather elongate row of punctures; submarginal stria strongly impressed; interstices flat, third bipunctate on disc, lateral interstice seriate-punctate, lateral border uniting with basal border and reaching peduncle. Under surface (excepting episterna of mesosternum) impunctate. Length 4-5, breadth 1·7-2 mm.

Hab.: Queensland—Brisbane (sent by Mr. Lea); N.S. Wales—Clarence River and Windsor (Lea), Grenfell, Junee, Urana, Mulwala (Sloane); Victoria—Ferntree Gully and Lilydale (Sloane).

Habits.—Found in damp situations near water, usually rare, but on July 11th, 1895, I found it very plentifully under sticks along the edge of a swamp about twenty miles north from the town of Urana.

This is the species I formerly regarded as *C. peryphoides*, Blkb.,* but Mr. Blackburn has informed me that it differs from that species. The only difference the description of *C. peryphoides* suggests to me is the darker colour of the legs in that species, a character that seems of little value, but probably *C. peryphoides* has the prothorax more strongly sinuate near the base, the basal angles more marked, and perhaps a coarser puncturation on the basal area.

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* P.L.S.N.S.W. 1894, (2), ix. p 448.

Often *C. cordicollis* has the apex of the elytra testaceous, while the specimen I have from Lilydale is a little smaller, with the rows of punctures on the elytra finer, the seventh indicated by about seven punctures.

CYCLOTHORAX LATICOLLIS, n.sp.

Elliptical-oval, robust, convex; head lævigate, front feebly biimpressed: prothorax transverse, wider at base than apex, punctate near basal margin; elytra fully striate. Black, nitid, femora and antennæ testaceous, tibiæ infuscate.

Head short, wide, convex; front with a shallow foveiform impression on each side between base of antennæ; eyes convex, not inclosed behind. Prothorax short, transverse (0·8 × 1·25 mm.), convex, lævigate (except just along basal margin), bordered (except on middle of base); sides rounded; anterior margin truncate, angles obtuse, near sides of head; base truncate on each side, middle lightly, widely and roundly produced backwards; basal angles widely obtuse; lateral margins a little explanate near basal angles and widened near anterior angles; border reflexed on sides, not reflexed at basal angles; basal impressions hardly marked, very shallow, short, wide, punctate; median line hardly impressed. Elytra ovate, a little wider than prothorax (2·3 × 1·3 mm.), convex; sides subparallel in middle, strongly rounded to base; humeral angles widely rounded; striæ entire, strongly punctate on disc; striole of first interstice short; third interstice bipunctate along course of third stria. Length 3·6, breadth 1·3 mm.

Hab.: N.S. Wales—Grenfell (Sloane; one specimen under the leaves of a felled sapling near Grenfell, August 17th, 1899.)

A thoroughly distinct species; its prothorax with the base decidedly wider than the apex and with wide basal angles differentiates it from all the species of the genus known to me; the basal punctate area of the prothorax, which is defined by a transverse impression, is very narrow, not lower than the rest of the surface, and does not extend near the basal angles on each side.

Tribe BEMBIDIINI.

Genus TACHYS.

TACHYS MULWALENSIS, n.sp.

Robust, oval. Clypeus large, lateral foveæ foveiform; prothorax transverse, wider across base than apex; elytra ovate, disc strongly 3-striate on each side of suture, lævigate towards sides, third stria strongly impressed on apical declivity and joining sutural stria at apex, submarginal stria obsolete on sides. Piceous; antennæ fuscous, basal joint testaceous.

Head wide, minutely shagreened; front obliquely biimpressed; space between frontal impressions convex; spaces between frontal impressions and eyes narrow, raised and bearing a setigerous puncture above each eye; clypeal suture strongly impressed, straight, connecting the frontal impressions. Prothorax transverse, convex, lævigate, widest about middle, strongly and roundly narrowed anteriorly, lightly and roundly obliquely narrowed posteriorly; anterior angles obtuse, close to sides of head; base wide, truncate, angles rectangular; border reflexed, wide towards basal angles; lateral basal impressions well marked, wide; a deep transverse stria near base, this stria very near margin on each side, curving forward and punctate in middle; basal area in middle below plane of disc; posterior marginal setigerous puncture placed on border at each basal angle. Elytra truncate-oval, of same width at base as base of prothorax, convex (subdepressed on disc); sides ampliate behind humeral angles, rounded in middle; striæ punctulate on disc, three inner ones entire, third deeply impressed, curving outward and inclosing a punctiform impression on apical declivity; fourth, fifth and sixth very lightly impressed; interstices depressed, third strongly bipunctate near third stria; lateral interstice developed and punctate near base and apex; border wide, reflexed. Length 2, breadth 1·3 mm.

Hab.: N.S. Wales—Mulwala (Sloane; plentiful under the bark of red gum trees standing in the flood waters of the Murray River on 22nd June, 1896.)

A very distinct species. Adopting the tabulation of the Australian species of *Tachys* which I have given in P.L.S.N.S.W. 1896, pp. 356-359, its place would be with those species which have the submarginal stria obsolete on the sides of the elytra; it would come nearest *T. ovatus*, Macl., from which it differs greatly by its larger size, less convex form, and the elytra more than unistriate on each side of suture.

Tribe FERONINI.

Genus HOMALOSOMA.

Table of Species.

I. Sinus of mentum parallel on sides.

1. Form very short: prothorax subquadrate, strongly emarginate at base, margins widely explanate and acclivous; elytra short, very convex, interstices not carinate, third impunctate, humeral angles widely rounded; prosternum and mesosternum setigero-punctate. .... *H. curtum*, Chaud.

2. Form wide and heavy; head very large; elytra with interstices not carinate, basal border prominent at humeral angles; prosternum setigero-punctate, mesosternum glabrous.

   a. Prothorax lightly narrowed to base, apex and base of same width, posterior angles obtuse .... *H. crassiforme*, Sl.

   aa. Prothorax strongly narrowed to base, wider across apex than base, posterior angles marked.

      b. Head and prothorax splendid brassy-green ... . *H. imperiale*, Sl.

      bb. Head black, prothorax only metallic towards margin........ .... *H. breve*, Motsch.

3. Elytra with at least seventh interstice carinate.

   C. Mentum with median tooth rounded at apex; prothorax wide at base, posterior marginal puncture at each basal angle; elytra with basal border dentate at humeral angles, ninth interstice narrow and raised posteriorly; prosternum and mesosternum setigero-punctate (metasternum setigero-punctate at each side).

d. Elytra convex on disc, colour black..... { *H. renardi*, Chaud. / *H. vigorsi*, Gory. / *H. alternans*, Sl. }

dd. Elytra and prothorax flat on disc, very wide at bases and with margins greenish......... .... *H. angulosum*, Chaud.

CC. Mentum with median tooth excised at apex; prothorax cordate, posterior marginal puncture on each side considerably before the base; prosternum and mesosternum glabrous.

D. Prothorax sinuate on each side near base, posterior angles rectangular or subrectangular (except in *H. porphyriacum*, Sl.)

E. Head long, genæ rounded to base of mandibles on each side.

f. Posterior femora long, slender; anterior angles of prothorax near to sides of head.

g. Form elongate; prothorax gently narrowed to base; elytra long, subparallel on sides; ♀ with apex of abdomen plurisetose.............................. *H. cyaneum*, Casteln.

gg. Prothorax strongly sinuate-angustate to base; elytra obovate, sides strongly rounded; ♀ with apex of abdomen 4-setose... .... *H. viridescens*, Casteln.

ff. Posterior femora swollen in middle; prothorax with anterior angles wide and distant from sides of head; elytra with third, fifth and seventh interstices carinate.

h. Elytra with ninth interstice merged with marginal channel; posterior coxæ wide at outer posterior angle......... *H. wilsoni*, Casteln.

hh. Elytra with ninth interstice raised posteriorly; posterior coxæ with outer posterior angle prominent and triangular...... .... *H. nitidicolle*, Casteln.

EE. Head very large, short, convex; genæ projecting widely from base of mandibles on each side, truncate-oval on anterior margin.

i. Elytra with basal border strongly dentate at humeral angles; head and prothorax metallic purple.. *H. porphyraceum*, Sl.

ii. Elytra with basal border hardly raised at humeral angles (these not dentate).

k. Colour black, elytra truncate-oval.... .... *H. cordatum*, Chaud.

kk. Colour of upper surface purple, elytra obovate...... *H. superbum*, Casteln.

DD. Prothorax with sides not sinuate before base, posterior angles obtuse; elytra with humeral angles rounded.

l. Elytra with third, fifth and seventh interstices carinate: black, prothorax and elytra margined with green....... .... *H. cyaneocinctum*, Boisd.

ll. Elytra with third, fifth and seventh interstices costate a little stronger than others, elytra blackish-green............................... *H. atroviride*, Sl.

4. Form oval; prothorax cordate; elytra with interstices not carinate, third impunctate, humeral angles rounded......... .... *H. obscuripenne*, Macl.

II. Sinus of mentum oblique on sides........... { *H. carinatulum*, Chaud.
H. amaropterum, Chaud. }

For notes on the species omitted from the table above, see P.L.S.N.S.W. 1894 (2), ix. p. 420; I have only now to add that *H. marginiferum*, Chaud., which was omitted from those notes, is very closely allied to *H. viridescens*, Casteln.; it is unknown to me in nature, but the description suggests that *H. viridescens* may be not more than a variety of *H. marginiferum*. In my former table (*l.c.*, p. 418) too much reliance was placed on the form of the outer angle of the basal border of the elytra, a feature which is evidently of subordinate value in grouping the species.

HOMALOSOMA CRASSIFORME, n.sp.

Compact, heavy, robust; head large; prothorax very little narrowed to base, apex and base of equal width (8·3 mm.); elytra truncate-oval, subparallel on sides. Head, under surface, legs and antennæ black; prothorax nitid, black on disc, viridescent towards margin; elytra greenish-black, shagreened, summits of costæ nitid, lateral margin brassy-green.

Head large, convex, a little swollen behind and below eyes; front lightly, widely and shortly biimpressed; eyes small, convex. Prothorax subquadrate (7.5* × 10·5 mm.), widest about anterior fifth, lightly narrowed posteriorly; sides not sinuate towards base; apex widely, deeply and evenly emarginate: angles advanced, roundly obtuse; base emarginate in middle, angles obtuse, hardly marked; lateral margins widely upturned near base; lateral channel wide; median line lightly impressed; lateral basal impressions wide, well marked; space between basal impressions widely depressed along base: posterior marginal puncture placed just within the basal angle. Elytra wider than prothorax (18·5 × 12·5 mm.), hardly narrowed to base, convex, lightly declivous to sides, strongly but not abruptly declivous to apex; base wide; humeral angles rounded; basal border raised in a short subdentiform prominence at humeral angles; apex not sinuate on each side; striæ wide, shallow—a row of shallow separate punctures at bottom of each; striole at base of first interstice short, oblique; interstices 1-7 costate, subequal, ninth nitid, hardly distinct from margin, narrow and raised posteriorly, seriate-punctate; marginal channel wide; third interstice with about four punctures along its course. Prosternum longitudinally impressed and setigero-punctate between coxæ; mesosternum and metasternum glabrous. Ventral segments lævigate, third, fourth and fifth setigero-punctate in middle near posterior margin. Posterior coxæ contiguous. Length 35, breadth 12·5 mm.

Hab.: Queensland—Cairns (Coll. French).

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* This is the length of the prothorax in the middle; from anterior to posterior angle it is 9 mm.

A distinct species allied to *H. imperiale*, Sl., and *H. breve*, Motsch., but differing greatly from both these species in facies—prothorax less transverse, less strongly narrowed to base, as wide across base as apex, less rounded on sides; elytra less rounded on sides, etc. It may be noted that these three species are without a puncture at base of first interstice of elytra near origin of first stria.

HOMALOSOMA PORPHYRIACUM, n.sp.

♀. Robust; head large, deeply biimpressed on front; prothorax subcordate; elytra oval, third, fifth and seventh interstices subcarinate, humeral angles dentate, inner side of margin seriate-punctate. Upper surface of head and prothorax shining metallic purple; elytra dark purple, opaque, summits of costæ nitid, lateral margins dark purple, shining; under surface black, shining—sides of head, prosternum and body with purple reflections; legs black.

Head large (8 x 8 mm.), swollen on each side behind eyes; front with a wide deep concavity on each side. Prothorax finely transversely striolate, subcordate, widest before middle (6·8 x 9·3 mm.); sides rounded on anterior two-thirds, strongly sinuate posteriorly; basal angles widely rounded, not marked; apex emarginate, angles obtuse, not prominent; base lightly and widely emarginate in middle; median line lightly impressed; lateral basal impressions wide, deep; posterior marginal puncture placed near margin considerably before basal angle. Elytra much wider than prothorax (18 x 12·5 mm.), widest a little behind middle, lightly convex, abrupt on sides from carina of seventh interstice; sides strongly rounded; apex widely and evenly rounded; striæ finely punctate; third and fifth interstices strongly costate (the costæ not reaching base); seventh carinate, second, fourth, sixth and eighth depressed, ninth merged with margin, third with four punctures on apical half; a setigerous puncture placed a little distance from base of first interstice on course of first stria; basal border forming a short prominent projection at each humeral angle. Prosternum, mesosternum and metasternum glabrous. Abdomen plurisetose at apex. Length 35, breadth 12·5 mm.

Hab.: Queensland (given to me by Mr. C. French as coming from Budgery Mountain, S. Queensland).

This handsome species is allied to *H. superbum*, Casteln., which it resembles in facies; but differs from it by its larger size, the bright metallic colour of head and prothorax, prothorax with basal angles roundly obtuse, elytra with basal border dentate at humeral angles, etc.

Genus Pterostichus.

Pterostichus phylarchus, n.sp.

♂. Upper surface æneous, prothorax more nitid and metallic than elytra; under surface, legs, labrum and mandibles shining black.

Robust, elongate-oval. Head convex; front wide, lightly and shortly biimpressed, swollen behind and below eyes; mentum with sides of sinus parallel. Prothorax truncate-cordate ($7 \times 9{\cdot}2$ mm.), lateral impressions of base strongly impressed, elongate, wide. Elytra oval (19×12 mm.), convex; deeply striate; humeral angles rounded; interstices convex, third with five punctures along its course, fifth and seventh with three similar punctures, ninth seriate-punctate. Anterior tarsi with three basal joints dilatate and squamulose beneath. Length 34, breadth 12 mm.

Hab.: N.S. Wales—Bellinger River (Mr. J. H. Maiden).

Closely allied to *Feronia regalis*, Casteln., from which it differs by colour, more robust shape, eyes more prominent, elytra with basal border joining lateral border at humeral angle with hardly any projection, femora thick and more dilatate in middle. This species and *Feronia regalis* cannot properly be placed in the subgenus *Notonomus* on account of the shape of the sinus of the mentum for one reason: their place is evidently between *Homalosoma* and *Notonomus* and there seems no reason to separate them from *Pterostichus*.

Genus Simodontus.*

Simodontus elongatus, Chaudoir.

I identify as *S. elongatus*, Chaud., a species from Sydney of which the following is a brief description :—

Elongate-oval, depressed. Head small, eyes prominent. Prothorax subquadrate (2 × 2·55 mm); base (2·2 mm.) much wider than apex (1·5 mm.); sides lightly rounded; apex deeply emarginate; anterior angles prominent, obtuse; base lightly emarginate in middle; posterior angles obtuse, not marked; inner basal impression on each side of base narrow, elongate, lightly curved outwards, external impression well marked, short. Elytra very little wider than prothorax (4·7 × 2·8 mm.), parallel on sides; humeral angles subangulate; striæ deep; interstices lightly convex, third 3-punctate along third stria; striole at base of second interstice elongate. Episterna of metasternum elongate. Black, nitid, subiridescent; antennæ, tibiæ and tarsi ferruginous. Length 8, breadth 2·8 mm.

Hab.: N.S. Wales—Botany near Sydney (Froggatt).

Differs from *S. homomelanus*, Germ., which it resembles, by its smaller head, more prominent eyes, prothorax more narrowed to apex, etc.

Simodontus grandiceps, n.sp.

♂. Elliptical, depressed; head large; prothorax quadrate, of equal width at base and apex (2·2 mm.), external basal impression of each side short, wide. triangular; elytra truncate-oval, lightly striate; episterna of metasternum hardly longer than broad; posterior tarsi sulcate externally. Piceous-brown, nitid; legs, antennæ, mentum and parts of mouth ferruginous.

Head wide: front and clypeus lightly biimpressed; impressions wide and shallow on front; eyes large, inclosed behind; orbits well developed behind eyes and projecting from head with same

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* *Vide* P.L.S.N.S.W. 1889, (2), iv. pp. 732-737, and 1898, Pt. 3, pp. 480-484, for recent notices of the genus *Simodontus*.

convexity as eyes. Prothorax hardly broader than long (2·5 × 2·7 mm.), depressed, widest before middle; sides subparallel in middle, lightly rounded to anterior angles, more gradually narrowed posteriorly; apex widely emarginate; anterior angles widely obtuse; base lightly emarginate in middle; posterior angles roundly obtuse; lateral border wide; inner basal impression of each side well marked, lightly divergent; external impression wide, bearing near each posterior angle a setigerous puncture; median line lightly impressed. Elytra considerably wider than prothorax (5·6 × 3·4 mm.); sides lightly rounded; base truncate; humeral angles raised, subdentate; apex wide, shortly rounded; lateral border wide; interstices depressed, third punctate along course of third stria,* ninth seriate-punctate; striole at base of second interstice short, oblique, rising from a punctiform impression. Length 9·7, breadth 3·4 mm.

Hab.: Victoria—Gellibrand River, 30 miles west from C. Otway (Sloane).

This species seems to lead towards the genus *Prosopogmus*. It differs from *S. homomelanus*, Germ., by its head still larger, eyes more prominent; prothorax wider at apex, posterior angles more obtuse; elytra wider, more rounded on sides; episterna of metasternum shorter and wider.

SIMODONTUS MANDIBULARIS, n.sp.

Oval, robust, lævigate; head large, mandibles thick and heavy, angulate on external edge; prothorax transverse, a little narrowed posteriorly, a little wider at base than apex; elytra truncate-cordate, convex, lightly striate, third interstice tripunctate along third stria, humeral angle subdentiform; episterna of metasternum subquadrate. Reddish-piceous-brown; legs and antennæ testaceous-piceous, femora paler.

Head wide, convex, ampliate behind base of mandibles; front with an obsolete round impression containing a fine puncture behind each angle of clypeus; clypeal suture well marked; eyes

* There are four punctures, all placed along the course of the third stria, on the left elytron of the specimen before me.

convex, not prominent, inclosed posteriorly. Mandibles wide and heavy at base, strongly and obliquely declivous to labrum and clypeus, left overlapping right at apex; external edge strongly and roundly angulate about posterior third (thence oblique), arcuate at apex, right more strongly angulate than left at posterior third. Prothorax transverse (1·8 x 2·7 mm.), convex, declivous on each side between lateral basal impression and posterior angle, widest before middle, lightly narrowed to base; sides rounded, oblique posteriorly; apex hardly emarginate; anterior angles obtuse; base truncate; posterior angles marked but obtuse; margins hardly explanate near posterior angles; border wide; inner basal impression of each side strongly marked, short, a little divergent and attaining border posteriorly; external basal impression hardly marked—if present, shallow and round; median line fine. Elytra wide (4·5 x 3·3 mm.), convex, declivous to base on each side of peduncle, narrowed to base; sides rounded; base truncate; humeral angles strongly marked, hardly dentiform; striole at base of second interstice short (sometimes obsolescent), rising from a punctiform impression. Length 7-8, breadth 3·3-3·35 mm.

Hab.: N. S. Wales—Mulwala (Sloane); Victoria—Mallee District (C. French, Junr.).

This species is characterised by the peculiar shape of the mandibles; it is allied by its facies and short metasternal episterna to *S. fortnumi*, Casteln., and *S. leai*, Sl. From *S. fortnumi* it can be distinguished by the dentate humeral angles of the elytra, &c.; and from *S. leai* by its larger size, larger head with less prominent eyes, differently shaped mandibles, front not strongly impressed, elytra not so short and more narrowed to base. From *S. æneipennis* (unknown to me in nature) it seems sto differ by having the elytra much more ampliate behind the houlders. For differences from *S. læviceps*, Sl., a closely allied species, *vide* description of that species (p. 576).

Simodontus læviceps, n.sp.

Oval, robust, lævigate; head wide, convex, without frontal impressions; prothorax transverse, wider at base than apex;

elytra truncate-cordate, finely striate, third interstice 3-punctate along course of third stria, humeral angles dentiform: episterna of metasternum short. Piceous-brown, femora and basal joints of antennæ testaceous.

Head smooth, clypeal suture distinct; eyes convex, prominent. Prothorax convex (1·6 × 2·3), smooth; sides rounded, strongly roundly narrowed anteriorly, lightly obliquely so posteriorly (sometimes subsinuate just before base); apex lightly emarginate; anterior angles obtuse, not prominent: base truncate, angles subrectangular, obtuse at summit; lateral margins explanate near basal angles; lateral border equal, rather wide, reflexed; inner basal impressions short, linear: space on each side between these impressions and basal angles depressed: external basal impression often obsolete, if present shallow, foveiform; median line fine. Elytra short (4 × 3 mm.), convex, lightly declivous to base on each side of peduncle; sides rounded; base truncate; humeral angles shortly dentate; apical curve obsoletely sinuate on each side; striole at base of second interstice very short or obsolete, rising from a punctiform impression. Length 6-6·8, breadth 2·5-3 mm.

Hab.: N.S. Wales—Urana, Junee, Narrandera and Grenfell (Sloane).

Very closely allied to *S. mandibularis*, Sl., from which it differs by its smaller size; smaller head with mandibles less heavy and evenly rounded on outer side, eyes more prominent; posterior angles of prothorax less marked. It differs from *S. æneipennis*, Chaud., and *S. fortnumi*, Casteln., by the same features as *S. mandibularis*, Sl.: and from *S. leai*, Sl., by the frontal impressions obsolete; margin of prothorax narrower; posterior angles less obtuse; elytra not so short and broad, &c.

Genus Pediomorphus.

Table of Species.

A. Prothorax not punctate near base, except in basal impressions.

b. Elytra piceous, prothorax and head reddish-piceous.. *P. planiusculus*, Chaud.

bb. Colour wholly reddish-brown.................. *P. macleayi*, Sl.
AA. Prothorax punctate across base.
C. Form oval, depressed............................ *P. ruficollis*, Sl.
CC. Form narrow, lightly convex................ *P. elongatus*, Sl.

PEDIOMORPHUS MACLEAYI, n.sp.

Depressed; head small, eyes prominent; prothorax transverse, subcordate, strongly rounded on sides; elytra finely punctate-striate. Reddish-brown.

Head small, smooth, convex, not narrowed behind eyes, feebly biimpressed between antennæ. Antennæ filiform, elongate; apical joint elongate, compressed-fusiform. Prothorax lævigate, widest a little before middle (1·6 × 2 mm.), emarginate at apex, truncate at base, depressed on disc, declivous to anterior angles; apex and base of about equal width; sides strongly rounded, strongly and roundly narrowed to apex, narrowed to base without sinuosity; anterior angles distant from sides of head, obtuse but marked; basal angles obtuse (not rounded); border narrow, reflexed, extending round anterior angles on each side; lateral channel very narrow; median line linear, well marked; lateral basal impressions well marked, short, punctulate; posterior marginal seta arising from a puncture placed in a slight dilatation of the border just before basal angle. Elytra suboval (4·2 × 2 7 mm.), parallel on middle of sides, widely rounded at humeral angles, widely depressed on disc, abruptly declivous to sides from sixth interstice; apex widely rounded, lightly sinuate on each side; striæ finely and closely punctate; interstices depressed, ninth convex, punctate, the punctures interrupted in middle. Metasternum punctate on each side; episterna of mesosternum and metasternum punctulate. Ventral segments rugulose-punctate. Length 6·7, breadth 2·7 mm.

Hab.: North-West Australia—King's Sound (Froggatt; specimens from Macleay Coll.).

Differs from *P. planiusculus*, Chaud., by its larger size, prothorax more strongly rounded on sides and more decidedly narrowed to base, elytra reddish instead of piceous, antennæ longer and less compressed, the apical joint in particular longer.

PEDIOMORPHUS RUFICOLLIS, n.sp.

Depressed; prothorax broader than long, hardly cordate, punctulate on each side near base; elytra finely punctate-striate. Nitid; head black; prothorax testaceous-red (usually infuscate along base and apex); elytra piceous-black; antennæ, palpi, and legs testaceous; abdomen piceous-brown.

Head small, smooth, convex; very lightly biimpressed between antennæ; eyes convex, rather prominent; antennæ slender, filiform, apical joint short, compressed-fusiform. Prothorax lævigate, widest a little before middle (1·15 × 1·35 mm.), emarginate at apex, truncate on base; apex and base of equal width; sides rounded on anterior two-thirds; roundly narrowed to apex, obliquely narrowed to base; anterior angles distant from head, obtuse; basal angles obtuse; border narrowly reflexed, extending round anterior angles on each side of apex; median line finely marked; lateral basal impressions wide, their whole area punctulate, the bottom forming a linear impression; posterior marginal setæ rising from a puncture placed in a slight dilatation of the border at each basal angle. Elytra parallel on sides (3 × 1·75 mm.), widely rounded at humeral angles, depressed on disc, abruptly roundly declivous to sides from fifth stria; apex rounded, lightly sinuate on each side; striæ linear, finely and closely punctate; interstices depressed. Metasternum punctate on each side; episternum of mesosternum and metasternum punctate. Ventral segments finely rugulose except in middle. Length 4·3-5, breadth 1·7-2 mm.

Hab.: N.S. Wales—Urana District (Sloane; plentiful sheltering under sticks and dried cow-dung in company with *P. planiusculus*, Chaud., near the edges of a swamp on the Colombo Plains Run, twenty miles north from the town of Urana, 11th July, 1895).

A distinct species differing from the others of the genus by its colour; also from *P. planiusculus* and *P. macleayi*, Sl., by its smaller size and punctate area on each side of base of prothorax, and from *P. elongatus*, Sl., by its facies. In general appearance it much resembles *Thenarotes australis*, Blkb.

Genus DARODILIA.

The following is a Synoptic List of the species of *Darodilia*, omitting *D. castelnaui*, Macl., and *D. (Meonis) ovicollis*, Macl., of which I have no specimens for reference.

- A. Prothorax truncate at apex, anterior angles close to sides of head; elytra with one or more striæ obsolete on apical declivity.
  - B. Elytra with three inner striæ impressed on disc, only first entire; size large...... *D. mandibularis*, Casteln.
  - BB. Elytra with four inner striæ strongly impressed and entire; size small.
    - C. Prothorax as long as broad, lightly rounded on sides; prosternal episterna feebly rugulose...... .... *D. macilenta*, Sl.
    - CC. Prothorax orbiculate, broader than long; prosternal episterna strongly rugulose...... .... *D. rugisternus*, Sl.
- AA. Prothorax emarginate at apex, anterior angles distant from sides of head; elytra fully striate at apex.
  - D. Head with frontal impressions foveate; prothorax rounded to basal angles on sides, two basal impressions on each side .... *D. robusta*, Sl.
  - DD. Head with front longitudinally biimpressed; prothorax subsinuate on sides just before basal angles, a single basal impression on each side *D. emarginata*, Sl.

DARODILIA ROBUSTA, n.sp.

♀. Robust, oval, convex, lævigate; head with front bifoveolate; prothorax suborbiculate; elytra with four inner striæ strongly impressed; ventral segments sulcate, punctulate on each side; mandibles prominent, decussating; labrum deeply emarginate. Black, nitid.

Head convex, widely and lightly transversely impressed between base of eyes, not swollen behind eyes; clypeal suture well marked, connecting the punctiform frontal foveæ; eyes prominent, hemispherical, lightly inclosed at base. Antennæ filiform, four basal joints cylindrical, others compressed. Prothorax transverse (2·7 x 3·2 mm.), widest about middle; sides strongly and evenly rounded; basal angles not marked; apex lightly emarginate, angles obtuse, a little marked; base a little rounded; border narrow; marginal channel fine; median line very lightly impressed; inner lateral impression of base deep, narrow, not long, external impression small, shallow, round (almost obsolete), divided from inner impression by a narrow raised space; posterior marginal setigerous puncture placed at extremity of marginal channel. Elytra oval (6·2 x 3·7 mm.); sides lightly rounded, much wider at base than base of prothorax; base truncate on each side of peduncle; shoulders rounded; apex lightly and widely sinuate on each side; four inner striæ strongly impressed, entire, fifth, sixth and seventh marked near apex (obsoletely indicated and minutely punctulate on sides in the two specimens before me), eighth strongly impressed; four inner interstices and lateral interstice convex for whole length, others convex on apical declivity; lateral interstice punctate, the punctures widely interrupted before basal half. Metasternal episterna elongate, deeply longitudinally sulcate near inner side. Length 10·5, breadth 3·7 mm.

Hab.: Queensland (given to me by Mr. C. French as from the Endeavour River).

A distinct species differentiated at once from all others except *D. emarginata*, Sl., by its wider and less depressed form. It differs from *D. emarginata* by its larger size; front not longitudinally biimpressed; prothorax more rounded on sides before basal angles; fifth and sixth striæ of elytra not strongly impressed, etc. From *D. mandibularis*, Casteln., it is readily distinguished by its less elongate form and the elytra 4-striate on each side of suture.

Tribe **LICININI.**

Genus PHYSOLESTHUS.

PHYSOLESTHUS RUFICOLLIS, n.sp.

Depressed, lævigate; mentum edentate, labial palpi securiform. Elytra black, nitid; head black, mandibles reddish-piceous, labrum pale testaceous; prothorax reddish; abdomen piceous-black, shining; legs and palpi testaceous.

Head wide, depressed between eyes, not narrowed behind eyes; front with a ridge extending on each side from eyes to base of mandibles; eyes large, prominent. Prothorax transverse ($1\cdot6 \times 2$ mm.), depressed, widest before middle (at anterior marginal seta), wider between posterior than between anterior angles; sides lightly and roundly narrowed anteriorly; more lightly and obliquely so posteriorly; apex lightly emarginate; anterior angles wide, obtuse; base truncate in middle, sloping forward on each side; posterior angles obtuse, a little marked; lateral margins reflexed, explanate near posterior angles; a short, wide, strongly marked impression on each side of base; median line strongly impressed. Elytra depressed ($4\cdot5 \times 3$ mm.), lightly striate; interstices depressed, second wider and with an elongate striole near base, third finely bipunctate along course of second stria, ninth seriate-punctate. Length 7·5, breadth 3 mm.

Hab.: N. S. Wales—Mulwala (Sloane; a single specimen harbouring from flood waters of Murray River under loose bark of a red gum tree).

Differs from other species of the genus by its red prothorax.

Tribe **ODACANTHINI.**

Genus EUDALIA.

EUDALIA NIGER, n.sp.

♀. Upper surface setigero-punctate, under surface punctate-glabrous. Head lævigate, sparsely setigero-punctate, widely dilatate across eyes, neck condyliform; prothorax subcylindrical longitudinally sulcate and setose on each side, punctate anteriorly —except on each side of disc; elytra wide, depressed (5·5 × 3·3 mm.), strongly punctate-striate, interstices lævigate (not shagreened), sparingly seriate-setigerous. Black, nitid; trochanters and parts of mouth piceous; femora—excepting apex—pale testaceous; tibiæ black, a wide testaceous band in middle.

Head with eyes as broad as long; middle of front and vertex impunctate; front widely biimpressed. Prothorax longer than broad (1·7 × 1·5 mm.), convex, lightly ampliate on each side in middle; disc with a smooth space on each side anteriorly, lateral margin thick, convex (subcarinate); median line linear. Length 10, breadth 3·3 mm.

Hab.: N. S. Wales—Mulwala and Junee (Sloane; a single specimen at Mulwala, 26th June, 1896, under loose bark of a red gum tree, having taken refuge from flood water; and on the muddy bank of Houlaghan's Creek, fifteen miles north from the town of Junee, a single example under a stick).

Differs from *E. macleayi*, Bates, by its deep shining black colour, the tarsi and basal joints of antennæ black; head wider across the eyes and more strongly constricted posteriorly, less punctate; prothorax more elongate and more ampliate on sides, less closely punctate, elytra with interstices nitid, not shagreened, more sparingly setose (the setæ piceous, erect), striæ more deeply impressed and more strongly punctate, apical curve less shortly oblique on each side. The elytra have a wide transverse depression on each side of the disc a little before the apex.

Tribe LEBIINI.

Genus Sarothrocrepis.

Sarothrocrepis humeratus, n.sp.

Depressed; prothorax transverse, posterior angles rectangular; elytra truncate on base, shoulders dentate. Bicolorous: head, antennæ and tibiæ ferruginous; prothorax testaceous; elytra black with a parallelogram-shaped plaga on basal half, basal border and margins testaceous; under surface of prothorax, coxæ and femora pale testaceous; body testaceous, abdomen infuscate.

Head as in other species of the genus, a horseshoe-shaped impression between eyes. Prothorax transverse (1·65 × 2·5 mm.), much narrower at apex than base, widest before middle; disc convex; lateral margins explanate—especially posteriorly; sides rounded anteriorly, greatly narrowed to apex, hardly narrowed to base, sinuate before posterior angles; apex widely emarginate, base truncate on each side, produced roundly backwards in middle; posterior angles sharply rectangular. Elytra subconvex, considerably wider than prothorax (5·2 × 3·6 mm.), lightly and rather obliquely dilatate behind shoulders, subparallel on middle of sides; base truncate; humeral angles strongly and sharply marked, almost dentiform; striæ crenulate; margin narrow with edge narrowly reflexed. Length 7·5-8·5, breadth 3·6-3·8 mm.

Hab.: Victoria—Lilydale (Sloane; November).

Distinguished from the other species of the genus by the humeral angles of the elytra being raised and sharply rectangular; the pattern of the elytra differs conspicuously from that of *S. corticalis*, Fabr., by the black colour extending forward to the basal border along interstices 5-7, and along the first interstice to the basal striole.

Genus DROMIUS.

DROMIUS AUSTRALIENSIS, n.sp.

Elongate, depressed. Black, subiridescent; elytra with a greenish tinge; legs testaceous (femora pallid, tibiæ darker); antennæ fuscous; under surface piceous, metasternum and posterior edge of ventral segments cloudy testaceous; head minutely shagreened.

Prothorax hardly wider than head with eyes; sides very lightly narrowed to base; posterior sinuosity obsolete; anterior angles obtuse; posterior angles marked, obtuse at summit. Elytra not attaining apex of abdomen, depressed, subparallel on sides, finely crenulate-striate; humeral angles widely rounded; apex roundly truncate; second interstice with two fine setigerous punctures on disc. Length 3·3-3·5, breadth 1·1-1·2 mm.

Hab.: N.S. Wales—Mulwala, Junee and Grenfell (Sloane).

Compared with *Dromius yarræ*, Blkb,, this species is smaller; the prothorax less obliquely truncate behind the posterior angles, and with basal lobe shorter; colour more coal-black, less iridescent.

Note.—Mr. A. M. Lea found a *Dromius* at Bridgetown, W.A., which seems to be *D. australiensis*.

THE TICK FEVER PARASITE.

By R. Greig Smith, M.Sc.

Tick fever is a disease which appears to be widely distributed throughout the warmer countries of the world. It is primarily an acute anæmia, associated with a haematozoon, which feeds upon and destroys the red blood corpuscles. In consequence of the degradation and disintegration of the corpuscles, the capillaries become clogged, the internal organs intensely swollen, and the liver and kidneys being frequently unable to cope with the task of eliminating the products of the corpuscle disintegration, death results from what is essentially capillary congestion. During the very rapid destruction of the corpuscles, the urine may be of a dark red colour and albuminous.

So far as is definitely known, the disease occurs only among cattle, but two diseases of sheep have been described which appear to be caused by the same parasite. In the southern portions of the United States of America it is known as Texas or southern cattle fever; in Italy, East Africa and Turkey as cattle malaria; in the lower reaches of the Danube as haemoglobinuria, and in Sardinia and Finland as haematuria.

Theobold Smith, in conjunction with Kilborne, was the first to give a complete account of the disease and to trace its cause to a haematozoon which he called *Pyrosoma bigeminum*, a name which has been altered by Wasielewski (8) to *Apiosoma bigeminum*, Smith. One year previous to the first of Theobald Smith's papers, Babes had described under the name of haemoglobinuria a disease of cattle in the swampy pastures of the lower Danube in Roumania, and had traced the cause to a haematozoon, but although the disease is now considered to be identical with Texas fever, Babes' description of the parasite was far from being as complete as that of Theobald Smith

There are two varieties of the disease, the acute and the chronic form. In the former, the destruction of the red corpuscles is very rapid, while in the latter it is much slower. The acute form is marked by the general symptom of rapid oxidation, viz., acute fever, and in the organs of affected animals all known forms of the parasite can be found. In the chronic disease only the supposed younger forms are to be seen. The presence of the parasite in an animal does not necessarily indicate the presence of disease, since it appears to exist latent, (5, 6) becoming evident when the system is weakened from some other disease, just as the cause of rheumatism, influenza, or even the common cold may presumably remain latent in man to become evident when the system is temporarily weakened as by a sudden chill.

Cattle are the most susceptible of all animals, and although it may be said that tick fever is a bovine disease, it should not be forgotten that other animals succumb to the action of parasites which may be identical with *Apiosoma bigeminum.* There is a canine disease of Lombardy and a sheep disease, carceag or parasitic ictero-haematuria, in both of which the organisms characteristic of tick fever have been observed. Furthermore, according to some authors, rabbits and guinea-pigs succumb when inoculated with blood containing the parasite.

Infection occurs by means of the cattle tick *(Ixodes bovis)* in cases of Texas fever, tick fever and haemoglobinuria. In the bovine malaria of the Roman Compagna (3) and of Turkey (6) there is no record of ticks associated with the disease

The parasite is found in the blood serum and within the red corpuscles. When invaded by the parasite the corpuscle loses its elasticity and is retained in the capillaries and the body organs. Consequently comparatively few invaded corpuscles are to be found in the circulating blood, the percentage varying from 1 to 2 except during the height of the fever, when it may rise to from 5 to 10 in a few cases. The blood of the organs, as for example the heart-substance, has about 80 per cent. of the corpuscles invaded.

The typical form of the parasite is pear-shaped, and although a single organism may occupy the corpuscle, yet commonly they occur in twos, sometimes even in fives and sixes. When double, the narrow ends are together, and it is undoubtedly only a matter of technique to show that they are united by a connecting thread. The pear-shaped parasite stains unequally; the part occupying the bulb of the pear stains feebly or not at all, and it is assumed that this is a vacuole; the middle portion generally takes the stain deeply. This form is not common in the corpuscle during life, (1) for by the time that the parasite has grown to this shape the corpuscle has become disintegrated and the organism free. It is to be found in numbers soon after death, while if a section or film be made immediately the animal dies, there is seen a mixture of the younger with the presumably oldest form. In the capillaries during the acute stage small double spindles are sometimes seen, each spindle being connected by a joining line. This is probably an intermediate stage of the parasite.

In fresh blood a small round spot is frequently seen close to the periphery in some of the corpuscles; it is free from haemoglobin and measures 0·5 μ in diameter. It is also visible in stained preparations, where it varies up to 0·6 μ, and is often divided. Since this appears at the beginning of the attack and disappears when the corpuscles begin to increase in number, it is not to be considered as a degenerate form (1). It is contended by Celli and Santori that this extremely small body is not the parasite, since Marciafava had seen it in cases of malaria, and they themselves had found it in healthy guinea-pigs as well as in rabbits and dogs which had died of diseases other than tick fever. It is referred to as a pseudoparasitic endoglobular body. It is possible that the smallest form of the tick fever parasite may be of the same diameter as the pseudoparasitic body; in this case they would be morphologically identical.

According to Celli and Santori, what is really the smallest and probably the youngest type of the parasite measures from 1 to 1·5 μ. It changes its shape as it moves about from place to place in the corpuscle, becoming round, oblong, cylindrical, egg- or pear-shaped in succession. It may occur singly, in pairs or threes in one and the same corpuscle. It is strongly refractile and shows up well against the ground of the corpuscle. Should the mobility cease either naturally or artificially by cooling below 24° C. or by killing, the amoeboid parasite becomes round and often shows a central point, which, together with its usual peripheral position, enables it to be recognised. It differs from the pseudoparasitic bodies in being larger, more refractile and motile (3). It occurs in the acute and chronic stages of the disease.

Sidney Hunt and Collins describe a similar multiplicity of form among bodies occurring free in the circulating blood, but especially in the substance of the kidney and the spleen, where they are enormously abundant They are also found, but to a less extent, in the liver. "These free bodies vary greatly in size, some being no more than $\frac{1}{20}$ and some as large as $\frac{1}{3}$ the size of a bovine red blood cell, which is somewhere about $\frac{1}{4000}$ of an inch," *i.e.*, they vary from 0·8 to 2 μ. "They vary also in form, the majority being round or spherical, some pear-shaped, some oblong, some sausage-like, others constricted like an hourglass and others irregular. None of these forms are by any means constant, since the bodies are perpetually changing their outline. They differ also in respect to colour: most are colourless and highly refractive, others have a yellowish or even reddish-brown tinge, but there is never any granular pigment. The majority appear homogeneous, others dark-centred, though this latter appearance may be due to their high refraction. A certain proportion are motionless, but the majority are in very active movement, and may sometimes be seen to work their way across the field of the microscope, apparently urged along by a flagellum. The most general and characteristic movement, however, is neither amoeboid nor locomotive, but consists of a peculiar rolling on their own axes, which gives them a twinkling appearance, something like that of a small bright coin as it sinks in deep water." The motility is more active than with the intracorpuscular parasite.

The amoeboid form of the parasite is larger, being from two to three times the size of the smallest motile form of Celli and Santori. The refrangibility is so low that it can only be seen with difficulty in some of its phases, especially when, as is often the case, the corpuscle is paler than usual. The amoeboid motion is active with the smaller sizes, and slower with the larger. On account of the amoeboid motion, the parasite may appear with one, two, three or more protrusions; it may divide into two, the halves connected by a thread when an appearance is obtained which is probably that described and considered by Theobald Smith as a younger stage of the pear-shape The two halves join again to form perhaps a diamond or a sphere The two pear-shaped forms are seldom small; they are generally large, and vary from 2·5 to 4 μ long, by 1·5 to 2 μ broad, and have a granule near the swollen end. They may be considered to be in extremely slow amoeboid motion, but so slow as to be practically non-motile or as a particular stage in the developmental cycle. In support of the former hypothesis there is the fact that long observation showed the form to vary from the pear to an egg or round shape; while in another case, also after long observation, an apiosoma without altering its shape disappeared from the corpuscle (3).

In very acute cases of the fever a few large granules have been observed lying separated from one another or in a heap within some of the blood corpuscles. They are non-motile, and retain their rounded shape Their significance is unknown, but it is suggested that they may be spore forms (3).

Besides the parasitic forms, one frequently observes in the blood, red corpuscles larger than usual, rather pale and beset throughout the different layers with chromatin granules. Since these granules are found in other cases of anaemia as, in the sheep, they have no relation with the parasite, and are to be traced to the caryolysis of the young red corpuscles.

The complete life cycle of the parasite has not yet been described by any author. Theobald Smith suggests that the small motile globule is the youngest intraglobular stage, the globule dividing, each part becoming spindle-shaped and ultimately pear-shaped, the portions being still connected by a thread. In the chronic cases of the fever there is a certain immunity produced, and the later stages of the parasite are suppressed (1) The large pear-shaped body either within or without the corpuscle may begin a reproductive stage, and produce a generation of very minute bodies akin to the smallest observed stage, or there may be a free reproductive phase in the blood distinct from the intraglobular. These phases have not been seen.

Sidney Hunt (5) notes that in coverglass preparations of advanced cases, the parasites exhibit all the stages between being intra- and extracorpuscular, the corpuscles being more or less disintegrated. Some of the apiosoma are seen to have a clear central portion which does not stain. The pear-shaped forms are of various sizes, the clear portions being more marked in the larger ones. Sometimes in the blood there are also seen crescent-shaped bodies which Dr. E. Klein, F.R.S., considered to be the stage succeeding the pear-shape, since they are presumably full of young pyrosoma. These crescent-shaped bodies are really sarcosporidia, common muscle parasites.

Like the yeasts, the protozoa do not lend themselves well as objects of study in the dry and stained condition. Yet by exercising care, especially in the choice of a fixing agent, it is possible to obtain specimens which tell us more of the structure of the parasite than can be learnt from their study in the fresh condition. In a number of films of dried blood* which the writer examined the various recognised phases in the life history of the parasite were observed. The smaller diplococcus bodies measured $0{\cdot}4\mu$, and the larger $1\,\mu$; both intra- and extra-corpuscular forms occurred. The mature forms varied in size, the difference being mainly due to the vacuole which seems to increase as growth proceeds much more than the other parts of the apiosoma The staining is irregular; the neck, the middle and the terminal margin of the pear colour deeply; the vacuole faintly or not at all. In some of the corpuscles two refractile spherical bodies are observable, and careful focussing and adjustment of the light revealed the shrivelled remains of the middle and neck of the apiosoma. The growth in the mature form, the persistence and refrangibility point to the so-called vacuole being really a capsule,

* Kindly lent by Dr. Frank Tidswell.

and, if so, all the interbovine cycle may be assumed to have been observed. The diplococcus bodies, the amoeba, the mature apiosoma with its capsule complete one portion of the life history. Since the multiplication of the parasite is so rapid it almost follows that all stages of the interbovine life cycle must have been observed by those who investigated the blood. The interpretation alone is wanting, and this is supplied if, for vacuole, we read capsule. Celli and Santori's observations upon fresh specimens bear out this interpretation. They noted that the mature apiosoma had a granule at the swollen end. This appearance would be caused by the refraction of the capsule. They make no mention of a vacuole, nor do they figure one in their drawings. The granule which they represent by a tiny circle occupies a position which coincides with the centre of the capsule. They mention that they saw the pear-shape alter, after a long time, to an egg or round shape. Such a change would be brought about by the enlargement of the capsule and the shrinkage and degradation of the body of the apiosoma concomitant with the maturation and persistence of the capsule. Another observation showed that the apiosoma, without altering its shape, suddenly disappeared from the corpuscle. This would happen were the capsule to rupture and liberate its contents simultaneously with the collapse of the other portions.

With regard to the susceptibility of other animals, Theobald Smith found that rabbits, guinea-pigs, goats and sheep showed neither a multiplication of the parasite nor symptoms of the disease when inoculated with virulent blood. Similarly, Celli and Santori injected virulent blood into rabbits, guinea-pigs, mice, rats, cats and dogs, but without result. They mention, however, that death sometimes ensued, but the parasite could not be found. The pseudo-parasitic forms were present. These authors may be wrong in considering all the small diplococcus bodies as being pseudo-parasitic. Although the parasitic forms were not found, the injected blood maintained its virulence through a series of three guinea-pigs. Nicolle and Adil Bey found that 1 c.c. of virulent blood caused the death of guinea-pigs. Sidney Hunt and Collins found the horse unaffected, while sheep developed high fever as the result of intravenous inoculation with virulent blood. The small marginal bodies were found in the blood of one of the sheep which was slaughtered, but there were no characteristic apiosoma. The sheep diseases carceag (Babes) and parasitic ictero-haematuria (Bonome) are caused, if not by the same parasite, by an ally so close that it seems only a modification. Babes does not describe the parasite at all fully, but since he claims that his disease and that of Bonome are identical, it will be sufficient to describe the parasite of the latter (7). The infected blood corpuscles have on their margin or inside round, oval or pear-shaped, strong, light-refracting, colourless bodies, varying in size from 1 to 3μ; they frequently show active contracting movements. In the plasma they are seen either singly or in twos or threes They are easily coloured by aniline stains. Organs of locomotion were never observed. The blood of the organs contained a greater number of invaded corpuscles than were to be found in the circulating blood. In the former places the parasites were chiefly the more mature forms, and in the latter chiefly the younger. In the urine the parasite was found partly free and partly in blood corpuscles.

It is admitted by American and Australian investigators that the cattle tick is the infecting agent. European authors must be aware of the part played by the tick in America, and yet no mention of the insect is made in some of their papers. Babes, however, noted that animals suffering from haemoglobinuria were infested with ticks; and Schneidemühl supplements this, saying that the parasite of this fever exists for some time in the body cavities of the tick as in Texas fever; all ticks do not convey the disease, since susceptible cattle may have ticks without any sign of illness. There are, however, varieties of ticks, some of which apparently never produce Texas fever, while others do But of the dangerous species of tick only those that carry infection are to be feared, and this infectivity is determined by locality. It is self-evident that in a new locality the disease must have begun either with an animal or with a tick: in the latter case the tick would infect an animal, and other ticks feeding thereon would convey the infection to other animals. But it is well known that a mature tick never leaves one host to attach itself to another: in fact, it is generally accepted that it is only in the larval stage that ticks adhere to cattle. The mature and infected tick, therefore, falls to the ground, and under some cover lays its eggs, which in time hatch, become the larval forms, and attach themselves to a passing animal with poisonous effect. The question, then, comes to be: in what manner is the parasite conveyed from the mother tick to the larval form? Is it carried internally or externally? Does the parasite, when absorbed by the tick, pass through the alimentary canal to infect the ground; the exterior of the eggs and ultimately the larval tick which inoculates the parasite into the animal after the manner of a solid inoculating needle; or does the parasite enter an alternative phase in its life-history in the body of the tick? One cannot say how the parasite gets from the parent to the larva, but that it certainly does and directly has been proved by the experiments of Theobald Smith and Kilborne, who hatched tick eggs in the laboratory and produced the disease by fastening the larvæ on susceptible animals. Prof. Mayo, of Kansas, also produced a fatal attack by placing upon a cow the larvæ hatched from mature ticks that had been sent by mail from Texas. These experiments, however, do not decide the question as to whether the parasite exists inside or outside the egg capsule. It would be interesting to know if larvæ hatched from disinfected eggs could produce the disease. If they could not, the search for a phase of the parasite in the body of the tick might be useless. Another point worthy of consideration is whether the tick may not mechanically carry the parasite from the pasture into the animal. We frequently hear of such mechanical inoculation by biting insects such as bugs and gnats, and in the case of louping-ill, a sheep disease of Scotland and the North of England, where infection is in all probability carried by the sheep tick, all evidence goes to show that the infection is carried mechanically by the insect. Theobald Smith considers it to be quite possible that biting or stinging and blood-sucking insects may transmit the parasite directly from susceptible animal to susceptible animal, or perhaps there may be the intermediate stage of a non-susceptible animal. Owing to the long incubation period, he could not, however, obtain data in support of this view. With regard to the possibility of the tick conveying the parasite from the pasture to the animal, it may be well to consider how the pasture may become infected. Infection has been produced artificially by scattering mature ticks from infected animals over the ground, and such seems to be the only method recognised at present whereby infection may occur, viz., by the infected ticks falling off the animal. If the tick acts only or partly as a mechanical agent in carrying the parasite, the infection of the pasture is of paramount importance. Such infection is chiefly caused by animals suffering from the fever. But it is also possible that animals which have recovered, and the blood of which still contains the parasite, as well as animals which, bred in an infected country, have the parasite latent in their system, probably through repeated tick inoculation, may also form the nucleus of an outbreak. Preventive inoculation by the use of what is known as recovered blood--that is, the blood of animals which have recovered from the disease—is a process which may not be unattended with danger. The practice would be innocuous did the recovered blood contain no parasite, but this cannot be said to be the case. As a result of the inoculation, the animal develops the fever, and during this time at least the blood will contain the parasite. One cannot doubt that a single tick sucking this blood may be the means of starting the disease in a new locality. But to return to the infection of the pasture, during an acute attack of the fever the animal is constipated, passing dung which is frequently blood-stained, and since the blood harbours the parasite a transference of the causative agent to the pasture occurs. The kidneys are found charged with the parasite, and since they are in a pathological condition it seems possible that the protozoon may pass into the urine. Although the latter has often been examined, the parasite has never been found in it with certainty.

Bonome (7) found the parasite in the urine of sheep suffering from parasitic ictero-haematuria. Against the view that the tick carries the parasite directly from the ground to the animal, are the experiments performed in America and Queensland, (4) showing that a strained watery emulsion of crushed larval ticks does not produce the disease. If these experiments are to be trusted as indicating a fact, viz., that on or in the larval tick there are no cattle parasites, there only remains the probability that the cattle parasite is matured in the body of the tick from an alternative form which may be called the tick parasite. This view is the one at present held, being engendered by these experiments and also perhaps on account of some similarity between Texas fever and malaria.

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ON THREE NEW SPECIES OF EUCALYPTUS.

By R. T. Baker, F.L.S., Curator, Technological Museum, Sydney.

(Plates xliii.-xlv.)

Eucalyptus oreades, sp.nov.

A "Mountain Ash."

(Plate xliii.)

A tall tree with a smooth whitish bark down to the ground, or sometimes leaving a lighter rough bark 6-8 feet from the ground.

Young leaves thin, elliptical-oval, shortly acuminate on a petiole of about an inch or more; venation more distinct than on mature leaves. Mature leaves long, often 9 inches, thick, shining, dark green on both sides, on rather long petioles, lanceolate, falcate, venation distinct, intramarginal vein removed from the edge, lateral veins very oblique, often approaching the venation of *E. coriacea*, A. Cunn. Oil glands numerous.

Peduncles axillary not numerous, generally with about 6-8 flowers. Calyx-tube hemispherical, on a pedicel of about 2-3 lines. Operculum hemispherical, acuminate, about the size of the calyx. Stamens recurved in the bud; all fertile. Anthers kidney-shaped. Ovary small, flat-topped

Fruit hemispherical, rarely pyriform, about 3 lines in diameter, the rim thin, capsule sunk, valves rarely or scarcely exserted.

Hab.—Lawson (*H. G. Smith* and *R.T.B.*); Mount Victoria and road to Jenolan Caves (*R. H. Cambage*).

This tree is allied to *E. Sieberiana*, F.v.M., in the venation and shape of the leaves and nature of timber, but it differs from it in its smooth bark and shape of fruits.

When seen in its native habitat it might easily be passed by as *E. saligna*, Sm., but it differs from that species in the timber, fruits and chemical constituents of its oil, and venation of the leaves.

In the venation of the leaves it might also be classified with *E. dives*, Schau., but in no other feature does it approach that species.

The fruits are somewhat similar to those of *E. stricta*, Sieb., *E. obtusiflora*, and *E. fraxinoides*, but smaller.

The venation and timber, as well as fruits and flowers, differentiate it from *E. coriacea*, A. Cunn., although some of its chemical constituents connect it with that species.

In botanical sequence it is placed between *E. Sieberiana*, F.v.M., and *E. coriacea*, A. Cunn.

This tree so far has only been found at the heads of gullies on the Blue Mountains, at the foot of precipitous sandstone cliffs, and always near the foot of waterfalls on the edge of the pools. It grows very tall, with scarcely a branch till near the top or head, which generally appears above the top of the smaller gullies.

It very possibly has been looked upon or classed as *E. saligna*, Sm., which is sometimes found on the banks of streams near the coast, both having a similar silver-grey shining bark.

If it were not for the fruit and buds it might be regarded as a smooth-barked variety of *E. Sieberiana*, F.v.M.; but this cortical variation has now been shown to have very little to support it in the field, taken in conjunction with other features.

Timber.—A light pale-coloured, rather soft timber, fissile, and not easily distinguished from that of *E. Sieberiana*, F.v.M. ("Mountain Ash"); it should be classified amongst the "Ashes." It is quite a distinct timber from "Blue Gum," *E. saligna*, and it is only suitable for indoor work. As its specific gravity is light and the timber tough it might be tried as a substitute for English Willow. It is largely used in the saw mills on Mount Victoria, towards Jenolan (R. H. Cambage).

Oil.—Oil distilled from fresh leaves averaged 1·16 per cent. The crude oil is only slightly coloured yellowish in tint; the rectified oil is almost colourless. The specific gravity of crude oil was ·8869 at 15° C., whilst the specific gravity of rectified oil below 190° was ·8646 at 15° C. Sp. gr. fraction 240-275, 9 per cent. = ·9377 at 15° C. Specific rotation crude oil [a] D − 25·6°. Specific rotation large fraction [a] D − 35·7°.

A large quantity of phellandrene was present. No eucalyptol could be detected.

On rectification 83 per cent. distilled below 190° C., 4 per cent. below 240° C., and 9 per cent. below 275° C.

The third fraction contains a small quantity of eudesmol determined by crystallisation. It does not appear to contain in any extent the constituent which gives to the oils of *E. Sieberiana*, F.v.M., *E. coriacea*, A. Cunn., *E. dives*, Schau , their characteristic odour (H. G. Smith).

Kino.—The exudation kino of this tree is tough, astringent, and contains no gum, eudesmin or aromadendron. The tannin gives a blue-purple colour, with ferric chloride in dilute aqueous solution, and a blue-purple colour and a dark precipitate at once with a solution of iron alum (H. G. Smith).

E. MACULOSA, sp.nov.

"Spotted Gum."

(Plate xliv.)

A tree rarely exceeding 60 feet in height, usually from 20-40 feet (W.B.). Bark smooth to the ground.

Young leaves lanceolate, 2 or 3 inches long, opposite, very narrow. Mature leaves narrow, lanceolate, falcate, not shining, same colour on both sides, venation obscure, intramarginal vein close to the edge, lateral veins oblique. Some trees have the leaves quite rigid and erect.

Peduncles axillary, slender, under 6 lines long, bearing from 4-16, occasionally 20, sessile or shortly pedicellate flowers. Calyx turbinate, about 1 line long; operculum of equal length, obtuse. Stamens all fertile, short and incurved, the free end appearing pendulous in the bud, as shown in the plate. Anthers small, ovoid, opening by longitudinal slits, connective prominent. Ovary flat-topped.

Fruit in the early stage much resembles that of *E. hæmastoma*, var. *micrantha*, and probably this species has been placed in the past under that variety In the mature stage the fruit is turbinate, and resembles some forms of *E. Smithii*, R.T.B., about 2 lines in diameter, rim domed, valves exserted, obtuse.

Hab.—Bungendore (*W. Bäuerlen*); Charley's Forest, Braidwood (*W. Bäuerlen*).

It grows in poor open forest ground up to 50 to 60 feet in height, and from 1 to 3 feet in diameter, with a rather dense head. Some trees on the ridges have the appearance in the distance of Pines, hence it is sometimes called "Pine." In a shrubby form it flowers when only 4 or 5 feet high. The bark is of different shades of grey, or bluish or yellow, with spots of about the same size and shape as those of *E. maculata*, Hook., the true "Spotted Gum." The bark is smooth to the ground (W. Bäuerlen)

This species has probably in the past (as stated above) been confounded with *E. hæmastoma*, Sm., var. *micrantha*, Benth., (*vide* Eucalyptographia, Dec. ii, *E. hæmastoma*, Sm., "Spotted Gum"). It differs, however, from that species and its variety in the shape of mature fruits, venation of leaves, in all the stamens being fertile, in the anthers being parallel, and especially in the chemical constituents of the oil. The bark of this species is always more bluish and less glossy than *E. hæmastoma*, Sm. The two trees are often associated (W.B.).

It has affinity with *E. Smithii* in the fruits in some instances, and particularly in the chemical composition of its oil. With the original "Spotted Gum," *E. maculata*, Hook., it has little or no affinity.

On account of the markings on the bark it could with equal justice be called Spotted Gum as *E. maculata*, but to distinguish it from that species and to record its field character the name of *E. maculosa* is proposed. The two species, however, are never found together in the same locality (W. Bäuerlen).

From the nature of the timber, bark, shape of buds and fruits, venation of leaves, this species is placed tentatively after *E. viminalis*, Labill.

Its chemical constituents connect it with *E. Smithii*, R.T.B.

Under this species it may be mentioned that two other trees are known by the same vernacular as this tree, viz.:—

(1) "Spotted Gum," at Charley's Forest and Fagan's Creek, Braidwood (W.B.).

(2) "Spotted Gum," at Ilford (R.T.B.).

The chemical and botanical evidence points, as far as yet examined, to these being distinct from the "Spotted Gum" of Bungendore, but in the meantime they are placed here tentatively as var. A. and var. B. of this species.

Var. A. is at certain seasons the host of a Psyllid, producing a beautifully figured, yellow-coloured lerp.

Var. B., when wounded, exudes a whitish substance called by the settlers "butter-milk" (G. Harris).

Timber.—The timber of the Bungendore specimens closely resembles that of the so-called *E. Gunnii*, Hook., occurring on the Snowy Mountains of this Colony, but is a little harder. It is straight-grained, free and easy to work, seasons badly, and is generally depreciated in value by the presence of gum-veins. It is a poor commercial timber. The timbers of the varieties A and B are similar in texture, but superior in hardness to the type, but nevertheless cannot be recommended for commercial use.

Oil.—The crude oil is a light amber colour. The yield of oil from fresh leaves gave 1·06 per cent., a mean of three distillations. The rectified oil is of a light yellowish tint, and in odour, taste, &c., resembles rectified Eucalyptus oils of the better class.

It contains no phellandrene, but a small quantity of dextrorotatory pinene is present. The rectified oil (fraction representing 87 per cent. of crude oil) contained 45·5 per cent. eucalyptol, rather less than should be demanded in a good Eucalyptus oil, as myself and colleague have suggested 48 per cent. of eucalyptol as the minimum allowable in oils used medicinally (see recommendations by the New South Wales committee appointed to deal with the addendum to the British Pharmacopœia). The specific gravity of the crude oil at 15° C. = ·9858. The specific gravity of the rectified oil at 15° C. = ·9075. The specific rotation of the crude oil = $[a]_D$ + 3·66. The specific rotation of the rectified oil = $[a]_D$ + 3·31; 92 per cent. of the crude oil distilled below 185° C. (H. G. Smith).

Mr. W. Bäuerlen, who is familiar with *E. hæmastoma*, Sm., and *E. maculosa* in the field, states "that there can be no doubt about their being distinct species, although there is so much similarity in the leaves and sometimes also in the general aspect that sometimes under certain conditions it is rather difficult to distinguish them. On comparison, however, one finds buds and fruits quite different, so much so that I only need speak of the trees as they appear in the field under certain conditions. Under such conditions *E. hæmastoma*, Sm., is all round the larger of the two, attaining a diameter of 2-5 feet, sometimes the butt bulging enormously near the ground; if anything it is more crooked than *E. maculosa* usually is, the trunk not being by far so spotted as *E. maculosa*, and always quite different in colour; this holds invariably from the youngest saplings, or even seedlings, to the oldest trees. The trunks of *E. maculosa* are always bluish with dark grey spots, or sometimes reddish or greenish spots, and always dull coloured, while the trunks of *E. hæmastoma* are always of a creamy colour, often, especially in the limbs, approaching quite white, but not dull or chalky; they have the appearance as if they were rubbed over with soap.

"Both trees are smooth to the very ground, but the difference of colour on the trunk never misled me in one instance. The foliage of *E. maculosa* is always more bluish, and the leaves more drooping; the veining is more conspicuous in the leaves of this species, and the leaves in the young state are narrower than the leaves in general, although there is very little difference.

"In some localities, like the steep, stony hillside near Lake George, it is more difficult to distinguish the two trees, especially when young; there *E. hæmastoma* has a very dense head with very narrow leaves, and also somewhat bluish in colour, but the trunks have their respective blue or creamy colour, and after a little experience one soon distinguishes the trees by that, if by nothing else. *E. maculosa* never has the insect markings (scribbles) so persistently found on *E. hæmastoma*."

Eucalyptus patentinervis, sp.nov.

"Bastard Mahogany."

(Plate xlv.)

A medium-sized tree as far as seen, with a stringy bark similar to that of *E. resinifera*, Sm. Ultimate branchlets angular.

Young leaves ovate, shortly acuminate, lanceolate, thin, almost membranous, petiole slender, from 1 to 2 inches long, venation prominent, intramarginal vein removed from the edge. Mature leaves lanceolate-falcate, coriaceous, acuminate, almost a foot long in some cases, not shining, colour uniform on both sides, petiole rather slender, channelled above, venation very distinct in the coast trees but finer in the inland ones, lateral veins very prominent and spreading, curved, numerous, the intramarginal vein removed from the edge. Oil glands very numerous.

Peduncles axillary, about 1 inch long, flattened, bearing about 10 fairly large flowers. Calyx occasionally angular, 6 lines long. Operculum about as long as the calyx, conical, sometimes concave below the summit. Stamens long, inflexed in the bud, all fertile. Anthers parallel. Ovary dome-topped.

Fruits large, hemispherical to pyriform, on a pedicel of about 4 lines, 5 lines in diameter, rim quite 1 line broad; valves prominently exserted, acute, nearly 3 lines long.

Hab.—Ballina (*W. Bäuerlen*); Bungwall (*A. Rudder*).

At Ballina this tree is found on poor sandy soil associated with *E. tereticornis*, Sm., and *E. corymbosa*, Sm., whilst at Bungwall it occurs on low clayey soil. It grows to a fairly large size, but always crooked, with a stem diameter from 2 to 3 feet, but soon branching, the limbs long and stout, gnarled and crooked; clear trunk about 10 feet in height (W. Bäuerlen). The bark is fibrous, though not so fibrous as in the true "Stringybark," but resembling that of *E. resinifera*, Sm., more than any other, and extending right out to the branchlets, or nearly so.

Timber.—Not used, apparently worthless (W. B.).

The common name of "Bastard Mahogany" might lead one to place it under *E. resinifera*, Sm., and no doubt it may have been classed in herbaria with that species, but it is certainly distinct from it. The leaves of *E. resinifera* have "numerous fine, close, parallel and almost transverse veins, sometimes scarcely conspicuous, the intramarginal one close to the edge." This species has more the venation of *E. tereticornis*, Sm. The transverse veins are oblique and prominent, and the intramarginal one removed from the edge, particularly so in the young leaves. The venation, therefore, shows no connection with *E. resinifera*, Sm., nor does it with *E. pellita*, F.v.M. From this latter species it also differs in the shape and size of the calyx-tube, and also in the fruits. The only connection apparently with *E. resinifera* is in the bark. The timber does not appear to have the reputation for quality similar to that of *E. resinifera.*

According to F. v. Mueller, *E. pellita*, F.v.M., is closely connected with *E. botryoides* and also *E. saligna*, but this species has quite a distinct venation from any of these: in fact, it would be difficult to connect it with them.

Mr. Bäuerlen has observed in the field that the base of the stamens is always coloured red.

In botanical sequence it is placed between *E. tereticornis*, Sm., and *E. rudis*, Endl.

EXPLANATION OF PLATES.

Plate xliii.—*E. oreades.*

Fig. 1.—Young leaf.
Fig. 2.—Terminal branchlet with early buds.
Fig. 3.—Twig with mature leaf, leaves and buds.
Fig. 4.—Mature leaf.
Fig. 5.—Section of bud } enlarged.
Fig. 6.—Anther (back and front view) } enlarged.
Figs. 7-9.—Fruits.

Plate xliv.—*E. maculosa.*

Fig. 1.—Sucker-leaves from Bungendore.
Fig. 2.—Twigs with flowers and buds.
Fig. 3.—Section of bud } enlarged.
Fig. 4.—Anther (back and front view) } enlarged.
Figs. 5-6.—Fruits.

Plate xlv.—*E. patentinervis.*

Fig. 1.—Sucker or young leaf.
Fig. 2-—Mature leaves and twig, with buds and flower.
Fig. 3.—Early buds.
Fig. 4.—Section of bud showing ovary } enlarged.
Fig. 5.—Anther (back and front view } enlarged.
Figs. 6-7.—Fruits.

ON TWO NEW SPECIES OF *CASUARINA*.

By R. T. Baker, F.L.S., Curator, Technological Museum, Sydney.

(Plates xlvi.-xlvii.)

Casuarina Cambagei, sp.nov.—" **Belah.**"

(Plate xlvi.)

A tree attaining a height of from 70 to 100 feet, diœcious, glabrous; branchlets glaucous or dark green in the slender form, ascending, internodes varying in length up to half an inch: not prominently angled.

Whorls 9-10-merous, the sheath-teeth acute.

Male spikes at the ends of the branchlets, in the slender variety from 1 to 2 inches long, in the glaucous variety usually 1 inch long; sheathing teeth erect.

Cones cylindrical, about 12 to 14 lines long and 10-12 broad, truncate; valves obtuse, very prominent, glabrous or minutely hoary pubescent on the exposed dorsal half, with a dorsal prominence or thickening. Nuts pale-coloured, 3 lines long including samara.

Hab.—Mount Hope, Forbes, Bogan River Country, Condobolin, Nymagee (*R. H. Cambage*); Bourke to Barringun (*R. Ridge*). In fact it occurs from the Queensland to the Victorian borders between the Darling River and the main Dividing Range.

" Belah " has a very wide range in the interior of this Colony, and has possibly in the past been confounded with *C. glauca*, Sieb.; and there can be little doubt but that Bentham has included it under his description of that species.

The timbers differentiate these trees in a marked degree. The timber of Sieber's *C. glauca* has the characteristic feature pertaining to our She Oak trees—the medullary rays being very conspicuous and pronounced, producing an elegant figure when the wood is cut on the quarter; whilst "Belah," *C. Cambagei*, possesses no figure whatever, and so in this respect shows no affinity with any of the other species of the genus. In fact, it was not till attention was drawn to this feature by Mr. Cambage that a new species was detected in this particular case. Bentham (B.Fl. Vol. vi. p. 196) under Sieber's *C. glauca* records that species (amongst other localities) as ranging "from the Lachlan and Darling Rivers to the Barrier Range." Now Sieber's type with the "Smaller cones and very numerous rather smaller valves very regularly arranged" was collected by him in the coast district of the Colony; it does not extend beyond the mountains, and it can be shown to be a distinct species from this one, so that Bentham, working on herbarium material, might easily be led to include the coast and interior trees as one and the same species, as there is some resemblance in the branchlets and perhaps in the cones of the two.

Sieber's *C. glauca* differs from this interior species in its "smaller cones, and its smaller and more regularly arranged valves"—which have not a dorsal thickening as holds in this species.

The nuts of the two species never could be confounded—those of *C. glauca* being very small, with a narrow samara, whilst those of this species are twice as long and have a broad samara. The male spikes of *C. glauca*, Sieb., are twice the length and have long revolute hair-like sheath-teeth in contradistinction to the short and erect ones of this species.

The valves of the fruits of this species are also quite distinct, those of *C. glauca* being of an uniform thickness; they are also quite distinct from those of *C. equisetifolia*, Forst.

The cones are allied to those of *C. stricta*, Ait., and it might here be stated that very possibly Bentham's synonymy under that species (B.Fl. Vol. vi. p. 195) will require, in face of our present knowledge, to be revised, as some of the species are quite worthy of specific rank. It would appear now that Casuarinas, like Eucalypts, cannot always be determined satisfactorily on herbarium material alone.

In botanical sequence it is placed after *C. stricta*, Ait., as it has branchlets and sheath-teeth similar to that species and somewhat similar fruit.

Baron von Mueller in his Fragmenta (Vol. x. p. 115) describes a species of *Casuarina* under the name of *C. lepidophloia*, from imperfect material, and so it is rather difficult to know to what tree he refers. Through the kindness of Mr. J. G. Luehmann, F.L.S., Curator of the National Herbarium, Melbourne, I have been enabled to examine the specimens on which Mueller founded his species, and except in the diameter of the leaflets (in some cases) there is nothing to connect it with this new species. The bark of "Belah" is certainly not "flaky."

Mueller states (*loc. cit.*) that *C. lepidophloia* occurs amongst *C. glauca*, but this needs some explanation, as *C. glauca* is not found in the interior; perhaps it was this particular species that he referred to under *C. glauca*, Sieb. The timber of this tree is so characteristic that had Baron von Mueller intended his description to apply to this species he would have described or referred to so peculiar a wood. The valves are rarely "fulvous pubescent," but nearly always whitish.

This new species is also one of the largest trees of the interior.

Timber.—The most marked specific difference of "Belah" is, as stated above, in the character of its timber. *C. glauca*, Sieb., ("Swamp Oak") has the usual timber characteristics of "She Oaks," but this tree possesses a timber quite distinct from that of any other of the Natural Order. The medullary rays can only with difficulty be traced, and whilst all other *Casuarina* timbers split on the quarter, this timber splits more readily at right angles to the rays, and this is one of the timber-getter's tests for the species. When "dressed" it has very little figure, is of a yellowish colour, close-grained, hard, and, in fact, more resembles English Hornbeam than any other Australian timber that has come under my notice. When placed amongst other Museum specimens of She Oaks, it shows little or no affinity with them. It is perhaps the hardest timber in the Western area of the Colony.

Fodder.—The branchlets are cut in considerable quantity for fodder (R. H. Cambage).

CASUARINA LUEHMANNI, sp nov.—"**Bull Oak.**"

(Plate xlvii.)

A fair-sized tree, attaining a height of 70 to 80 feet, or rarely 100 feet, and a diameter of from 1 to 1½ feet, rarely 2 feet. Bark furrowed, brittle, and easily removed. Branchlets robust, light coloured or glaucous, under a line (¾) in diameter, about the same thickness as in *C. glauca*, Sieb., the internodes ribbed, 6 lines long, glaucous, the nodes yellow, sheath-teeth brown or black, short, acute, 9 to 12 in the whorl, mostly 11.

Flowers diœcious. Male spikes about an inch long, of a light golden-brown colour, clustered at the nodes toward the end of the branchlets; internodes straw-coloured; teeth golden-coloured, erect, short, acuminate, constricted at the nodes.

Fruit cones flattened, about ½ inch in diameter, and consisting almost uniformly of three discs or rows of valves, but often irregularly shaped, owing apparently to only a few of the seeds being developed. Valves protruding, prominent, sometimes pubescent at the back and front, with a well defined dorsal protuberance extending from the base of the valve to half its length and ending in an abrupt angle broadly obtuse or shortly acuminate. Nuts small, dark brown, shining, with a short samara.

Hab.—Forbes, Parkes, Condobolin *(R. H. Cambage)*, Grenfell, Bourke to Barringun.

The range is almost identical with that of "Belah," *C. Cambagei*.

Following Bentham's classification (B.Fl. Vol. vi. p. 194), this species belongs to the section Leiopitys—whorls 7-16-merous, and of the species in this section it has greatest affinities with *C. glauca*, Sieb., and *C. lepidophloia*, F.v.M. The branchlets by their thickness and colour distinguish it from *C. stricta*, Ait., and other inland species. The fruits are so characteristic and constant throughout its extensive range that the species cannot easily be confounded with any other.

Timber.—A hard close-grained wood. The heart wood is of a deep red colour, toning off to pale towards the bark. Medullary rays very pronounced, especially in a transverse section (*vide* Mr. Cambage's remarks appended). Useful for cabinet and ornamental work.

To Mr. R. H. Cambage, L.S., Mining Surveyor of the Mines Department, is due the credit of having determined in the field the specific differences of these two trees from cognate species, particularly in regard to their timber characters, and he writes concerning them :—

'The "Belah" and "Bull Oak" are two Casuarinas growing in the western districts of N. S. Wales. Their general appearance is somewhat similar, but after a little practice they can be readily identified at a distance of quite a quarter of a mile in level country.

'The most striking difference is that the "Belah" has a darker and denser foliage than the "Bull Oak." The branchlets of the former are finer but more numerous, and this latter fact always gives one the impression that the "Belah" is a very healthy looking tree, while the foliage of the "Bull Oak" looks a little more sparse and of a lighter colour, that of the "Belah" being a dark green. The "Belah" is cut considerably for fodder, while the "Bull Oak" is little used for that purpose. On approaching the two trees it becomes manifest that the bark of the "Belah" is the smoother, while that of the "Bull Oak" is considerably furrowed and thicker. On cutting the trees it is found that the "Bull Oak" is a mass of medullary rays, some of which are $\frac{1}{8}$ of an inch across as seen on the top of a stump. I have noticed them on old exposed stumps near Forbes on which the weathering has acted more upon the wood around the edge and between the rays than upon the rays themselves, the effect being that towards the edge of the stump the rays may be seen standing in relief like so many blades while the sap and wood between have disappeared.

'The "Belah" when cut down discloses practically no medullary rays, but some very fine ones may be seen in cross sections of the upper branches. My attention was first drawn to this matter some years ago when I noticed that my axemen in splitting Oak would split it, to use their own term, "on the quarter," that is along the line of the medullary rays, but in splitting "Belah" it would be "on the back," or at right angles to the rays. Knowing that this course was followed because it was easier, I looked for the cause and found that great assistance was obtained from the rays in the Oak, and but little from the very fine ones in the "Belah."

'*Habitat.*—The "Bull Oak" is generally found growing on fairly level land, but not necessarily a flat, while the "Belah" is usually considered as an indication of dampness, probably low land subject to water in wet weather, and known as "gilgai country" from the numerous natural water basins which bear that name. It is not usual to find the two trees growing alternately along any route that may be travelled, but the groups or belts may alternate, as, for instance, the "Bull Oak" may be followed for a few miles when it will, perhaps, cease and before it reoccurs one or more belts of "Belah" may be passed. In some cases the one group will continue right up to the other, so that in the distance of a few chains many trees of each may be noticed.'

I have to acknowledge my indebtedness to Mr. J. G. Luehmann, F.L.S., Curator, National Herbarium, Melbourne, for his assistance in the differentiation of these species by the loan of specimens.

EXPLANATION OF PLATES.

(Plate xlvi.)

"Belah"—*Casuarina Cambagei*, R.T.B.

Fig. 1.—Twig with branchlets with staminate spikes.
Fig. 2.—Sheathing-teeth of branchlet (enlarged).
Fig. 3.—Portion of branchlet showing stamens (enlarged).
Fig. 4.—Pistillate flowers.
Fig. 5.—Fruit cone.
Fig. 6.—Nut.

(Plate xlvii.)

"Bull Oak"—*C. Luehmanni*, R.T.B.

Fig. 1.—Twig with terminal branchlets and young cones.
Fig. 2.—Staminate spikes.
Fig. 3.—Sheathing-teeth of branchlet (enlarged).
Fig. 4.—Fruit cones.
Fig. 5.—Nut.

OBSERVATIONS ON THE EUCALYPTS OF NEW SOUTH WALES.

Part VI.

By Henry Deane, M.A., F.L.S., and J. H. Maiden, F.L.S.

(Plates xlviii.-l.)

Eucalyptus conica, sp.nov.

(Plate xlviii., figs. 1-3.)

A Box of medium size; a pretty, graceful tree, with pendulous branches.

Vernacular names.—"Fuzzy Box," "Bastard Box," "Yellow Box," "Grey Box" or "Woolly Butt," "Apple Box."

Bark.—Of the ordinary "box" character, but in districts where the two trees grow together rougher than that of *E. hemiphloia;* persistent in all cases, right on to the small branches.

Timber.—Reddish-yellow, and very tough when dry; much redder than ordinary Box (R. H. Cambage).

Sucker-leaves.—Pale green, not glaucous; broadly ovate; the intramarginal vein considerably distant from the margin, and, with the midrib, giving the leaf a triplinerved appearance.

Mature leaves.—Lanceolate, ultimately narrow-lanceolate, and, say, 4 inches long by half an inch broad; varying, however, in length and width, and some branchlets including very wide leaves; the intramarginal vein is distinctly removed from the edge of the leaf, although this is of course less marked in the case of narrow leaves; the venation is oblique, but few of these secondary veins are as prominent as the intramarginal vein. The foliage is drooping and has frequently long stalks.

Buds.—Clavate, the calyx-tube greatly exceeding the operculum in size; the operculum nearly hemispherical, with a small umbo; the calyx-tube tapering gradually to the common point of attachment to the stalk, the buds being sessile.

Flowers.—This is a very floriferous species; the inflorescence is arranged in panicles of several inches, the individual umbels having a maximum of six or seven flowers. Stigma hardly dilated; anthers small, opening in terminal pores, all fertile and inflected in the bud.

Fruits.—Narrow conical (hence the specific name), tapering to the point of attachment of the common stalk. Often not quite symmetrical, and somewhat pear-shaped. Greatest length, say, $\frac{3}{8}$ inch by, say, $\frac{5}{32}$ inch broad. Thin rim; the valves, which are three or four and very small, are deeply sunk. Of a pale brown colour and shining.

Range.—Found in much of the country west of the Dividing Range and its spurs, forming, with *E. hemiphloia* and *E. Behriana*, the "Box" of the western country.

Resembles *E. Stuartiana* so much that on the Lachlan it is called "Apple Box" (R.H.C.).

The affinity of *E conica* is undoubtedly closest to *E. polyanthema*, though the trees are, in our opinion, so distinct that we cannot make one a variety of the other. At the same time it is not a strong species. The principal differences between it and *E. polyanthema* may be indicated as follows—its more pendulous habit, its lèss furrowed bark, which is often of a yellowish cast, its paler timber, and its narrower and non-glaucous foliage. In *E. conica* the umbels are separate in the axils of the leaves, or, by suppression of the terminal one, become an elongated panicle. The operculum is not nearly as long as the calyx-tube, while the anthers are all fertile. As regards the fruits, the fruit of *E. conica* is more narrow or slender conical and the rim is more depressed. The rim of the fruit does not appear to be indented in *E. conica*, while it is of common occurrence in *E. polyanthema.*

And, speaking generally, *E. conica* is glabrous while *E. polyanthema* is more or less glaucous.

E. aggregata, sp.nov.

(Plate xlix.)

An umbrageous tree, probably worthy of cultivation in cold, damp situations, for ornamental purposes.

Local names.—"Peppermint" at Wallerawang, probably because of the fibrous appearance of the bark. Known as "Flooded Gum" in most districts, an exception to the usual rule in Australia to limit the term "Gum" to those species of Eucalypts having smooth or nearly smooth barks. It has been called both "Sally" and "Messmate" in the Crookwell district; while it is known as "Black Gum" at Fagan's Creek, according to Mr. Bäuerlen.

Bark.—Box-like or rather more flaky; between that of a Box and a Stringybark or Woollybutt; cuts woolly. The trunk, large and small branches are all rough; the ultimate branchlets alone being smooth. In old trees very thick and containing essential oil.

Timber.—White and tough when fresh, but the trunk is usually not straight enough and large enough, as a general rule, for marketable timber; reckoned worthless for standing in the ground.

Young leaves.—Quite glabrous; oval to nearly oblong; strictly opposite up to an inch long; the margins undulate; mucronate with a short point. Young trees are often eaten down by cattle.

Mature leaves.—Foliage semi-pendulous, lanceolate in shape; usually symmetrical, but oblique leaves not rare: undulate; equally green on both sides, scarcely shining; on the average probably $4\frac{1}{2}$ inches long by 1 broad. Intramarginal vein considerably removed from the edge; other veins few but conspicuous; very oblique.

Buds.—Usually four to six in the umbel, but sevens not rare; stalk up to $\frac{1}{8}$ inch long, hardly compressed, more compressed as the fruit reaches maturity; the stalklets short and round. The operculum and calyx-tube about equal, and both tapering towards a point, the operculum being nearly conical.

Flowers.—Stamens apparently all fertile and inflected in the bud; stigma not dilated; anthers opening by parallel slits.

Fruits.—Hemispherical in shape and sometimes, owing to the shortening of the stalklets, so clustered together as to form a dense head, hence the specific name; small, not exceeding $\frac{3}{16}$ inch in diameter, with a well-defined, sharp rim, domed, and with 3 or 4 well exserted valves.

Size.—Usually small gnarled trees, but a number 30 or 40 feet with a trunk of 12-18 inches or even 2 feet.

Habitat and range.—Alluvial flats, following watercourses or depressions; always found in damp situations, hence the name "Flooded Gum." As regards its western localities, up to the present it has only been found west of the Blue Mountains—Wallerawang (H.D.), Rydal (J.H.M.); Jenolan Caves (W. Blakely); near Orange, on the Cadia-road, which remains its most western locality at present (R. H. Cambage); Rockley and Burraga (R.H.C.). It has not been recorded north of Sydney, and its southern localities are Nimbo Station, head of Queanbeyan River; also Crookwell (H.D.) and Fagan's Creek, Braidwood district (Mr W. Bäuerlen, communicated by Mr. R. T. Baker).

Its closest affinity is undoubtedly to *E. Macarthuri*. Both grow in similar situations, are strikingly similar in appearance, have bark of similar texture and not dissimilar-looking fruit. The venation of the mature leaves and the shape of the sucker leaves, however, divide them sharply.

From *E. Stuartiana* our species is distinguished by its darker bark, smaller fruits, venation of leaves, &c. The leaves of *E. Stuartiana* are also of a darker green, and the fruits are larger. *E. Stuartiana* would not have been referred to in this connection were it not that some of the older botanists looked upon the present species as a variety of *E. Stuartiana*.

E. NOVA-ANGLICA,* sp.nov.

"**Black Peppermint**" of New England.

(Plate l.)

It is the Eucalypt No. 2, "Broad-suckered Peppermint" of p. 541 of Maiden's "Eucalypts of the New England Table-land" (Report A.A.A.S. vii.).

It is gregarious and occupies considerable areas often to the exclusion of other arboreal vegetation (J. F. Campbell).

Bark.—Dark straight bark (hence the local name "Black Peppermint"); thinner than that of *E. Stuartiana* ("White Peppermint" or "Apple"). Semi-persistent on the trunk, more or less ribbony on the boughs and deciduous on the ultimate branchlets.

Timber.—Of a pinkish or pale red colour when fresh, drying to a pale colour. It is of a soft nature, liable to rapid decay on reaching maturity. Of no commercial value, but used for fencing in the absence of more durable timber.

Sucker leaves.—Intensely glaucous, often 3 inches long and $2\frac{1}{2}$ inches broad. Orbicular to cordate; often stem-clasping. Twigs inclining to quadrangular in very early stage.

Mature leaves.—Lanceolate, and, when fully mature, three to four inches long and half an inch wide on the average. Veins strongly marked, pinnate and anastomosing, the intramarginal vein at some distance from the edge; the midrib and the intramarginal veins often pink, as are sometimes the other veins, while the leaf itself is often suffused with a tinge of the same colour. On the same twig it is a common occurrence to obtain the ordinary mature glabrous foliage interspersed with abundance of glaucous foliage of similar shape and of various stages towards the normal sucker foliage. This has been referred to in Maiden's Notes on the Eucalypts of New England, already quoted, and is an important character.

* In lieu of *neo-anglica*, Abstract for November, 1898.

The foliage has a strong peppermint odour. The twigs are round.

Buds.—From two or three to six in an umbel, but clusters of four or five are commonest. On a flattened stalk of about a quarter of an inch; the stalklets less flattened and less than half the length of the stalks. The buds glaucous and often pink or purplish, ovoid, the top of the operculum somewhat pointed. The operculum usually about the same size as the calyx-tube.

Flowers.—The flowers are usually borne in great profusion, with bright yellow filaments. Stamens apparently all fertile and inflected in the bud, anthers with parallel, distinct cells; style of moderate length, the stigma nearly flat-topped and dilated a little, the appearance of the dilatation being increased by the constriction caused by the drying of the filament.

Fruits.—Variable somewhat in size, but always under a quarter of an inch in diameter; usually glaucous, but sometimes entirely glabrous. In shape nearly hemispherical, with a well-defined, more or less domed rim; the valves, which are indifferently three or four in number, exserted, and sometimes well exserted.

Size.—"A healthy mature tree seldom exceeds 6 feet in girth, after which it becomes a shell of much larger proportions and grows to a height of some 50 feet and more" (J.F.C.).

Range.—"Grows on alluvial flats, preferring the clay soil derived from the Silurian slate to that of the heavier basalt on the lighter granite" (J. F. Campbell). It is common over the greater portion of New England. It occurs on the summit of Ben Lomond. It appears to occur in Victoria, specimens from that colony possessing remarkable similarity to ours; the matter might perhaps engage the attention of our Victorian co-worker. We have shown elsewhere that the New England and Victorian forms of other species (*e.g.*, *E. amygdalina*, *E. obliqua*) are very similar, and in a number of cases New England plants have not been recorded for hundreds of miles until southern New South Wales or Victoria is reached.

The affinity of *E. novæ-angliæ* is undoubtedly closest to *E. Stuartiana*. Where the two species occur together the former goes by the name of Black Peppermint and the latter White Peppermint or Apple. The latter has a white zigzag or wrinkled bark, thicker and much paler in colour than that of the Black Peppermint. *E. Stuartiana* has thickish, fleshy leaves, largish fruits (in comparison), and of a different shape to those of *E. nova-anglica*. The foliage of *E. Stuartiana* is non-glaucous except when young. Its buds are glabrous and of a different shape to those of *E. nova-anglica.* Its leaves possess a less odour of peppermint and are often eaten by cattle.

Twigs in bud and flower undoubtedly show some resemblance to *E. rubida;* the flowers of *E. nova-anglica* are, however, in more than threes, while the bark is fibrous. Also the timber of *E. nova-anglica* resembles that of the Messmate group; this circumstance alone sharply separates it from *E. rubida.*

Miscellaneous Notes.

i. RENANTHEREÆ.

E. STRICTA, Sieb. No. 472.

An authentic specimen in the National Herbarium, Melbourne, received from Prof. Engler (now of Berlin) is identical with the narrow-leaved scrubby gum from the Blue Mountains as figured by us in the Proc. for 1897, Pl. xxxi., fig. 17. The original of the *E. stricta* of the *Flora Australiensis, i.e.*, of Bentham, is somewhat uncertain, this botanist perhaps having *E. cneorifolia*, DC., before him.

E. OBTUSIFLORA, DC.

The National Herbarium, Melbourne, contains two specimens (single leaves only) from De Candolle's Herbarium, both different and both indeterminable.

It seems desirable to reject the name altogether. In Part iii. of our "Observations" (*Proc.* 1897, p. 714) we expressed the opinion that *E. obtusiflora* should be retained as a species, because we were then under the impression that we had absolutely identified De Candolle's plant, and that, under all the circumstances, it was a convenience to retain the name. We have revived the name *E. virgata*, and we are now of opinion that all the specimens referable to *E. obtusiflora* may be placed with *E. stricta* or *E. virgata*. The plants known as *E. obtusiflora*, in fact, form a connecting link or series of connecting links between these two species.

E. VIRGATA, Sieb.

Is, according to an authentic specimen in the National Herbarium, Melbourne, identical with *E. Luehmanniana*, F.v.M.

We would invite attention to what we have already written under *E. Luehmanniana* and *E. virgata* (P.L.S.N.S.W., 1897, pp. 711-713, 717-719). It will be seen from perusal of this how full of difficulty the subject is, but we have paid another visit to Melbourne, and examination of additional material has convinced us as to the identity of *E. virgata* as above stated, and this name will stand and *E. Luehmanniana* consequently fall. We believe we have now arrived at finality in the matter, and invite attention to our further remarks under var. *altior*.

This identification of *virgata* with *Luehmanniana* makes it clear why Sieber adopted the name, as in the coast districts the species is invariably virgate.

E. VIRGATA, Sieb., var. ALTIOR.

See p. 713 (*loc. cit.*). A consequence of the identification of *E. virgata* with *E. Luehmanniana* is that the variety referred to must now bear the name *E. virgata*, var. *altior*. Following are some additional notes concerning it. It is not only found at Mt. Wilson, but at Mt. Victoria and other elevated parts of the Blue Mountains. It is a typical ribbony gum, the ribbons being 8 or 10 feet long and even more, broad and tough. We think it very probable the species has been sometimes noted as *E. viminalis*, judging from its appearance as a ribbony gum, but it is a handsomer and more erect species than *E. viminalis*. It is a tall tree, very straight, 60-100 feet high and even more. It has absolutely clean, shiny stems except at the butt, say for 8 or 10 feet, where it is more or less fibrous. At Mt. Wilson it is associated with

E. goniocalyx and at Mt. Victoria with the same species to a less extent. It has reddish twigs, and slightly glaucous leaves rich in oil.

Mr. J. L. Boorman has found this variety also in the southern districts, viz., at Wingello, where it is known as "Messmate." His specimens show the stalklets nearly round, and the rim of the fruit less domed. It remains to be seen whether the southern and western trees are not absolutely identical.

The Blue Mountain tree is known and cut commercially as "Mountain Ash." This is, of course, the ordinary name of *E. Sieberiana*, F.v.M. The timbers of the two trees are not dissimilar, neither are the immature fruits. We offer the statement with considerable confidence, that herein lies the cause of the confusion that has existed for so many years between *E. virgata* and *E. Sieberiana*, long considered as synonyms (*vide* Mueller's *Eucalyptographia* under *E. Sieberiana*). Considering the splendid development of the mountain form of *E. virgata*, there is no doubt that the mountain ranges are the natural home of the species, while the coast form is simply the depauperate form. In other words, that what is now named var. *altior* should be the species, and the virgate coast form simply a variety. We need scarcely say, however, that it would not be possible to alter the species name now.

E. HAEMASTOMA, Sm., var. MICRANTHA, Benth.

Mr. W. Forsyth has recently found this variety near the head of the Castlereagh River, which extends the range of the species further towards the westward than it has previously been found in this latitude. It is a large tree, and is locally known as "Cabbage Gum."

ii. PORANTHEREÆ.

E. MELLIODORA, A. Cunn.

We would invite attention to a narrow-leaved form of this species from the Lachlan and other parts of the colony. Leaves 2-3 inches long, and $\frac{7}{32}$ inch wide.

Mr. W. Forsyth has recently found this species near Coonabarabran. The fruits are nearly hemispherical, and in place of the characteristic narrow band or rim which usually encircles the slightly constricted orifice, and which is well seen on a side view of the fruit, there is a dark coloured broadish rim best seen on the top of the expanding orifice, and reminding one of the rim (and shape of fruit) of *E. haemastoma*.

This appearance is observed in fruits from other parts of the colony, *e.g.*, from Bungendore.

E. LARGIFLORENS, F.v.M. (Syn. *E. bicolor*, A. Cunn.)

A box tree attaining a large size, with somewhat scrambling habit, narrowish leaves, pendulous branches (hence the name *E. pendula*, A. Cunn.) and small fruits. Sometimes whole forests are affected by galls, so that it is next to impossible to procure a sound bud or fruit.

Found usually on river flats or other moist situations in good land throughout the greater part of the western division of the colony. In poorer or drier soil it forms a small tree sometimes called "Scrub Box" or "Dwarf Box."

It is not surprising that a species of so extensive a range exhibits considerable variation. We propose below (p. 623) to give notes on two extreme forms, readily noted by their narrow and broad leaves respectively. The extreme forms of this species present such considerable difference of appearance that we may figure them on a future occasion. The species in fact varies in the size, shape, texture and lustre of the leaf, the size and shape of the fruit, the length of pedicel, and in other characters of less importance.

Following are some notes from various districts of the colony:—

It is very common on the Lachlan. It is a handsome tree, common on the river flats, *e.g.*, about Condobolin. It is sometimes known as "Drooping Box." It has bark on the ultimate branchlets and red twigs. When cut down and allowed to wilt a little, cattle and horses will eat the leaves when hard pressed, and even the bark. Specimens from the same district have shiny leaves, of medium width, not specially narrow, with prominent, spreading veins. Fruits subconical when dead ripe, with a defined rim at the edge of the fruit, which sometimes shows a distinct angle. Absolutely identical specimens are from Tomingley to Narromine (Dubbo district).

"Swamp Box," "White Box," and "Coolibah" on the Lachlan (Forester Kidston). The same gentleman on another occasion says:—"Long narrow leaves; a gnarled, tough, black box." It has also been styled "Grey Box." "The Commom Box of the Riverina." "Narrow-leaved Box" is a common name, of obvious meaning.

At Murrumbidgerie (Dubbo district) it is known as "Coolibah." Mr. A. Murphy says of it:—"Similar to White Box (*hemiphloia*), but a taller tree, the gum-limbs (smooth bark) come low down the tree. A useful timber, similar to but harder than that of *E. hemiphloia*. Common on the Lachlan, beginning at Parkes."

The species is common in the Darling country, and west towards the South Australian and Queensland border.

We have received two specimens (one in fruit and in young bud, the other in young bud only) from Murtee holding, with the note that sheep eat one whether as standing scrub or cut down, but will not touch the other. The twigs appear to us to be botanically identical, and the matter is certainly worthy of further investigation.

In the north-west part of the colony is a box, extensively distributed, which had puzzled us a good deal because we had not received complete material. Its foliage is pendulous, the leaves shining and commonly 3 inches long and only $\frac{3}{8}$ in. broad, reminding one in this respect of the well-known Wilga (*Geijera parviflora*). The fruits are small (about $\frac{3}{32}$ in. in diameter). In working at this species at the National Herbarium, Melbourne, we came across a specimen labelled by Leichhardt "Box bark, not Ironbark, between Condamine and Severn, June, 1843." Leichhardt's warning *re* Ironbark was to show that he had not confused it with the narrow-leaved Ironbark (afterwards named *E. crebra*) common in the district. Mueller referred it to *E. largiflorens:*

Bentham marked it, doubtfully, *amygdalina*. Latterly interest in the tree was revived by the collection of similar specimens on the plains near Baradine, N.S.W., by Mr. W. Forsyth. One of us has recently visited the Narrabri district, and has obtained a complete series of specimens, which not only show that Mueller's view was correct, but that this extreme narrowness of the leaves and smallness of the fruits is not constant, passing into the normal form. Under all the circumstances, and as smallness of the fruits is a character of this species, it seems scarcely desirable to name this graceful, narrow-leaved, small-fruited form, distinct as it appears at first sight. It may perhaps be Mueller's var. *parviflora* (B.Fl. iii. 215), of which we have not seen a specimen.

Then we have a broad-leaved form in which the leaves are frequently one inch broad, and say 3 inches long, thick ("leaves rather thin," B.Fl.) rigid, lustreless and even glaucous. Often there is a yellowish cast of twigs, midribs, buds and foliage generally. This yellowish cast is so marked in some trees that we have known them to have been called "Yellow Box" in consequence, and hence confused with *E. melliodora*. The transit to normal *largiflorens* is perfect. The broad-leaved forms are best developed in the extreme west of the colony, and they are, in the absence of flowers or fruits, sometimes difficult to discriminate from the broader-leaved forms of *E. microtheca*.

"Goborro," or "Goborra," is a tree frequently referred to by Mitchell ("Three Expeditions"), and is doubtless *E. largiflorens*, from the quotations which follow. Specimens of Goborro sent to us by two reliable correspondents are *E. largiflorens*, and we think it desirable to finally settle the nomenclature of so important a tree.

In a letter Forester Kidston says:—The tree called Goborro by the aboriginals is commonly known as "White Box" by the splitters all over Riverina. It frequents the ridgy and gravelly soiled parts, and grows with a straighter bole and straighter grain than any of the other trees called Box. The leaves are pendulous, and narrower than the Bimbil." (*E. populifolia*).

"The alluvial portion of the margin of the Darling is narrow, and in most places overgrown with the Dwarf Box" (Mitchell's *Three Exped.* i. 302).

". . . the trees which grew along the banks of the Lachlan. All were of the Dwarf Box kind, named Goborro by the natives, a sort of Eucalyptus which usually grows by itself on the lower margins of the Darling and Lachlan, and other parts subject to inundation, and on which the occasional rise of the waters is marked by the dark colour remaining on the lower part of the trunk" (*Op. cit.* ii. 30).

"Clumps of trees of the Flooded Box or 'Marura' of the natives appeared occasionally (near the Lachlan) in and about the many hollows in the surface" (ii. 49).

"The small kind (of Eucalyptus) covered with a rough bark, and never exceeding the size of fruit trees in an orchard, and called, I believe, by Mr. Oxley, the Dwarf Box, but by the natives Goborro, grows only on plains subject to inundation, and it usually bears on the lower part of the trunk the mark of the water by which it is at times surrounded. Between the Goborro and the Yarra (*E. rostrata*) there seems this difference: the Yarra grows only on the banks of rivers, lakes and ponds, from the water of which the roots derive nourishment; but when the trunk itself has been too long immersed, the tree dies, as appeared on various lakes and in reedy swamps on the Lachlan. The Goborro, on the contrary, seldom grows on the banks of a running stream, but seems to thrive in inundations, however long their duration" (ii. 55).

E. largiflorens is known as "Coolibar" on the Diamantina, Queensland, according to Dr. T. L. Bancroft. "Coolibah" and "Coolybar" are other spellings, and "Coolabah" is the name of a station on the Great Western line, 424 miles from Sydney, named after the trees: see *E. microtheca* below, to which species the name Coolibah now properly belongs.

E. Behriana, F.v.M.

This does not appear to be a strong species, apparently connecting with *E. hemiphloia* on the one hand and *E. largiflorens* on the other. The typical form occurs in New South Wales, and the species must therefore be added to the flora of the colony. Woolls included it in his *Plants of New South Wales* (1885), but Mueller (*Second Census of Australian Plants*, 1889) continued to exclude it, probably because the necessary specimens from the colony were not available to him.

It has broadish leaves like *E. hemiphloia*, and has been often looked upon as a small-fruited form of that species. It is not Bentham's var. (?) *parviflora* (B.Fl. iii. 217), which is perhaps an Ironbark (*Eucalyptographia*).

Some localities are:—Narrandera, Wagga Wagga, Young to Grenfell, Mudgee, Dubbo to Peak Hill, Gunnedah to Coonabarabran, Wilcannia; and other places towards the north-west corner of the colony.

E. MELANOPHLOIA, F.v.M.

Gundy, 11 miles east of Scone (J. H. M., August, 1899), is its most easterly recorded locality.

iii. PARALLELANTHERÆ.

E. MICROTHECA, F.v.M.

It is the "Dwarf Box" of Forest Department Exhibition Catalogues of a few years back, where it is labelled "*E. brachypoda*: timber not much used or valued. Open plains, Lachlan, Darling and towards the Barrier Range."

It is found in the Narrabri district (on the banks of the Namoi and elsewhere), where it is known as "Coolibah." It has a rough, persistent scaly bark, and is a pretty tree, with rather dense and drooping foliage. Forester McGee, of the same district, sent it as "Coolibah" or "Swamp Box" some years ago. The leaves were very glaucous, up to 7 inches long and up to 1 inch broad.

Leaves from trees collected on the Darling River (Bourke, &c.) vary in width; leaves of the same length vary, on the same tree, from $\frac{3}{8}$ to $\frac{3}{4}$ inch broad.

The late K. H. Bennett sent this species from Ivanhoe, *viâ* Hay, under the native name, "Tangoon" with the note that "this is our largest tree, often attaining a height of 70 to 80 feet, with a diameter of 4 feet. It is the principal tree used by the blacks for the extraction of water from the roots. While indubitably *E. microtheca*, it resembles the broad-leaved forms of *E. largiflorens* The flowers are large, the leaves have a yellowish cast, and are $\frac{3}{4}$ or 1 inch broad, by $2\frac{3}{4}$ inches long, having quite a different appearance from normal *microtheca*. In fact remarks in regard to the variation in size and shape of leaves of *E. largiflorens* largely apply to *E. microtheca* also.

"Coolibah" or "Flooded Box" is found on all Gulf (of Carpentaria) waters, often in flooded ground, of a crooked growth, about 30 feet high (E. W. Palmer, *Proc. R.S.N.S.W.* 1883, p. 106). Mr. Palmer's specimens came from the Flinders, and were named *E. microtheca* by Baron von Mueller. Following are some additional particulars furnished in a letter from Mr. Palmer to the late Rev. Dr. Woolls, whom we had asked to enquire as to the differences between the Coolibah and Goborro (*E. largiflorens*):

"The Coolibah generally is of a crooked growth, but now and again, in favoured localities of deep soil, it is straight enough to make stockyard posts of about 10 to 12 inches in diameter, and 8 or 10 feet long. The wood is excessively hard and inlocked; impossible to split, and hard to bore through. It requires especially good augers to bore it. The bark is rough and scaly, and the branches are not smooth and white. The colour of the wood is very dark brown. I have seen the Flooded Box of the Darling (*i.e.*, *largiflorens*), but never examined it closely. Although it looks like our Flooded Box of the Flinders there is a difference. The Goborro seems smaller, the bark is different, and the branches are smooth and white in the bark."

Goborro (*E. largiflorens*) and Coolibah (*E. microtheca*) are frequently confused. If fruits be available the hemispherical, very open fruit, not above 2 lines diameter, the valves protruding, of the latter at once distinguishes them; while the anthers of the latter open in slits, and of the former in pores. There are other differences. Coolibah is more a fibrous-barked tree than is usually understood by the term "Box." The differences between the two species were well known to the blacks, and it is a matter for regret that the average denizen of the interior has not acquired the information.

E. Maideni, F.v.M.

This species approaches *E. globulus*, and some botanists desirous of consolidating species might be inclined to look upon it as an extreme form of the latter. Luehmann's remarks, at p. 534, Vol. vii. *Report Aust. Assoc. Adv. Science*, are interesting in this connection. The true *E. globulus* is very rare in New South Wales, being confined to situations at no great distance from the Victorian border. We have seen in the National Herbarium at Melbourne specimens from Ovens River, Victoria; Granite Creek, Gippsland; and Nowa Nowa, an arm of Lake Tyers, Gippsland (A. W. Howitt), which are all identical, or nearly so, with typical *E. Maideni*, F.v.M. Other localities for this species in New South Wales are "Sources of stream leading to Merimbula" (Howitt), Wilson's Promontory, Mt. Dromedary (Miss Bate), Walcha district (the special localities referred to at p. 357, *Agric. Gazette*, N.S.W., for 1898, as *E. globulus*), Nulla Mountain, (Mudgee district).

E. goniocalyx, F.v.M.

This species has been found by Mr. W. Forsyth in the Warrumbungle Ranges (summit of Mt. Bulaway, 3450 feet), which locality pushes its range considerably to the westward. Fruits scarcely angled.

Mr. R. H. Cambage points out that in districts (Burraga, Rockley, &c.) where this species is known to some as "Bundy," it is confused by others with "Apple" (*E. Stuartiana*). Bundy occurs on the ridges; Apple follows the valleys, and is also found on flat basalt tops. At Burraga it is considered the best furnace wood for copper smelting.

E. SALIGNA, Sm., var. PARVIFLORA, D. & M.

This variety also occurs at Mt. Wilson and Wallerawang.

E. STUARTIANA, F.v.M.

Mr. W. Forsyth has recently found this species near the head of the Castlereagh River, where it is known as "Wollybutt." Mr. J. L. Boorman reports that about Sunny Corner it is known as "Pepperwood" as well as "Apple."

This species is the *E. Bridgesiana* of Mr. R. T. Baker (P.L.S. N.S.W., 1898, p. 164, with fig.). The figure in the *Eucalyptographia* of this species is one of the happiest of the delineations of that work, and is simply unmistakable. In both the *Flora Australiensis* and *Eucalyptographia* there is some confusion with *E. Gunnii* and perhaps another species, chiefly in regard to local names, habitat and range. We recently proceeded to the National Herbarium at Melbourne to study the specimens there, and to confer with the Curator, Mr. J. G. Luehmann, long Baron von Mueller's principal assistant, and one who best knows the late botanist's views on this and many other points. After carefully investigating the matter we saw no reason to refrain from accepting the *Eucalytographia* plate as faithfully depicting *E. Stuartiana*, and the like remarks apply to *E. Gunnii*.

E. Stuartiana is usually known in New South Wales and Victoria as "Apple," but is not to be confused with *Angophora*. In some districts it is called "White Peppermint" owing to the whiteness of its bark. The bark is thickish, and often zig-zagged or wrinkled on the outside; the leaves also are thickish (as observed by Bentham), and non-glaucous except sometimes when quite young; they are sometimes eaten by stock. The shape of the fruits is well brought out in the figures of Mueller and Mr. Baker. The timber is one of the most worthless in the colony.

We draw attention to narrow (lanceolate) suckers in this species. The specimens were collected 7 miles east of Walcha, and the tree appears to be normal *Stuartiana* in every other respect. It is the Eucalypt No. 1, of page 541, "Some Eucalypts of the New England Table-land" (*Proc. Aust. Assoc. Adv. Sci.* 1898).

E. SQUAMOSA, Deane & Maiden.

P.L.S.N.S.W., 1897, p. 561, pl. xix.

(Plate xlviii., figs. 4-5.)

During the year 1899 this species flowered and fruited more freely than it has done since we began to have it under observation (1889). We are therefore able to present a sketch of inflorescence and fruit which will supplement the former plate.

We are able to give additional localities for this species, viz.:—Bargo Brush (Miss Atkinson), Duck River, near Parramatta (Rev. Dr. Woolls), Richmond (H. D.). The specimens of Miss Atkinson and Dr. Woolls were collected about 40 years ago. Examination of the material in the National Herbarium, Melbourne, shows that it is the "Drooping Gum" of Woolls, near Duck River (included under *E. viminalis* by Bentham, B. Fl. iii. 240). It was probably also collected by Caley ("specimens with a hemispherical calyx-tube, and broad almost globular operculum"). *E. squamosa* possesses similarities to more than one species, and presented considerable difficulty, according to notes in the deceased botanist's herbarium. The species is not a strong one, and there is room for difference of opinion in regard to it. One of Miss Atkinson's specimens was collected in August, 1865, at Bargo Brush, and bears her note—"Weeping Gum. Pendent tree of 30 to 40 feet. Bark like Blue Gum. Found in aqueous situations. Very partial." Another specimen labelled "Blue Mountains," and absolutely identical with the preceding one, bears Mr. Luehmann's opinion—"I think this is a form of *E. tereticornis*," and that there is affinity to this species is undoubted. Coming to one of Woolls' Duck River specimens, Mueller named it *E. tereticornis*, var. *sphærocalyx*. Woolls' label was—"Flooded Gum, smooth bark; tree 30-40 feet." We may mention that all Miss Atkinson's and Dr. Woolls' specimens passed through Bentham's hands with Mueller's endorsements upon them, but his opinion was that they were a form of *E. viminalis*, as already stated. Another opinion of Mueller's on a Duck River specimen was *E. tereticornis*, var. *amblycorys*. On another occasion he labelled a similar specimen *E. saligna* (?), and undoubtedly it possesses strong points of resemblance to that species also. The history of this tree forms an instructive illustration of the difficulties surrounding the elucidation of the genus.

E. EXIMIA, Schauer.

Shoalhaven River (Badgery's Crossing to Nowra; W. Forsyth and A. A. Hamilton). This is the most southerly locality recorded for this species, it being hitherto known scarcely south of Sydney.

EXPLANATION OF PLATES.

Plate xlviii., figs. 1-3.

Eucalyptus conica.

Fig. 1.—Flowering twig showing drooping habit.
Fig. 2.—Anther opening in pores.
Fig. 3.—Fruits.

Figs. 4-5.

E. squamosa.

Fig. 4.—Buds.
Fig. 5.—Fruits.

(To supplement Plate xix. P.L.S. 1897.)

Plate xlix.

E. aggregata.

Fig. 1.—Twig (in bud only).
Fig. 2.—Sucker foliage.
Fig. 3.—Vertical section of bud.
Fig. 4.—Cluster of fruits.
Fig. 5.—Anther.

(The drawings of figs. 1-2 were kindly made by Mr. R. T. Baker.)

Plate l.

E. nova-anglica.

Fig. 1.—Flowering twig.
Fig. 2.—Sucker leaves.
Fig. 3.—Seedling.
Fig. 4.—Vertical section of bud.
Fig. 5.—Anther.
Fig. 6.—Fruits.

NOTES AND EXHIBITS.

Mr. Stead exhibited some interesting specimens of a Phasmid from Tanna, New Hebrides; also a preparation of the crustacean, *Ibacus Peronii*, Leach, from Port Jackson, showing both ventral and dorsal aspects and the oral appendages.

Mr. Baker exhibited herbarium specimens, oils, timbers, and photographs in illustration of his papers.

Mr. Maiden exhibited herbarium specimens in illustration of the paper by Mr. Deane and himself.

Mr. Palmer exhibited portion of a bunch of dates, nearly mature, from a palm about 20 years old growing at the residence of Mrs. H. Smith, "Fernleigh," Bourke-street. The fruits ripen, have the true date flavour, but are not so large as the date of commerce, and are seedless. Mr. Palmer also showed the gall of *Brachyscelis duplex*, Schrad., from Lawson.

Mr. Whitelegge exhibited a living plant and dried fronds of a fern regarded as being new to the Colony. The species was originally described, from specimens collected in New Caledonia, as *Doodia linearis* by J. Smith (Ferns Brit. Foreign, p. 199, 1866). It is mentioned in Hooker and Baker's Synopsis, p. 190, where it is referred to under *Doodia caudata*, R.Br., as "A curious form from New Caledonia and Australia." The latter notice appears to be the only one of the occurrence of the plant in Australia. The examples exhibited were collected early in the present month at Ourimbah, near Gosford.

Mr. H. S. Mort exhibited an unusually large emu egg measuring $6\frac{3}{4} \times 4\frac{1}{4}$ inches, obtained near Byrock.

The Rev. W. W. Watts communicated the following

Notes on some new Mosses from New South Wales.

From a return recently received from Dr. V. F. Brotherus, of Helsingfors, I beg to report the following additions to the Moss Flora of this Colony. Nos. 1-5 are new to science; and Nos. 6-13 have not previously been recorded from New South Wales.

1. *Fissidens microblastus*, Broth.—This species was collected by me on the ground at the top of a mountain, the right spelling of which I have sought in vain, and which, therefore, I can only give as locally pronounced,—"Montecollum." The mountain lies between Wilson's Creek, at the head of the north arm of the Richmond River, and the Brunswick River.

2. *Splachnobryum Wattsii*, Broth.—This is a minute moss growing in damp places under overhanging rocks at Watson's Bay and at Parsley Bay. It is the first *Splachnobryum* recorded for N.S.W. Apparently, *S. Baileyi*, collected in Queensland, is the only other species yet found in Australia. Only sterile specimens of *S. Wattsii* have been collected. I found it, first, in February of this year. During the present month I have gathered additional specimens, but still without fruit.

3. *Syrrhopodon Wattsii*, Broth.—Of this moss a very small specimen only has been named, but I believe I have it in later packets not yet determined. It is a distinctive species.

4. *Calymperes armatum*, Broth.—This moss also was collected at Watson's Bay in February last. I have found other specimens this month.

The two genera, *Syrrhopodon* and *Calymperes*, both belong to the same tribe, *Calymperaceæ*; and, considering that not more than 6 or 7 species of the whole tribe were previously recorded for Australia, the find is an interesting one.

5. *Macromitrium microblastum*, Broth.—This is a good species, and was found by me on decaying pine logs on Wilson's Creek, near the aforesaid Montecollum.

6. *Fissidens incurvo-bryoides*, C.M.—Previously recorded from Queensland. I have ample material, collected in the Richmond River District.

7. *Hypnum pseudo-plumosum*, Brid.—Not previously recorded for Australia. Collected on Wilson's Creek, Richmond River District.

8. *Polytrichadelphus magellanicus*, Hedw.—Collected by Mr. W. Bäuerlein near the Victorian border.

9. *Macromitrium platyphyllaceum*, C.M.—A very fine species, previously recorded for Queensland. Found by me on the Richmond River.

10. *Macromitrium caloblastoides*, C.M.

11. *Macromitrium dimorphum*, C.M.

12. *Macromitrium weisioides*, C.M.

13. *Macromitrium Hartmanni*, C.M.

These *Macromitria* were named by the late Dr. Carl Müller from Queensland specimens, and three out of the five were recently described in his *Symbolæ ad Bryologiam Australiæ*. They are now proved to be plentiful on the Richmond River.

Mounted specimens of the species new to science were exhibited.

WEDNESDAY, NOVEMBER 29TH, 1899.

The concluding Ordinary Monthly Meeting of the current Session was held at the Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesday evening, November 29th, 1899.

The Hon. James Norton, LL.D., M.L.C., President, in the Chair.

Mr. RICHARD H. CAMBAGE, L.S., Burwood, and Mr. J. B. JAQUET, A.R.S.M., F.G.S., Department of Mines, Sydney, were elected Ordinary Members of the Society.

The President reminded Members of the forthcoming meeting of the Australasian Association for the Advancement of Science to be held in Melbourne in January next, and called attention to the circulars of information which were laid on the table.

DONATIONS.

Department of Agriculture, Brisbane—Queensland Agricultural Journal. Vol. v. Part 5 (Nov., 1899). *From the Secretary of Agriculture.*

Royal Geographical Society of Australasia: Queensland Branch — Proceedings and Transactions. Vol. xiv. (Session 1898-99): Pamphlet, "Some Critical Notes on the Queensland Volume of the International Catalogue of Scientific Literature" (8vo. Brisbane, 1899). *From the Society.*

Department of Agriculture, Sydney—Agricultural Gazette of New South Wales. Vol. x. Part 11 (Nov., 1899). *From the Hon. the Minister for Mines and Agriculture.*

New South Wales Chamber of Mines, Sydney—Journal. Vol. i. No. 2 (Nov., 1899). *From the Hon. Secretary.*

Royal Society of New South Wales—Abstract of Proceedings. Nov. 1st, 1899. *From the Society.*

The Surveyor, Sydney. Vol. xii. No. 11 (Nov., 1899). *From the Editor.*

Two Entomological Pamphlets (from Agric. Gazette of N.S. Wales). By W. W. Froggatt, F.L.S., Government Entomologist. *From the Author.*

Australasian Institute of Mining Engineers—Proceedings. First Ordinary Meeting, 1899: Pamphlet, The Machinery and Processes Patented in Australasia, 1899. *From the Institute.*

Australasian Journal of Pharmacy, Melbourne. Vol. xiv. No. 167. (Nov., 1899). *From the Editor.*

Department of Mines, Victoria: Geological Survey—Monthly Progress Report. No. 2 (May, 1899). *From the Secretary for Mines.*

Field Naturalists' Club of Victoria—Victorian Naturalist. Vol. xvi. No. 7 (Nov., 1899). *From the Club.*

Royal Geographical Society of Australasia: Victorian Branch—Journal. Vol. xvii. (1899). *From the Society.*

Geological Survey, Perth—Annual Progress Report for the Year 1898. *From the Government Geologist.*

Department of Mines, Hobart—Report of the Secretary for Mines for the Year 1898-99. *From the Secretary for Mines.*

New Zealand Department of Agriculture—Sixth and Seventh Annual Reports (1897-99). *From H. Farquhar, Esq.*

New Zealand Institute—Transactions and Proceedings. Vol. xxxi. (June, 1898). *From the Institute.*

Academy of Natural Sciences, Philadelphia — Proceedings. 1898. Part iii. *From the Academy.*

American Academy of Arts and Sciences, Boston—Proceedings. Vol. xxxiv. Nos. 8-10 and 18-20 (Jan. and May-April, 1899). *From the Academy.*

American Naturalist (Cambridge). Vol. xxxiii. Nos. 393-394 (Sept.-Oct., 1899). *From the Editor.*

Boston Society of Natural History—Memoirs. Vol. v. Nos. 4-5 (April, 1899): Proceedings. Vol. xxviii. Nos. 13-16 (Jan.-April, 1899). *From the Society.*

California Academy of Sciences—Proceedings. Third Series. *Botany.* Vol. i. Nos. 3-5 (Sept.-Nov., 1898): *Geology.* Vol. i. No. 4 (Sept., 1899): *Math.-Physics.* Vol. i. Nos. 1-4 (Feb.-March, 1898): *Zoology.* Vol. i. Nos. 6-10 (Jan.-Oct., 1898). *From the Academy.*

Chicago Academy of Sciences—Bulletin. No. ii. of the Geological Survey (May, 1897): Fortieth Annual Report, for the Year 1897. *From the Academy.*

Connecticut Academy of Arts and Sciences—Transactions. T.p., &c., to Vol. iv. (1877-82); Vol. x. Part 1 (1899). *From the Academy.*

Johns Hopkins University, Baltimore—Hospital Bulletin. Vol. x. Nos. 93-97 (Dec., 1898-April, 1899). *From the University.*

Museum of Comparative Zoology at Harvard College, Cambridge—Annual Report for the Year 1898-99: Bulletin. Vol. xxxii. No. 10 (Sept., 1899). *From the Director.*

New York Academy of Sciences—Annals. Vol. xii. Part 1 (April, 1899). *From the Academy.*

U.S. Geological Survey—Eighteenth Annual Report (1896-97). Parts i., iii. and iv. (1897-98). *From the Director.*

Museu Paraense de Historia Natural e Ethnographia—Boletim Vol i. Nos. 1-4 (1894-96). *From the Director.*

Asiatic Society of Bengal, Calcutta—Journal. Vol. lxviii. Part i. No. 1, with Portfolio of Plates (1899); Part ii. No. 1 (1899); Part iii. No. 1 (1899): Proceedings, 1899. Nos. iv.-vii. (April-July, 1899). *From the Society.*

Indian Museum, Calcutta—Natural History Notes from the R.I.M.S.S. "Investigator." Series iii. No. 3 (Aug., 1899). *From the Superintendent.*

Perak Government Gazette. Vol. xii. Nos. 28-30 (Sept.-Oct., 1899). *From the Government Secretary.*

Conchological Society of Great Britain and Ireland—Journal of Conchology. Vol. ix. No. 8 (Oct., 1899). *From the Society.*

Entomological Society of London—Transactions, 1899. Part 3. *From the Society.*

Royal Society, London—Proceedings. Vol. lxv. No. 419 (Oct., 1899). *From the Society.*

Zoological Society of London—Proceedings, 1899. Part iii.: Transactions. Vol. xv. Part 3 (Oct., 1899). *From the Society.*

Gesellschaft für Erdkunde zu Berlin—Verhandlungen. Band xxv. Nos. 8-10 (1898). *From the Society.*

Naturwissenschaftlicher Verein zu Bremen—Abhandlungen. xvi. Band. 2 Heft (1899). *From the Society.*

Pamphlet "Systematische Uebersicht der Ergebnisse seiner Reisen und Schriftstellerischen Thätigkeit." By O. Finsch (8vo. Berlin, 1899). *From the Author.*

Pamphlet "Zur Kenntniss der Gattungen *Margelopsis* und *Nemopsis.* Vorläufige Mittheilung." Von Dr. Clemens Hartlaub. (8vo. Berlin, 1899). *From the Author.*

Senckenbergische Naturforschende Gesellschaft, Frankfurt a. M.—Abhandlungen. xxi. Band., iv. Heft, Tp., &c. (1899). *From the Society.*

Verein für Erdkunde zu Leipzig—Wissenschaftliche Veröffentlichungen. iv. Band. (1899). *From the Society.*

Zoologischer Anzeiger. xxii. Band. Nos. 598-599 (Oct., 1899). *From the Editor.*

Société Belge de Microscopie, Bruxelles—Bulletin. Tome xxv. (1898-99). *From the Society.*

Société Royale de Géographie d'Anvers—Bulletin. Tome xxiii. 2e Fasc. (1899). *From the Society.*

Société Royale Malacologique de Belgique—Annales. Tome xxxii. (1897): Bulletins des Séances. Année 1899 (pp. xxxiii.-xcvi.). *From the Society.*

Journal de Conchyliologie, Paris. Vol. xlvii. No. 3 (1899). *From the Editor.*

Musée d'Histoire Naturelle de Marseille—Annales. Tome v. 2me Fasc. (1899): Bulletin. Série ii. Tome i. 1er Fasc. (Jan.-Sept., 1898). *From the Museum.*

Muséum d'Histoire Naturelle, Paris—Bulletin. Année, 1898. Nos. 7-8; Année, 1899. Nos. 1-5: Nouvelles Archives. 2me Série. Tome x. 1-2 Fasc. (1898). *From the Museum.*

Société Botanique de Lyon—Annales. Tomes xxii.-xxiii. (1897-98). *From the Society.*

Société des Sciences Naturelles de l'Ouest de la France—Bulletin. Tome viii. Nos. 3-4 (1898); T. ix. Nos. 1-2 (1899). *From the Society.*

Société Entomologique de France—Annales. Vol. lxvi. (1897): Bulletin, 1897. *From the Society.*

Société Linnéenne de Normandie, Caen—Bulletin. 5e Série. Vol. ii. (1899): Mémoires. Vol. xix. 3e Fasc. (1899). *From the Society.*

Société Zoologique de France—Bulletin. Tome xxiii. (1898): Mémoires. T. xi. (1898). *From the Society.*

Société Hollandaise des Sciences à Harlem—Archives Néerlandaises. Série ii. Tome ii. Tp., &c. (1899): Tome iii. 1e Liv. (1899). *From the Society.*

Société des Sciences de Finlande—Bidrag. Häftet xlvii. (1898): Acta. Tomus xxiv. (1899). *From the Society.*

Société Impériale des Naturalistes de Moscou—Bulletin. Année 1898. Nos. 2-3. *From the Society.*

Videnskabs-Selskabet i Christiania—Forhandlinger, 1899. No. 1: Skrifter I. Mathematisk-naturv. Klasse, 1899. Nos. 2-4, and 6-7 (1899). *From the Society.*

Kongliga Svenska Vetenskaps-Academie, Stockholm—Handlingar. xxxi. Band. (1898-99). *From the Academy.*

Regia Societas Scientiarum Upsaliensis—Nova Acta. Ser. iii. Vol. xviii. Fasc. 1 (1899). *From the Society.*

University of Upsala: Geological Institution—Bulletin. Vol. iv. Part 1 (1898). *From the University.*

La Nuova Notarisia, Padova. Serie x. (1899) Aprile and Ottobre. *From the Editor, Dr. G. B. De Toni.*

South African Philosophical Society—Transactions. Vols. i.-ix. Part i., and x. Part i. (1878-97). *From the Society.*

NOTES FROM THE BOTANIC GARDENS, SYDNEY.

No. 5.

By J. H. Maiden and E. Betche.

DILLENIACEÆ.

Hibbertia stricta, R.Br., var. pedunculata, var.nov.

Perfectly glabrous, with creeping and rooting stems. Flowers on pedicels attaining 6 lines in length. Stamens rarely more than 4, the filaments united. Carpels quite glabrous.

Wingello (J. L. Boorman, November, 1899).

This well marked variety approaches Bentham's variety *leiocarpa*, with which it has in common the procumbent habit and the glabrous carpels, but it is distinguished by the rooting stems and the long peduncles, which do not exceed 3 lines in any other of the numerous varieties of *H. stricta*.

CRUCIFERÆ.

Lepidium ruderale, Linn., var. spinescens, Benth.

Narrabri (J. H. Maiden, November, 1899).

The spinescent form is only recorded from South Australia in the *Flora Australiensis*.

RUTACEÆ.

Eriostemon trachyphyllus, F.v.M.

Badgery's Crossing to Nowra (W. Forsyth & A. A. Hamilton, September, 1899); near Botany Bay, Sydney (J. L. Boorman, October, 1899).

The most northern locality previously recorded is Braidwood. In the Nowra specimens the flowers are frequently in clusters of three in the leaf-axils.

GEIJERA PARVIFLORA, Lindl.

Page River, Scone district; also Hunter River, 4 miles easterly (J. H. Maiden, August, 1899). Most eastern localities recorded.

SAPINDACEÆ.

HETERODENDRON OLEÆFOLIUM, Desf.

Page River, Scone district (J. H. Maiden, August, 1899). Most eastern locality recorded.

DODONÆA ADENOPHORA, Miq.

A West Australian plant erroneously included in the Flora of New South Wales. The western *D. adenophora*, Miq., and the eastern *D. tenuifolia*, Lindl., are very similar in habit, and were united by Bentham in the *Flora Australiensis*. Mueller separated them again on account of the dissepiment of the fruits, which are deciduous in *D. adenophora* and persistent in *D. tenuifolia*, but included both in the Flora of New South Wales. In a recent critical examination of the New South Wales species of *Dodonæa* we found abundant material from many New South Wales localities of *D. tenuifolia*, but not a single specimen of *D. adenophora*, and suspecting a mistake in Mueller's "Second Census of Australian Plants," we asked Mr. Luehmann whether he had any East Australian specimens of the true *D. adenophora*. Mr. Luehmann replied that *D. adenophora* is in the Melbourne Herbarium confined to West Australia, and that Mueller had himself noticed the mistake and had intended to correct it in his third Census, which death prevented him from publishing.

LEGUMINOSÆ.

DAVIESIA RECURVATA, Maiden & R. T. Baker.

Warrumbungle Ranges (W. Forsyth, October, 1899). Previously recorded only from Taloobie, 25 miles north of Rylstone, and from Never Never, 24 miles east of Rylstone.

SWAINSONA CADELLI, F.v.M. (ined).

Warrumbungle Ranges (W. Forsyth, October, 1899).

We take this opportunity of offering a few words of explanation in regard to the naming of this apparently very local plant.

Flowering specimens were first collected in 1883 by E. Betche in the Warrumbungle Ranges, near Coonabarabran, and sent to Mueller for naming. About 6 years later Mrs. Cadell sent a bunch of cut flowers (without leaves) from Gulargambone to Mr. Charles Moore, then Director of the Gardens, which contained the same *Swainsona*. These flowers were again sent to Mueller, and his attention was drawn to the fact that they were identical with the undescribed species from Coonabarabran formerly sent to him. Mueller named the plant provisionally in a private letter *S. Cadelli*, but never wrote, or at all events published, a description. The first description was published in 1893 in the *Handbook of the Flora of New South Wales* (Moore & Betche), and though the fruits have not been collected, all other characters agree so completely with Bentham's section A of the genus, that it has been placed next to *S. galegifolia*, from which it is readily distinguished by its subulate calyx-tube and large floral bracts.

ACACIA RUBIDA, A. Cunn.

Several of the phyllodineous *Acacias* long retain their pinnate seedling leaves, but in no species is this habit more prominent than in *A. rubida*, where the pinnate leaves at the base of the stem seem to be scarcely ever absent, even in full grown plants.

ACACIA SALICINA, Lindl.

Page River, Scone district (J. H. Maiden, August, 1899). Most easterly locality recorded.

ACACIA JONESII, F.v.M. and Maiden.

Wingello. Previously only recorded from Goulburn district, near Barber's Creek.

Acacia harpophylla, F.v.M.

Ripe pods recently sent by Mr. J. Gregson from Warrah, Willow Tree, enable us to complete the description of this species in the *Flora Australiensis.* Pods rather thick but flattened, with thickened margins, about 2 lines broad and usually $1\frac{1}{2}$ to $2\frac{1}{2}$ inches long, often curved and somewhat restricted between the seeds. Seeds comparatively large, brown, not shining, placed longitudinally; funicle very small for the genus, only slightly folded.

MYRTACEÆ.

Verticordia darwinioides, Maiden and Betche.

(P.L.S.N.S.W., 1898, p. 17). Synonymous with *Rylstonea cernua*, R. T. Baker, *Ibid.*, 1898, p. 767.

After a careful comparison of a specimen of *Rylstonea* (description published in November, 1898), kindly supplied by Mr. Baker, with our *Verticordia darwinioides* (published in March, 1898) we have arrived at the conclusion that they are identical, but the material from which our diagnosis was drawn was taken from an abnormal, starved plant found on the outskirts of the geographical range of the species, while Mr. Baker gathered his complete material in what appears to be the true home of this rare plant.

Following are extracts from Mr. Baker's and our own papers:—

Verticordia darwinioides.	Rylstonea cernua.
Leaves about 2 lines long, obtuse, but with a fine oblique point; floral leaves completely resembling the stem leaves.	*Leaves* 4 to 6 lines long, with a recurved point, the floral ones almost of equal length.
Flowers usually in pairs on a common slender peduncle, 1 to about 2 lines in length.	*Flowers* pedicellate in pairs, borne on a common peduncle; peduncle filiform, 4 to 6 lines long, nodding.

VERTICORDIA DARWINIOIDES.

Bracteoles large, enclosing the flower buds and long persistent, thin and scarious.

Calyx-tube cylindrical, 5-ribbed, smooth, about 3 lines long, the lobes deeply divided into 5 to 8 narrow filamentous segments, about twice as long as the petals.

Petals ovate, about 1 line long, entire.

Stamens mostly eaten off by insects, so that they could not be distinguished from staminodia.

Anthers nearly globular as far as seen, but destroyed or damaged by insects.

Style slender, much exserted, bearded towards the end.

Ovules 2 only in the ovaria examined.

RYLSTONEA CERNUA.

Bracteoles forming a hood over the corolla and folding over each other on the flower bud, and not falling off till the petals expand, scarious on the edges.

Calyx-tube cylindrical, prominently 5-ribbed, 5 to 6 lines long, lobes simply divided into about 5 to 10 divisions, about twice as long as the petals, the outer lobes with accessory lobes.

Petals entire, imbricate, semi-circular, contracted at the base.

Stamens 10, in a ring at the base of the petals; staminodia alternating with the stamens.

Anthers globular, with two parallel cells, opening by minute pores, &c.

Style well exserted, thick at the base and tapering upwards, bearded towards the end.

Ovules about 8, attached to a peltate placenta, &c.

It will be clearly seen from the above comparative extracts that the difference between the two plants lies chiefly in the size of unessential organs (except the difference in the number of ovules, which is probably due to the defective insect-eaten material we had to work upon), quite in keeping with the theory that our specimens were abnormal; all other differences are trifling or explainable. The flowers in the Dubbo specimens are scarcely nodding, owing to the short peduncles, but very conspicuously so in *Rylstonea* with the long slender peduncles.

We mentioned in our paper on *Verticordia darwinioides* that we hoped to procure better material next season, which might necessitate modifications in the above description; we did not succeed in that, but Mr. Baker had complete material at the time, and it is a regretable oversight on his part that he did not see that we were working on the same plant, and did not refer to the obvious affinity of his "supposed new genus" with our plant, in publishing his paper seven months later. Our plant is decidedly a connecting link between *Verticordia* and *Darwinia* (including *Homoranthus*), and having considered the matter, we would have ourselves proposed a new genus but for its affinity to the S. Australian *Verticordia Wilhelmi*. Mr. Baker's statement in his "Analysis of cognate genera," in which he characterises the genus *Verticordia* as: "Calyx hemispherical . . . flowers in corymbose heads," is scarcely correct. The calyx of *V. Wilhelmi* is not hemispherical, but cylindrical, exactly as in *V. darwinioides*, and the inflorescence of the genus is described by Bentham as: "Flowers usually pedicellate in the upper axils, forming often broad terminal leafy corymbs, or simple leafy spikes or racemes," is consequently extremely variable, and not a character on which the separation of a new genus could be based.

Angophora lanceolata, Cav., and A. intermedia, DC.

Narrabri (J. H. Maiden, November, 1899). The most north western locality recorded for both species.

UMBELLIFERÆ.

Actinotus Gibbonsii, F.v.M.

Narrabri (J. H. Maiden, November, 1899). A new locality for a rare plant

Our common Flannel Flower, *A. Helianthi*, Labill., so well known in the Port Jackson district, occurs also at Narrabri. We have also found it considerably to the south-east, viz., Weddin Range and Bundah Range, Grenfell.

CAPRIFOLIACEÆ.

Sambucus xanthocarpa, F.v.M.

Weddin Forest Reserve (J. H. Maiden, November, 1899). The most western locality recorded.

COMPOSITÆ.

Soliva sessilis, Ruiz and Pav.

Naturalised in Moore Park, near Sydney (October, 1899).

Soliva anthemifolia, R.Br., though included in Mueller's "Census of Australian Plants," has been always suspected of having immigrated from South America. The discovery of a second South American species of the same range, from the Argentine to South Brazil, greatly strengthens this belief.

Helichrysum collinum, DC. (syn. with *H. oxylepis*, F.v.M.)

The type specimen of *H. oxylepis* from Moreton Bay has long linear leaves with revolute margins, and looks rather different from the broad-leaved woolly specimens of *H. collinum* from the Goulburn district or the Blue Mountains, but we find the shape and indumentum of the leaves, as well as the length of the involucral bracts characters so variable, that we fail to draw a line between the two species. Inspection of the abundant material in the Melbourne Herbarium confirms our opinion, and we now propose to reduce *H. oxylepis* to a variety of *H. collinum*. From the fact that in Mueller's original description of *H. oxylepis* in 1858 (*Fragm.* i. 35) he refers to its affinity to *H. scorpioides*, and does not mention the much more closely allied *H. collinum* (described so far back as 1837), we may conclude that the existence of *H. collinum* escaped his notice at the time, which oversight led to the mistake we have now corrected.

GOODENIACEÆ.

Goodenia glomerata, sp.nov.

A perennial with a tufted stem and several erect leafy woolly-hairy flowering stems. Leaves chiefly radical, spathulate-lanceolate, remotely and minutely denticulate or quite entire, narrowed in the lower half and slightly widened again at the sessile base, about $2\frac{1}{2}$ inches long, those of the stem distant, shorter, less narrowed in the lower part and more entire. Flowering stems about 10 inches high in the specimens seen, bearing the flowers at the top crowded together in a leafy head-like woolly-hairy cluster. Flowers sessile (7 in the single head available for examination), the calyces almost concealed in the long hairs of the rhachis, bracteoles and the base of the calyx-lobes. Calyx-tube very short, the lobes long, with linear-subulate points. Corolla yellow, hairy outside, about $\frac{3}{4}$ inch long, the two upper lobes separated much lower down. Capsule ovoid, about 3 lines long, densely woolly-hairy, the dissepiment reaching to above the middle. Seeds rather small and numerous, flat, with a thickened margin, the flat centre minutely pitted.

Braidwood (W. Bäuerlen, December, 1884: specimens kindly communicated by Mr. R. T. Baker).

The affinities of this species are with *G. geniculata*, R.Br., var. *lanata* (*G. lanata*, R.Br.), from which it is chiefly distinguished by its erect habit, head-like inflorescence and shape of the calyx lobes.

EPACRIDEÆ.

Epacris Calvertiana, F.v.M.

Jenolan Caves (W. F. Blakely, October, 1899).

Leaves from lanceolate to ovate-lanceolate, spreading.

A very different-looking plant from the ordinary form of *E. Calvertiana* with narrow-lanceolate erect leaves, but in other respects identical.

APOCYNEÆ.

Melodinus australis, sp.nov.

Described by the collector as "a shrub up to 4 feet," and called by him "Bell-bird bush," but from the evidence of the specimen sent, we are inclined to believe that under favourable conditions it is a trailing if not climbing shrub, quite glabrous. Leaves shortly petiolate, linear-lanceolate, 3 to 3½ inches long, about 6 to 7 lines broad in the middle, tapering at both ends, shining above, paler underneath, with slightly recurved, somewhat undulate margins. Flowers generally 3 to 5 in loose axillary cymes much shorter than the leaves but much longer than the petioles, the pedicels 1 to 3 lines long, with 1 to several pairs of small bracts. Calyx without any glands, the segments obtuse, slightly ciliolate, above 1 line long, persistent under the fruit. Corolla-tube about 2 lines long, the lobes slightly longer, acute, the throat-scales usually irregularly united in a lobed or crested ring. Anthers inserted in the middle of the tube. Ovary glabrous. Fruit yellowish, on a short peduncle of about ½ inch, pear-shaped, attaining in our specimens 2¼ inches in length and about 1½ inches in diameter, with a hardened rind and numerous seeds embedded in pulp.

Between Unkya Creek and Allgomera, Yarrahappini Mountain, Kempsey district (G. R. Brown, January, 1897, and November, 1899).

BORAGINEÆ.

Ehretia membranifolia, R.Br.

Baradine (W. Forsyth, November, 1899). A new locality for a plant rather rare in New South Wales.

VERBENACEÆ.

Spartothamnus junceus, A. Cunn.

Scone (J. H. Maiden, August, 1899).

In this locality a shrub 6 feet high by 6 feet broad, the stem attaining 3 inches in diameter at the base, which is very much larger than hitherto recorded.

LAURINEÆ.

Endiandra Sieberi, Nees.

Shellharbour (E. Cheel, October, 1899). Most southern locality recorded.

THYMELEÆ.

Pimelea petræa, Meissn.

Warrumbungle Ranges (W. Forsyth, October, 1899).

The most northern and eastern locality recorded. It differs from a type specimen in the Sydney Herbarium, from Cudnaka, S. Australia, in the rather larger and less numerous flowers and less hairy leaves. In 1851 Mueller named his Cudnaka specimens *P. octophylla*, R Br., var. *petræa*, but in the publication of his *Census* he kept the two species distinct. Our specimens from the Warrumbungle Ranges approach *P. octophylla*, and suggest that after all Mueller's original view may be the correct one.

EUPHORBIACEÆ.

Acalypha nemorum, F.v.M.

Road from Badgery's Crossing to Nowra (W. Forsyth & A. A. Hamilton, September 1899).

Previously recorded in New South Wales from the northern brush-forests, not further south than the Hastings River. The leaves of the southern specimens do not exceed $\frac{3}{4}$ of an inch in length, but, apart from the size of the leaves, we cannot find any essential difference between the northern and southern specimens. Female flowers and fruits not seen.

CYCADEÆ.

Macrozamia secunda, C. Moore.

Weddin Forest Reserve (J. H. Maiden, November, 1899).

This rather rare *Macrozamia* has been found hitherto only in the ranges near Dubbo and Mudgee, extending from Mudgee to Coonabarabran, where it gradually merges into *M. heteromera*.

The new locality extends its range considerably to the south.

Macrozamia flexuosa, C. Moore.

Scone to Stewart's Brook (J. H. Maiden, August, 1899), in stiff basaltic soil.

Previously only recorded from Limeburner's Creek on the lower Hunter River near Raymond Terrace.

ORCHIDEÆ.

SARCOCHILUS FITZGERALDI, F.v.M., var. RUBICENTRUM, var.nov.

Tweed River district (W. Forsyth, December, 1898).

Originally described by Fitzgerald as *S. rubicentrum* from plants procured from the Cairns district in Queensland; but not previously found in New South Wales, as far as we know.

CYMBIDIUM CANALICULATUM, R.Br.

Narrabri (J. H. Maiden, November, 1899). The most western locality recorded.

AMARYLLIDEÆ.

CRINUM PEDUNCULATUM, R.Br.

South shore of Jervis Bay, where it is known as "Rock Lily" (J. H. Maiden, July, 1899). Most southern locality recorded.

RESTIACEÆ.

LEPYRODIA MUELLERI, Benth.

Botany Swamps, La Perouse Road (J. H. Camfield, 12, 1897). New for the Port Jackson district. Previously (as regards New South Wales) recorded from the southern coast district.

GRAMINEÆ.

CHRYSOPOGON GRYLLUS, Trin., var. SPICIGERA, var.nov.

Narrabri (J. H. Maiden, November, 1899).

Spikelets generally in pairs along the ultimate branches of the panicle, rarely in threes. Awn of the second glume of the sessile spikelet generally very short.

Bentham adopted the name *spicigera* for a variety of *Chrysopogon parviflorus* with the spikelets mostly in pairs; we propose to apply the same name to the very similar variation just recorded in the closely allied *C. Gryllus*.

Following are additions to Hamilton's list of the Mt. Wilson flora (*antea*, p. 346). They were recently collected by Mr. Jesse and the Misses Gregson, and Mr. Maiden :—

STERCULIACEÆ.

Lasiopetalum ferrugineum, Sm., var. cordatum, Benth.

RHAMNEÆ.

Pomaderris phillyreoides, Sieb.

LEGUMINOSÆ.

Daviesia ulicina, Sm.
Pultenæa incurvata, A. Cunn.
" echinula, Sieb.
" plumosa, Sieb.

DROSERACEÆ.

Drosera peltata, Sm.

MYRTACEÆ.

Eucalyptus saligna, Sm., var. parviflora, D. & M.

SCROPHULARINEÆ.

Euphrasia Brownii, F.v.M.

ORCHIDEÆ.

Lyperanthus ellipticus, R.Br.
Bulbophyllum Elisæ, F.v.M.

A NEW VARIETY OF *DENDROBIUM UNDULATUM* FROM THE SOLOMON ISLANDS.

By J. H. Maiden, Botanic Gardens, Sydney.

Last year I received an orchid from the Solomon Islands from Mr. C. M. Woodford, H.B.M. Deputy Commissioner for the Western Pacific, resident in the group. It has recently flowered, and differs so markedly from any form of *Dendrobium undulatum*, R.Br., known to me that I propose to describe it as a variety under the name of *Woodfordianum*.

The leaves broader and closer together than in the type. The labellum rather smaller, with shorter lateral lobes. The lateral petals shorter, spirally twisted, but without undulate margins. The dorsal and lateral sepals shorter and scarcely spirally twisted; the margins not undulate.

The lateral petals dull purplish or almost steely-blue. The sepals whitish, tinged with purplish. The labellum whitish, tinged with purple.

THE NODULE ORGANISM OF THE LEGUMINOSÆ.

By R. Greig Smith, M.Sc., Macleay Bacteriologist.

(Plates li.-lii.)

It has been for a long time known to agriculturists that a leguminous crop enriches the soil to a considerable extent, and it is customary to sow a crop of beans, clover, or other leguminous plant as a preparation for wheat, which makes a great demand upon the soil nitrogen. It was the general feeling that the Leguminosæ could gain nitrogen from the air, but how this occurred was not understood.

In the middle of the century Boussingault, Villes, Lawes, Gilbert and Pugh studied the question, and although Villes certainly showed a gain of nitrogen in some of his plant experiments, yet the later investigations of the Rothamsted experimenters showed that neither the Leguminosæ nor any other plant could utilise the nitrogen from any source other than the soil. With the exception of Berthelot, who about 1876 doubted this conclusion, the matter lay practically dormant until Hellriegal and Wilfarth in 1886 published their classical researches upon the fixation of nitrogen. These authors showed that when crop plants were grown with a sufficiency of minerals the produce was proportional to the amount of nitrogenous manure in the soil. This law, however, did not hold for the Leguminosæ, which grew independently of nitrogenous manuring; indeed some of the largest crops of peas were obtained from soils which had received no nitrogen whatever. But they also showed that when the leguminous plant reached the "sick" period—that is, when the growing plant had exhausted all the cotyledonary nitrogen and appeared pale green in colour—it either took on a new lease of life or died, depending upon whether nodules appeared upon the roots. With the death of the plant there was no formation of nodules and no gain of nitrogen, while with the survival over this sick period the nodules appeared, and there was a considerable gain of nitrogen. From this the inference was naturally drawn that leguminous plants could gain their nitrogenous food by absorbing the atmospheric nitrogen in some way, and that this action had an intimate relation with the nodules formed upon the roots. In other words, the nodules were capable of elaborating gaseous nitrogen into nitrogenous forms capable of being assimilated by the plant.

Hellriegal and Wilfarth in this way indirectly proved the fixation of nitrogen by showing that the mature plant contained more nitrogen than was originally in the soil. Schloesing and Laurent afterwards proved the fact directly by a loss of the atmospheric nitrogen in contact with the plant. Woronin, Marshall Ward and Frank had shown that the nodules did not form on the roots when the plants were grown in either sterilised soil or water, and it was only when the sterile soil was infected with ordinary soil, or when the plants in water culture had pieces of chopped nodules inserted between the root hairs, that nodules were produced. Woronin, as early as 1866, had suggested the presence of bacteria in the nodular tissue, and the earlier experiments bore out the idea.

Marshall Ward was the first to describe the entry of the organisms into the tissues of the plant through the root hairs. A bright spot was observed on the outer epidermal cell wall of the root hair; this fused with the cell wall, and emerging on the inner side, grew along the inside of the hair as a filament which reached the deeper layers of the cortex cells, and these by their proliferation ultimately formed the nodule. Since infection only occurs on the root hair the location of the nodule is accidental. The interior of the nodule is occupied by albuminoid cells, where the cellulose-dissolving infecting thread can be seen branching and passing like a mycelium from the protoplasm of one cell through the cell wall into the protoplasm of a neighbouring cell. The method of entry of the organism was confirmed by Prazmowski, who further saw a number of rods inside the simple filament of

Ward. Maria Dawson* showed that the filaments consisted of strands of straight rodlets imbedded in a matrix, the rodlets being heaped up at the places where the filaments are swollen. The rods appear to be liberated in the cell by the protecting mucilaginous or gelatinous membrane of the filament becoming dissolved, or by the bacteria budding off like a *Dematium*. Mazé agreed with the former alternative. When the bacteria become free they soon lose their original rod-like shape, becoming branched and stouter, and in this condition are known as bacteroids. The bacteroids may slowly fuse, one with the other, to form a spongy tissue, to which Beijerinck ascribed the fixation of nitrogen, likening it to the spongy tissue of the animal lung, where in one case there may be a fixation of nitrogen and in the other there is a fixation of oxygen. Beijerinck in 1888 announced that he had succeeded in isolating what he considered to be the infecting organism. His method of procedure was to sterilise the nodule by treatment with alcohol followed by ether, then to smash it up in a mortar with sterile water and to spread a few drops of the emulsion on plates, upon which a gelatine medium had been poured and allowed to set. The medium was made by adding 18 per cent. gelatine, $\frac{1}{2}$ per cent. peptone, $\frac{1}{4}$ per cent. asparagine, and 1 per cent. saccharose to an infusion of leguminous stalks and leaves. The solidified gelatine quickly absorbed the water, leaving the organisms upon the surface. After some days colonies were seen, consisting of short rods and motile swarmers, which might migrate from the parent colony to found a new colony at some distance. The organism, which he named *Bacillus radicicola*, appears to be pleomorphic, since it occurs not only as rods and minute swarmers but also develops branched forms, among which a simulation of the Greek letter γ is very common. A year later Prazmowski succeeded in infecting leguminous plants with pure cultures of the organism, the name of which he changed to *Bacterium radicicola*, since it did not appear to be capable of forming spores.

* Maria Dawson—Proc. Roy. Soc. lxiv., 167.

Beijerinck could not prove a fixation of nitrogen by pure cultures of the organisms when grown in artificial media, but he remarked that it could grow in the presence of a minimum quantity of nitrogenous material provided a sufficient amount of carbohydrate food was present. At a later date he advised the use of 8-9 per cent. washed gelatine, 2 per cent. sucrose with leguminous plant extract. With regard to carbohydrate food, it is to be noted that there is a considerable quantity of starch in the bacteroidal cells. *Bact. radicicola* in artificial culture is unable to fix nitrogen directly, but in the presence of carbohydrates it is able to seize the smallest trace of nitrate or ammonium salt and convert it into an albuminoid form. The bacteria separated from the nodules of the different genera of Leguminosæ differed in a slight degree, and although this difference prevented the bacteria from one genus producing nodules on the roots of other genera it was not sufficient to make one consider the bacteria as belonging to different families; they could only be considered as varieties of one species. Nobbe considers* that the organism is so influenced by the host plant that it becomes adaptable for existence only in that genus of plant.

As far as can be gathered,† the morphological and cultural characters of *Bacterium radicicola* as described by Beijerinck are as follows:—

Small motile swarmers $0{\cdot}18 : 0{\cdot}9\mu$, or non-motile rods $1 : 4\text{-}5\mu$; the rods show branching forms like the bacteroids of the nodules. No spore formation has been observed, and cultures are killed by exposure to 60°-70 C. The swarmers are strongly aerobic. Drying and freezing are without influence. Gelatine-, starch- and cellulose-dissolving or saccharose inverting enzymes are apparently not secreted. On gelatine the colonies grow slowly, are hemispherical, whitish, clear or somewhat turbid; the smaller colonies

* Stutzer, in Centralblatt für Bakteriologie, 2 Abt. I. 68.

† Lafar, Technische Mykologie.
Kruse, in Flugge's Die Mikroorganismen.
Beijerinck, Centralblatt fur Bakt. 1 Abt. V. 804

are firm and adhesive; the larger are watery. The gelatine is not liquefied.

Frank,* under the name *Rhizobium leguminosarum*, describes an organism which seems to be Beijerinck's bacterium. The rhizobia are actively motile, rounded to long in shape, and 0·9 to 1·3 μ in length. There are also non-motile forms; flagella, however, could not be found. Curved forms, more or less constricted in the middle, apparently a division stage, were frequently observed. Zooglœa forms also were seen, and these often contained in the gelatinous matrix very short coccus-like bodies, the size of which was estimated at 0·2 μ. Spores were not observed. On gelatine the colonies grow slowly, reaching a diameter of 1 mm. in about a week. They are small, rounded to elliptical, raised, of a pale yellow colour and mucilaginous. The gelatine is sometimes liquefied.

Kirchner† claims the organism of the Soja Bean as a variety of *Rhizobium*. The rods are generally somewhat bent, and measure 0·8 : 3·2-3·6 μ. They show a granular content when stained, and are non-motile. On gelatine the colonies grow slowly, forming raised, rounded, transparent, white paraffin-like drops which do not liquefy the medium. Laurent,‡ in discussing the organism of the nodule, prefers the designation *Rhizobium leguminosarum*, but he differs from Frank in respect to its morphological characters. The colonies on gelatine are whitish, and have a glistening surface. The strongly developed colonies are slimy, the slime staining well with dahlia violet, yellow with iodine, and shows no cellulose reaction. It thrives well in media destitute of nitrogen. Sugar, especially saccharose, is favourable. When the medium is 5 mm. deep, a slimy precipitate is formed; when 1 cm. deep floccules are obtained, and with deeper layers there is only a turbidity. The medium should be neutral or slightly alkaline.

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* Frank, Centralblatt fur Bakt. 1 Abt. IX. 629.

† Kirchner, *ibid.*, 2 Abt. II. 96.

‡ Laurent, *ibid.*, 1 Abt. IX. 703.

Temperatures from 22°-26° are most favourable; the growth ceases at 30°. In bouillon, a slimy precipitate is formed, which consists of rods and branched forms. Motility could not be observed even in the smallest forms.

Beijerinck,* from the nodules of *Vicia lathyroides*, obtained a species of *Bact. radicicola*, which in artificial media had a pronounced capsule, forming threads and balls similar to the appearances seen in nodule sections of some genera of *Leguminosæ*. In the capsule the rods do not assume the bacteroidal form.

Gonnermann† considered that the bacteriological research of the nodule had been kept in the background; those who had investigated the nodule question had done so from a botanical and an agricultural-chemical point of view. Beijerinck had not described his bacterium at all fully; indeed, he mentioned the organism as being ciliated, although he had not observed the flagella. As a result of his own researches, Gonnermann did not consider the nodule to be produced by the stimulus of one organism alone, but to result from the action of several. Out of nine bacteria which he separated from sterile soil, in which nodules had been produced on plants by infection with cut nodules,‡ he found two cocci which by themselves were capable of producing nodules on leguminous roots. This is the first intimation that cocci may produce the nodules, although Frank spoke of cocci which became bacteria in the tissues, and Beijerinck claimed that *Bact. radicicola* may assume the coccus, bacterium or spirillum form.

Klein§ claims to have proved nodule-formation on the lupin by two bacteria, one allied to *Bacterium fluorescens liquefaciens*, and the other a short, oval, non-motile bacterium, which stains deeply at the ends and produces small colonies that slowly liquefy the gelatine.

It is evident that the bacterial flora of the leguminous nodule may be very varied—a circumstance which is to be expected by

* Beijerinck, *Ibid.*, xv. 728.

† Gonnermann, Centralb. für Bakt. 2 Abt. i. 200.

‡ Kruse—Flugge, Die Microorganismen.

§ Klein, Centralb. fur Bakt. 1 Abt. xvi. 840.

all who have done bacteriological work with plant tissues, for it is a matter of general experience that many bacteria which live in the soil obtain access to the plant. Galippe* found that garlic was the only plant the tissues of which were free from soil bacteria. There should not, however, be so much doubt with regard to the bacteria which cause the formation of the nodule; neither should the morphological and cultural characters of the organism be so indefinite. Of the bacteria for which nodule-forming power is claimed, there is distinct evidence in favour of two, viz., *Bacterium radicicola*, Beijerinck, and *Rhizobium leguminosarum*, Frank. The differences between these two organisms are not very great, and it is probable that were the two examined by one bacteriologist they would be found to be identical. The differences certainly do not justify a difference in name, especially with a microbe which is admitted to be on the borderland between the bacteria, the saccharomycetes and the hyphomycetes. Each investigator considers it to be allied to a different family, and an organism, the characteristics of which are so different from the bacterial type, should have a specific name. The appellation, therefore, given by Frank is to be welcomed, especially as it is becoming more evident that the name bacterium or bacillus must be retained for those organisms that are of a fixed type. Those that grow like the hyphomycetes in some of their stages are now being called by names which indicate a variance from the true type of the fission fungi.

The circumstance that gives the nodule bacterium its interest is undoubtedly the fact that it either fixes atmospheric nitrogen itself or stimulates the plant to do so. Both Beijerinck and Frank state that pure cultures of their organisms do not assimilate free nitrogen. Heindrich also showed that the organism grew well on sterile potato, but did not fix nitrogen. On the contrary, Mazé† obtained a decided gain of nitrogen in bean sucrose media, containing 1 part of nitrogen and from 100 to 200 parts of sucrose.

* Galippe, Centralb. fur Bakt. 1 Abt. III. 108.

† Mazé, Annales de l' Institut Pasteur XII.

Other investigators claim, as the results of experiments with growing plants, that fixation only begins when the bacteria have become degenerated in the nodular tissue into bacteroids. As long as they exist in the rod-form there is no fixation. While this seems true for the plant and the bacteria, Liebscher and Prazmowski think that *Bact. radicicola* can fix nitrogen in the soil, and Stutzer suggests that other bacteria may assist. This is quite possible, for such a fixation has been shown with other bacteria and minute plants. Schloesing and Laurent* obtained nitrogen assimilation with certain algæ and mosses growing upon the surface of soil. Winogradsky† separated from soil a bacterium which, together with two other species, gained a notable quantity of nitrogen when cultivated in a nitrogen-free glucose medium. This is an interesting case of company-working among bacteria.

. . . .

In order to give the organism the food constituents which are presumably required for its growth, an extract of some leguminous plant is made, and this is used as a basis, in the same way that meat extract forms the basis of media for the growth of bacteria parasitic in animals. In this investigation the lupin was first examined, and consequently this plant was employed. A kilogram of chopped stems and leaves was boiled with a litre of Sydney town water for several hours, and then pressed through a meat press. The resulting extract was evaporated to less than a litre, filtered and made up to the volume. In the beginning of the experiments a simple agar medium was prepared by adding 2 per cent. agar to the infusion, and after the usual methods of procedure, 10 cubic centimetres were caused to set in Petri dishes. Several young lupin plants were dug up, the nodules washed, cut off, and the outside sterilised by steeping for 15 minutes in mercuric chloride (1-1000), then for a minute in strong spirit, followed by

* Schloesing and Laurent, Journal of the Chemical Society, lxii. Abs. II. 1021, and lxiv. Abs. II. 138, 336.

† Winogradsky, Centralb. fur Bakt. 1 Abt. XVI. 129.

half a minute in ether. The nodules were picked out of the ether, held with the forceps till the ether had evaporated, and cut open with a sterile knife. The cut surface was rubbed over the solidified agar in the Petri dish. After several days' incubation at 22° C. many growths appeared on the plates, but in none of them could the typical organisms be observed. This is not extraordinary, for Marshall Ward complained that it was not so easy to obtain a culture from the nodules as the description of Beijerinck would lead one to believe.

There is a considerable difference of opinion with regard to the medium best suited to the organism. Beijerinck in his later papers recommended a very poor medium, and ascribed the want of success that experimenters had experienced in their endeavours to obtain the organism, to the employment of media rich in albuminoids. Atkinson found that it grew well in ordinary meat agar. Gonnermann used a plant infusion with 3 per cent. peptone. Mazé recommends a plant extract with 3 per cent. saccharose. Beijerinck did not neutralise the natural acidity of the extract, while Laurent and also Mazé advised a neutral or slightly alkaline medium.

In the plates containing the simple unneutralised medium, no colonies of the organism could be obtained, but after about a week a dark coloured smudge was noticed on one of the plates. An examination of this slight stain showed a few irregular forms of the organism, and several tubes of different media were inoculated. The only medium in which growth took place was one recommended by Hansen for cultivating yeast. As advised by him, however, it is too acid, and consequently it was neutralised.* The culture in the faintly acid medium was purified by inoculating a series of three liquefied ordinary nutrient gelatine tubes, and

* The peptone-glucose medium eventually used contained :—Peptone, 10 grams ; glucose, 50 grams ; calcium chloride (cryst.), 5 grams ; monopotassium phosphate, 2·5 grams ; tap water, 1000 c.c. Neutralise with caustic potash until 10 c.c. contain an acidity equal to 0·7 c.c. tenth normal acid. Boil, filter and sterilise.

pouring these into Petri dishes. In about 10 days colonies grew on one of the plates to a millimetre in diameter. Different media inoculated from one of the colonies showed the following characteristics when grown at 22° C. :—

Meat-gelatine plate.—The surface colonies appear as raised hemispheres with a white, glistening, paraffin-like appearance: glutinous when touched with the needle. With 60-fold magnification they are circular and opaque except at the margins where a little light passes through showing a granular structure. The deep colonies are oval or round, brownish and coarsely granular.

Stab cultures in various gelatine media.—White uncharacteristic growth along the needle track; slight surface growth.

Lupin-agar with 1 % potassium chloride.—Luxuriant, stearine-like growth which has extracted some of the colour of the medium.

Meat-agar stroke.—The inoculating loop has produced a thin, rough, glistening, whitish ribbon with rough margins; the culture gravitates slightly to lower portions; growth never luxuriant.

Glycerine-meat-agar stroke.—At first the growth is like that on meat-agar, later it becomes more luxurious. In three weeks there is an exceedingly voluminous raised, spreading, white glistening culture.

Inorganic fluid media.—Scanty growth.

Peptone-glucose fluid media.—Turbid with slight film and flocculent precipitate.

Peptone-sucrose fluid media.—Clear with film and precipitate chiefly of old films.

Potato, ordinary acid.—A yellowish-white, spreading, glistening layer.

Lupin-extract, etc., gelatine plate.—Translucent, white, raised, non-spreading colonies. With 60-fold magnification, circular granular colonies with sharp margin; the deep colonies are like the surface ones, but are more opaque, and consequently appear more granular.

The earlier cultures in agar media made from the unneutralised infusion were not at all successful, a circumstance due partly to the acidity and partly to the agar surface which was very soft owing to the action of the acid which, as sterilisation proceeded, made the medium less and less gelatinous. This was obviated by neutralising the medium immediately after the agar or gelatine was dissolved. Potassium hydrate suggests itself as the best alkali to use in neutralising a plant extract, especially when one remembers how much the Leguminosæ are benefited by potash salts. In some of the cultures, as for example lupin-agar, with 1 per cent. potassium chloride, it seemed as if the salt had stimulated the growth of the organism. According to Mazé, sodium chloride acts as a poison towards the nodule bacterium paralysing its development. A plate seeded with the organism and dotted with solutions of various salts showed the greatest amount of growth between a potassium phosphate and a calcium chloride manuring. This suggested a means of clarifying the various plant-extract media which are always more or less turbid from the gradual precipitation of organic matter. When the agar or gelatine is dissolved in the plant extract 5 c.c. each of a 10 per cent. solution of monopotassium phosphate and of a 20 per cent. solution of crystallised calcium chloride are added to every 100 c.c. of the hot gelatine or agar medium, which is then neutralised with 10 per cent. potassium hydrate to faint acidity. Ten c.c. of the solution are pipetted out and neutralised with tenth normal potash, using phenolphthalein as an indicator, and normal potash is added to the bulk of the medium in proportion to make every 100 c.c. possess an acidity equal to 0·7 c.c. of normal acid. This acidity is equal to 0·05 per cent. tartaric acid.

The organism is a strong aerobe, and grows most freely when started upon the surface of a medium. It does not grow under anaerobic conditions in peptone-glucose fluid, a medium which seems best suited to its needs. Laurent maintained that it could grow anaerobically, while Mazé, denying this, assumed that oxygen had not been thoroughly eliminated from Laurent's culture media.

Ordinary acid potato forms an excellent medium for its growth, and yet it refuses to grow upon a medium prepared by adding 2 per cent. starch and 2 per cent. agar to acid potato extract. The failure of the organism to grow upon this medium cannot be due to the acidity, for the steamed potato and the potato-agar had about the same acidity. It is more probable that starch is not the carbohydrate in the potato that is utilised, and that in the nodule the organism does not utilise the starch as such. Steaming possibly alters some of the relatively great amount of starch in the acid potato into a derivative, which can supply the organism with carbohydrate food. This derivative cannot be dextrin, for experiment showed that when dextrin is added to ordinary meat-agar to the extent of 5 per cent. it retards the growth. Extract of lupins or of other leguminous plants does not seem a necessity for the culture media. Grass will do quite as well, and for that matter the plant extract might be left out entirely. Fairly luxuriant cultures were obtained upon a medium made with 10 per cent. washed gelatine, 3 per cent. glucose, and the customary calcium chloride and potassium phosphate. The most luxurious growth was obtained with meat-agar containing 6 per cent. glycerine. More than this percentage of glycerine, *e.g.*, 10 per cent. or 20 per cent., prevented growth.

With regard to temperature, the organism grows very well at 22° C., and this is very fortunate since it enables gelatine media to be employed. At 30° C. growth is slow, but it is by no means checked. Mazé was able to accustom the organism to grow at 35° C.

The media ultimately adopted were peptone-glucose as a fluid (see footnote, p. 661), and glucose-glycerine agar or gelatine as a solid.*

* Washed gelatine, 20 grams, or washed agar, 2 grams; lupin extract, 100 c.c.; glucose, 4 grams; glycerine, 2 grams. Heat until the gelatine or agar is dissolved, add 10 c.c. each of 10 per cent. monopotassium phosphate and 20 per cent. calcium chloride, make the volume up to 200 c.c. and neutralise until there is an acidity equal to 0·05 per cent. tartaric acid (*i.e.*, until 10 c.c possess an acidity equal to 0·7 c.c. tenth normal acid). Heat, filter, sterilise.

Although a culture of the nodule organism was obtained from the lupin nodules by smearing the surface of set agar, the method did not recommend itself as one at all well adapted for easily getting the organism.

Beijerinck's method of sowing drops of nodule emulsion was just as useless, because the places were in a few days swarming with other bacteria.

Better results were obtained by washing the nodules and passing them successively through mercuric chloride, alcohol and ether, holding them with sterile forceps until the ether evaporated and placing each into a Freudenreich flask containing 10 c.c. sterile, 0·6 per cent. potassic chloride. In the flasks the nodules were crushed with stout sterile glass rods. The emulsion thus obtained was blown by means of a sterile glass spray upon the surface of set gelatine medium in a Petri dish. From six to twelve plates should be prepared from the same number of nodules, as some of the nodules may contain foreign organisms which grow quickly and generally liquefy the gelatine. One objection to spraying the plates is that the air is washed at the same time, and moulds and aerial bacteria carried to the gelatine surface. The usual method of obtaining pure cultures by inoculating the gelatine, previous to pouring into plates, is not to be recommended, as the nodule-formers are then chiefly in the body of the gelatine film, and grow very slowly indeed, especially when taken directly from the nodule where they are presumably in a somewhat enfeebled condition. The passage through the potassium chloride seems to act as a stimulant, for the colonies grow faster than when distilled water is employed.

A better method than spraying consists in sterilising a small camel's-hair brush or pencil by passing it successively through mercuric chloride, alcohol and ether, allowing the ether to evaporate and washing in sterile potassium chloride. The moist sterile brush is then pushed about in the nodule emulsion and painted over the set gelatine surface. Confluent or isolated colonies appear in from six to ten days, and from these a pure culture may be obtained in the usual way by inoculating a series of tubes and pouring into Petri dishes.

The colonies are circular, well raised from the surface and white. The white colour may give place to a yellowish from absorption of the colouring matter of the medium. In a pale coloured medium the colonies are like drops of paraffin or skimmed milk; on the same plate both yellowish and white colonies have been observed near one another. The yellowish was the older colony, and apparently had absorbed all the free colouring matter before the younger had made much progress. Although the colonies do not liquefy the gelatine, yet in some cultures a slight liquefaction has been seen. This was obtained with a vigorous culture growing upon a medium containing 6 per cent. gelatine which, through prolonged heating during filtration, had lost some of its gelatinising power. On the plates the colonies may consist of many forms of the organism. Some colonies may consist entirely of short bipolar staining rods in the interior as well as on the surface of the growth. Others again, even on the same plate, may consist of these together with rods swollen at the ends and exhibiting irregular staining, or with Y, saturn-like, or branching forms.

The organism, generally speaking, is a capsulated bacterium, with rounded ends and stains irregularly. The strong stains such as fuchsin, unless the excess of colour is removed by alcohol, show an irregular rod that may be more or less branched, while the weaker stains as the blues show the protoplasm contracted in places. The shorter bacterial forms are straight and stain at the poles; the longer forms may be more or less bent, and show three, four, five or more stained portions. The general shape varies somewhat in the different media. In peptone-glucose fluid the short bipolar staining rods predominate, while the substitution of sucrose for glucose causes the irregular and branching forms to preponderate. On ordinary meat-agar media the broken rods appear to be thin in the middle; the addition of glycerine to the meat agar causes some of the organisms to assume the long form, the segregated protoplasm of which gives the rod a chlamydosporelike appearance. The broken appearance of the dried and stained rod is very characteristic.

A few of the films that had been made from peptone-glucose fluid cultures showed small terminal prominences that suggested buds, and in order to observe them better, the films, instead of being fixed by heat, as is customary in preparing bacterial films, were fixed by means of formalin, the employment of heat being avoided throughout the process. The method consisted in spreading a loop of a 36 to 48 hours culture upon a clean cover glass and allowing the film to dry in the air. It was then floated on a 5-10 per cent. aqueous solution of formalin for five minutes, rinsed in distilled water, floated on the stain, again washed in tap followed by distilled water, allowed to dry in the air and finally mounted in balsam. Of the various stains, gentian-violet used as Fränkel's carbol-violet gave the best result The blues were rather weak, and carbol-fuchsin stained the whole organism, although when diluted it did fairly well.

The organisms prepared in this way appeared as more or less oval vacuolated yeasts, and a few of the cells showed a pronounced terminal bud. The yeasts are undoubtedly best seen in the fresh condition, but the nodule organisms are much too small for observation in this way, and consequently the use of a differential stain is necessary. When prepared in this way the single cells vary in length and breadth, but generally are about 0·5 μ broad and from 1·2 to 2·0 μ long. The longer forms consist of several cells contained in a delicate tubular capsule. We can now explain the broken appearances of the organisms when prepared by the methods usually adopted for bacteria. The heat used to fix the organisms causes the protoplasm of the cell to contract, and a break occurs across the vacuole. The single organism thus exhibits polar staining. The organisms may have produced a bud more or less mature that separates from the parent cell, but is still retained within the capsule. The stained organism and bud will now appear as a rod, staining centrally and at the poles. The bud may mature and form its vacuole, in which case two organisms will be contained in one capsule. This double organism will stain as a straight or bent rod, the protoplasm of which has collected in four places.

A hanging-drop preparation of a two days old culture in peptone-glucose fluid at 22° C. shows the young cell as actively motile, darting about over the field of the microscope. At a later stage it has a forward waltzing motion, and ultimately the motion ceases when the cell presumably begins to bud. When the bud has separated from the parent protoplasm it pulls and tugs in its endeavour to free itself from the capsule membrane containing the motionless mother cell, and we have an appearance exactly like that of an ant attempting to drag along a twig which proves too heavy for its powers.

The capsule is frequently too strong, and the bud grows to maturity still enclosed in the parent membrane. In young cultures budding is very vigorous, and a second bud may appear pushing the first to one side. Thus there is produced the Y form. Another bud may form an X.

In peptone sucrose media the irregular forms are very common; indeed with a two days' culture there are very few individual cells. These combinations clearly result from the inability of the daughter cells to escape from the parent membrane, which is apparently much more tough than when glucose is used as a nutrient. When grown upon solid media, the cells are generally in the rod form, but this does not justify their being placed among the bacteria. Indeed, since they are budding fungi, the name applied to them by Beijerinck is a misnomer.

A year ago Maria Dawson, by constant observation under high magnification, found that the organisms divided into equal or slightly unequal halves, but since they divided, this investigator considered that they were true bacteria. As before mentioned, the organisms are too small to be seen clearly in the unstained condition, and the observation of even the more mature buds is a matter of some difficulty. The younger buds enclosed in the refractile membrane are probably impossible to be seen until they have attained a more mature form, when they appear as if division had occurred.

The nodule yeasts have always a tendency to form a more or less gelatinous capsule. In peptone-glucose fluid this is very thin, while in solid media it is more or less bulky. Under some conditions, and notably in sucrose fluids, the cells are collected in zooglœa films, tufts and filaments. They are very prone to collect round foreign solid particles, such as fragments of cotton wool, and when this occurs there is presented the appearance of a microscopically wide tube containing the organisms. The capsule, when swollen and mucilaginous, gathers more or less towards the middle of the simple cell, or of the elongated or branching compound cells, and by staining equally with the cell produces many odd forms. Among these odd forms there is a lenticular shape, and a sphere with two or three projecting points: the two projecting points cause the organism to appear like the planet Saturn. The other varieties of form may be called hat-shapes. These irregular appearances are only observed when stains are used that colour the capsule as deeply as the cell. The relation between the capsule and the organism may be demonstrated by staining with carbol-fuchsin, and washing most of the stain out of the capsule with dilute alcohol. The cell then appears of a deep red colour, and the capsule pink.

In my endeavour to obtain a preparation showing the flagellum by means of which the cell presumably is enabled to move about, many cultures of the organism were tried in various ways. As a result of these trials it became evident that the suspension of an agar culture in water or normal saline was not suitable. Ultimately peptone-glucose fluid cultures were used in the undiluted condition, spread on clean cover-glasses, air-dried and fixed in 5-10 per cent. formalin solution. The formalin solution, while fixing the organisms, probably also extracts some of the soluble constituents of the film which might take up the mordant and become stained. The formalin was washed off with distilled water, and the cover-glass immersed in Coerner-Fischer mordant that had been warmed and filtered. The watch-glass containing film and mordant was kept warm by placing it over the very small flame of a microchemical burner.

After from 1 to 2 minutes, the cover-glass was taken out of the solution, rinsed thoroughly in tap water and then in distilled water. Staining was effected by immersing the cover-glass, film-side downwards, for 5 minutes in carbol-fuchsin, which had been filtered cold and then warmed. The stained film was washed, air-dried and mounted in balsam. When successfully stained by this method the appendages of the cell are revealed. An empty tubular capsule can sometimes be seen attached to the organism; the width of the tube, as well as the frayed end, show clearly what it is. The cell has sometimes a relatively wide diffuse terminal thread, which is in all probability a mucilage thread and accidental, since it is too wide and transparent either for a flagellum or for the capsular tube. A few cells have stronger threads varying up to twice the length of the organism. These are exceedingly like the flagella of the bacteria. They may be flagella—it is more probable that they are not, since they are but seldom found. For example, in a 40 hours' culture at 18° C., most of the organisms were actively motile, and a film of this culture showed when mordanted and stained only two cells with these pronounced terminal threads. Had they been flagella there would have been in the same film many more cells endowed with these appendages. The culture, however, showed that practically every cell bore an exceedingly thin terminal thread varying up to 2 μ in length, and bearing upon the distal end a tuft like the tuft upon a lion's tail or the lash upon a whip. This is undoubtedly the flagellum by means of which the cell moves. The thread is so thin that even when mordanted and stained it is seen with difficulty. The terminal tuft, however, is easily made out, and assists in the discernment of the thread. The tufted flagella appear singly and at one end of the simple organisms.

While the coccus form of other investigators is undoubtedly the bud, the spirillum and slightly bent forms are caused by the bending of two or more cells while still enclosed in the parent membrane, and the collection of individual organisms appearing or staining as one bacterium produces the curvature of the supposed simple rod. It must not be forgotten, however, that in common with all yeasts the rhizobia under certain unfavourable conditions, and notably within the nodule, may grow to long and irregular forms, just as some of the most pronounced saccharomycetes grow as sausage-shaped and lengthened forms. With the latter this frequently occurs when they are grown on solid media, and also when cultivated for a long time on the surface of liquid media.

When young cultures of *Rhizobium* are placed upon the gypsum block, as is customary in determining ascospore formation with the yeasts, and maintained for a few days at 22° C., the protoplasm of the cell is seen to aggregate into points and finally disappear, the cell meanwhile swelling and losing its staining power. Among the cells occur a number of coccus forms, but since they occur free, and have not with certainty been seen inside the cells, they are probably buds and not ascospores. The older cultures on gypsum show only a collection of non-staining forms.

Experiments were made with pure cultures of the organism, using glucose and sucrose in conjunction with plant extract, but neither with *Rhizobia* obtained from the lupin nor the pea could any fixation of free nitrogen be found either in faintly acid, neutral or faintly alkaline media; the cultures finally contained the same amount of nitrogen as they had at the beginning of the experiment.

With regard to the other organisms of the nodule, examination of the crushed nodule suspension shows what is virtually a pure culture of *Rhizobium.* Other organisms are so few in number that they are overwhelmed by the nodule formers. So numerous are they that any doubt as to whether other organisms may cause the formation of the nodule is at once dispelled, and *Rhizobium* undoubtedly plays the chief if not the only rôle. Other organisms do occur, but most of them may be looked upon as accidental, since they are not universally found in all nodules. There is one organism, however, which has been found very frequently in the nodules of peas, lupins and vetches. It grew so freely upon carbonaceous media poor in nitrogen, and was of so large a size that experiments were made in order to ascertain if this could fix free atmospheric nitrogen. The experiments were negative; the blanks showed the same amount of nitrogen as the cultures. This organism appeared sometimes as a streptococcus, and sometimes as a chain of fat bacteria, the individual cells measuring about 3 μ long and about 2 μ broad. A culture in lupin extract that had stood for two months showed a collection of spores. On solid media these developed into smaller compact rods with rounded ends, and this appearance, together with the culture characteristics obtained from the original organism, identified the bacillus as *Bac. megatherium*. The recognition of this organism, which, if not identical with, is very closely allied to, the alinit bacillus, *Bac. Ellenbachii a*, which is claimed to assist the cereals in collecting nitrogen from the air, induced the trial of a mixed culture of this bacillus with *Rhizobium* in order to see if these organisms growing together could fix atmospheric nitrogen in artificial culture. The mixed culture grew most luxuriantly to form a syrupy fluid, which was in great contrast to the thinner cultures of the separate organisms. There was no gain of nitrogen, however, by the cultures. A second set received an additional quantity of glucose after reaching the syrupy stage, but still there was no gain. Cover-glass preparations of the eleven days' syrupy culture showed the rhizobia staining strongly as if in extremely vigorous condition. A number of short empty capsule tubes were dimly visible. The growth of megatherium was restricted; spores occurred here and there, and there were a few short chains of coccus forms. The small coccus-like buds, as well as the mature forms of *Rhizobium*, were frequently seen adhering to these chains. There were a few large oval cells which contained one or two rhizobia; the cells apparently consisted of a stain-absorbing plasma, and probably were huge capsules. Yellow masses of bye-product also occurred; these recalled the masses after seen in the nodule cells. Bearing in mind that the nodules are rich in starch, it seems possible that *Bac. megatherium* may functionate as a starch dissolver, and in this way assist the nutrition of *Rhizobium*.

Of the other bacteria and moulds of the nodule there are none that call for any special attention. When taken from the nodule they are chiefly capsulated gelatine-liquefying bacteria. *Bact. fluorescens liquefaciens* was obtained from the nodules of one pea plant in goodly amount; but since it was not found in any other, its presence was purely accidental. Stutzer's *Hyphomicrobium* occurs very frequently as an impurity in the partially pure colonies of the nodule former.

The following are the points which this investigation has decided:—

1. The nodule organism is a yeast and possesses a vacuole.
2. Frank's designation *Rhizobium leguminosarum* is better than Beijerinck's *Bacterium radicicola*.
3. The organism multiplies by budding, which, together with the presence of a more of less persistent mucilaginous capsule, causes the single or compound organism to assume a variety of shapes.
4. The vigorous forms are motile, the motility being due to a single, terminal, tufted flagellum.
5. A faintly acid glucose medium is best adapted to its growth.
6. The organism does not fix nitrogen in artificial media.
7. *Bac. megatherium* usually accompanies *Rhizobium* in the nodules.
8. Other bacteria found in the nodules are probably accidental.

EXPLANATION OF PLATES.

Magnification 1500. Culture medium, peptone-glucose fluid. Numbers 3-7 stained with Coerner-Fischer mordant.

Fig. 1.—Double cell and pronounced vacuole.

Fig. 2.—Groups of budding and vacuolated cells.

Fig. 3.—Budding cells.

Figs. 4-7.—Cells with flagellum appendages.

Fig. 8.—Cells in *Megatherium-Rhizobium* culture showing *Rhizobium* cells in large capsule and also in thin branching capsule.

CONTRIBUTION TO A KNOWLEDGE OF THE MOSSES OF NEW SOUTH WALES.

By William Forsyth.

If an apology were required for bringing this paper under the notice of the members of this Society, the general want of knowledge prevailing even amongst botanists with respect to the mosses of New South Wales would, I think, be considered ample.

No list or catalogue of the mosses of Australia has been published since the date of issue of Mr. Mitten's list in 1882. Many species have been discovered since that time, but from the fact that nearly all the collections have been sent for determination to specialists in Europe, and the descriptions of new species published in European publications—not always obtainable here—information regarding them is very meagre indeed, and to ascertain what has or has not been recorded is a matter of no little difficulty and some uncertainty.

It is, therefore, with the object of furnishing some little information with regard to geographical distribution, etc., that the writer submits the following list. Many of the species have not hitherto been recorded for New South Wales, and some of them have been recorded in so indefinite a manner as to be next to useless so far as affording any guide to the collector is concerned. Some new localities also are given for species already definitely recorded.

The total number of species under notice is 61, of which 43 are new for the colony, the remaining number furnishing new localities: and 26 are recorded from Port Jackson.

Although much care has been taken to have the given localities, etc., as full and correct as possible, still some incompleteness cannot be unexpected in a list which must neccessarily be of a tentative character.

It has only to be stated that the specimens from which the species were determined passed through the hands of the eminent bryologist, Dr. Brotherus, of Helsingfors, to banish any doubt as to the correctness of the naming.

I have to acknowledge my indebtedness to Mr. R. A. Bastow, F.L.S., well known for his work on Tasmanian Mosses, for a copy of his MS. "List of Australian Mosses." The localities marked with an asterisk are from this as yet unpublished list. I have also to thank Mr. T. Whitelegge and Rev. W. W. Watts for the opportunity of using some of their records.

No previous records for species are given outside of Australia and Tasmania.

Tribe i. DICRANEÆ, Mitten.

DICRANELLA, C.M.

DICRANELLA DIETRICHIÆ, C.M.

National Park (*W. Forsyth*; Sept. 13th, 1898); Fitzroy Falls (*T. Whitelegge*; Nov. 8th, 1884).

Previously recorded from Queensland and New South Wales.*

DICRANELLA TRICRURIS, C.M.

Turramurra, near Sydney (*W. Forsyth*; Aug. 14th, 1898) and Burringbar; Nov. 11th, 1898); Richmond River (*Rev. W. W. Watts*; April 29th, 1896); Gosford (*T. Whitelegge*; Sept., 1891).

Previously recorded from Queensland.

BLINDIA, Bruch & Schimper.

BLINDIA ROBUSTA, Hampe.

Merritt's Camp, Kosciusko (*W. Forsyth*; Jan., 1899).

Previously recorded from Tasmania* and Victoria.

This handsome moss was found growing just a few feet from the edge of a large snow drift, and in some instances partly covered by the melting snow.

HOLOMITRIUM.

HOLOMITRIUM PERICHÆTIALE, Bridel.

Lane Cove, Port Jackson (*W. Forsyth*; July, 1898); Ballina, Alstonville Road (*Rev. W. W. Watts*; Dec., 1897).

Previously recorded from Tasmania, Victoria and Queensland.*

ENCAMPTODON, Montague.

ENCAMPTODON MUELLERI, Hpe. & C.M.

Mt. Warning (*W. Forsyth*; Oct. 31st, 1898): Brooklet, Richmond River (*Rev. W. W. Watts*; Sept., 1896).

Previously recorded from Victoria.

CAMPYLOPUS, Bridel.

CAMPYLOPUS WOOLLSII, C.M.

Top of Mt. Warning, growing on the stems of *Xanthorrhoea arborea*, R.Br. (31st. Oct., 1898), National Park (July, 1898), Three Mile Scrub, Byron Bay (7th Nov., 1898), and Turramurra (*W. Forsyth*: 14th Aug., 1898); Wyong (*A. A. Hamilton*: April, 1899).

Previously recorded by the late Rev. Dr. Woolls from Sydney, but without any definite locality; also recorded from Queensland.

Tribe ii. **GRIMMIEÆ.**

GRIMMIA, Ehrhart.

GRIMMIA APOCARPA, Hedwig.

Merritt's Camp, Kosciusko; growing plentifully on the rocks above Merritt's Camp, on the Kosciusko Plateau (*W. Forsyth*; Jan., 1899).

Previously recorded from Tasmania and Victoria.

GRIMMIA TRICHOPHYLLA, Grev.

Pretty Point, Kosciusko (*W. Forsyth*: Jan., 1899).

Previously recorded from Tasmania and Queensland.*

GRIMMIA CYGNICOLLA, Tayl., (*G. pulvinata*, Hook. & Tayl.)

Barber's Creek (*J. H. Maiden*; Oct., 1898).

Previously recorded from Western Australia, Tasmania, Victoria and Queensland.*

Grimmia obtusata, Hpe. & C.M.

Merritt's Camp, Kosciusko (*W. Forsyth*; Jan., 1899).
Previously recorded from Victoria.*

Glyphomitrium, Bridel.

Glyphomitrium Muelleri, Mitten.

Bowmark (*J. H. Maiden*; Sept. 14th, 1897).
Previously recorded from Queensland and New South Wales.*

Tribe iii. **LEUCOBRYEÆ.**

Leucobryum, Hampe.

Leucobryum strictifolium, Broth.

Lawson, Blue Mts. (*E. Betche*; Aug., 1895); Cowan Creek (*A. A. Hamilton*; Jan., 1899).
Previously recorded from Queensland; and Richmond River, New South Wales (*Rev. W. W. Watts*).

Tribe v. **TORTULEÆ.**

Weissia, Hedwig.

Weissia flavipes, J. Hook. & Wils.

La Perouse, Botany Bay (*W. Forsyth*; July, 1899); Richmond River (*Rev. W. W. Watts*).
Previously recorded from Tasmania and Victoria.

Hymenostomum, R.Br.

Hymenostomum olivaceum, C.M.

Nepean River (*W. Forsyth*; Sept. 23rd, 1898).
Previously recorded from Gosford (*T. Whitelegge*, 1891).

Tortula, Hedwig.

Tortula princeps, DeNotaris.

Jenolan (*J. H. Maiden*; Aug., 1898).
Previously recorded from Tasmania* and Victoria.

TORTULA (BARBULA) SUBCALYCINA, C.M.

Lane Cove (*W. Forsyth*; July, 1898); Rookwood (*E. Cheel*; Aug. 7th, 1898).

Previously recorded from Queensland.*

TORTULA CALYCINA, C.M.

National Park (*W. Forsyth*; Sept. 10th, 1898).

Previously recorded from West Australia, Tasmania and Queensland.

EUCALYPTA, Schreber.

EUCALYPTA TASMANICA, Hpe. & C.M.

Jenolan (*J. H. Maiden*; Aug., 1898); Shoalhaven Gullies, near Badgery's Crossing (*W. Forsyth*; Sept., 1899); and Warrumbungle Ranges (Oct., 1899).

Previously recorded from Tasmania.

Tribe vi. **ORTHOTRICHEÆ.**

ORTHODONTIUM, Schreber.

ORTHODONTIUM LINEARE, Taylor.

La Perouse (*W. Forsyth*; July, 1898); Gosford (*T. Whitelegge*; Sept. 20th, 1891).

Growing abundantly on the lower part of the trunks of *Eucalyptus robusta* at La Perouse, Botany Bay. I have a suspicion that plants of this species with mature fructification form the *O. ovale* of C.M.

Previously recorded from West Australia* and Tasmania.

ORTHODONTIUM SULCATUM, Hook.

Tempe, near Sydney (*A. A. Hamilton*; Sept. 18th, 1898).

Previously recorded from Victoria.

ORTHODONTIUM OVALE (?) C.M.

La Perouse (*W. Forsyth*; Dec., 1898).

Previously recorded from Gosford, New South Wales (*T. Whitelegge*, 1891).

This moss also grows plentifully on the trunks of trees of *Eucalyptus robusta* at La Perouse.

Tribe vii. **SPLACHNEÆ.**

TAYLORIA, Hook.

TAYLORIA OCTOBLEPHARIS, Hook.

Turramurra (Aug., 1898), Lane Cove (July, 1898), Nepean River (Sept., 1898), and National Park (*W. Forsyth*: Aug., 1898); Appin (*J. H. Maiden*; Sept., 1898); Mosman's Bay (*T. Whitelegge*, 1884).

Strange as it may appear I cannot find any record of this moss for New South Wales. It is a common moss, and I am aware that it has been found by Mr. Whitelegge, Mr. Watts and others.

Tribe viii. **FUNARIEÆ.**

FUNARIA, Schreber.

FUNARIA ARISTATA, Broth.

Lane Cove (*W. Forsyth*; July. 1898, and Sept., 1898).

Previously recorded from Lilyvale, New South Wales (*T. Whitelegge*; Sept., 1891).

FUNARIA CUSPIDATA, Hook. & Wils.

La Perouse (*W. Forsyth*; July, 1898).

Previously recorded from Victoria.*

FUNARIA GLABRA, Tayl.

Turramurra (*W. Forsyth*; 14th Aug., 1898), Lane Cove (Sept., 1898), and National Park (10th Sept., 1898).

Previously recorded from West Australia, Tasmania and Victoria.

Tribe ix. **BARTRAMIEÆ.**

PHILONOTIS, Bridel.

PHILONOTIS APPRESSA, Hook. & Wils.

Mt. Kosciusko (*W. Forsyth*; Jan., 1899).

Previously recorded from Tasmania and Victoria.

CONOSTOMUM, Swartz.

CONOSTOMUM PUSILLUM, Hook. & Wils.

King's Tableland, Blue Mts. (*W. Forsyth*; Nov. 2nd, 1898), and Mt. Kosciusko (Jan., 1899).

Previously recorded from Tasmania and Victoria.

The specimens from Mt. Kosciusko are much more robust than those from King's Tableland, their general appearance being very different.

CONOSTOMUM CURVIROSTRE, Mitten.

Summit of Mt. Kosciusko (*W. Forsyth*; Jan., 1899).

We found this quaint little moss growing on the summit of Kosciusko close to the Observatory.

Previously recorded from Victoria.

BARTRAMIA, Hedwig.

BARTRAMIA PAPILLATA, Hook. & Wils.

Merritt's Camp, Kosciusko (*W. Forsyth*; Jan., 1899).

Previously recorded from Tasmania, Victoria and Queensland.*

Tribe x. BRYEÆ.

BRYUM, Linn.

BRYUM LEPTOTHECIUM, Tayl.

Jenolan Caves (*H. Malthouse*; Aug., 1898); Manly (*A. A. Hamilton*; Sept., 1898).

Previously recorded from Tasmania and Victoria.

BRYUM CREBERRIMUM, Tayl.

Lane Cove (*W. Forsyth*; July, 1898).

Previously recorded from West Australia.

BRYUM PACHYTHECA, C.M.

"Thirteen miles from Dubbo" (*J. H. Maiden*; Aug. 8th, 1898); Rookwood (*E. Cheel*; Aug. 7th, 1898).

Previously recorded from West Australia, Victoria and Tasmania.

Mitten in his list put this species and *B. baloides*, Tayl., under the head of *B. dichotomum*, Hedw., but the Index Bryologicus keeps the species (*pachytheca*) distinct. As Mr. Mitten gives the three colonies—West Australia, Victoria and Tasmania—for the three so-called species under the heading of *dichotomum*, it would be interesting to know how many of the colonies have recorded "*pachytheca.*"

Bryum chrysoneuron, C.M.

Lane Cove (*W. Forsyth*; July, 1898).

Previously recorded from Tasmania and Victoria.

Bryum pyrothecium, Hpe. & C.M.

King's Tableland (*W. Forsyth*; Oct., 1898).

Previously recorded from Victoria.

Bryum erythropyxis, C.M.

National Park (*W. Forsyth*; Aug., 1898), and La Perouse (July, 1898).

Previously recorded from Hume River (*Miss Campbell*, 1881); Cambewarra (*T. Whitelegge*, 1881).

Bryum (Webera) nutans.

Merritt's Camp, Kosciusko (*W. Forsyth*; Jan., 1899).

Previously recorded from Tasmania, Victoria and New South Wales.*

Rhizogonium, Bridel.

Rhizogonium Novæ-Hollandiæ, Bridel.

Burringbar (*W. Forsyth*; Nov. 5th, 1898).

Previously recorded from Tasmania and Victoria.

Tribe xii. RHACOPILEÆ.

RHACOPILUM, Bridel.

RHACOPILUM CONVOLUTACEUM, C.M.

Jenolan Caves (*H. Malthouse*; Aug., 1898); King's Tableland (*W. Forsyth*; Oct., 1898); Mosman's Bay (*T. Whitelegge*; Sept., 1884).

Previously recorded from Richmond River (Camara); also from Tasmania and Queensland.

Tribe xv. NECKEREÆ.

LEPTODON, Mohr.

LEPTODON SMITHII, Mohr.

Mt. Tomah (*J. H. Maiden*; Nov., 1898); Shoalhaven Gullies (*W. Forsyth*; Sept., 1899).

Previously recorded from New South Wales, but no locality given.

Tribe xvi. SEMATOPHYLLEÆ.

RHAPHIDOSTEGIUM, Schreber.

RHAPHIDOSTEGIUM ACICULA, C.M.

National Park (*W. Forsyth*; July, 1898), La Perouse (July, 1898); Wyong (*A. A. Hamilton*; April, 1899); Cook's River (*Rev. W. W. Watts*; March, 1896); Lord Howe Island (*J. H. Maiden*; April, 1898).

Previously recorded from Victoria.*

RHAPHIDOSTEGIUM LUCIDULOIDES, C.M.

Lane Cove (*W. Forsyth*; July, 1898), National Park (Aug., 1898), Cooper Estate, Woollahra (Aug., 1898); "Near Gordon" (*Rev. W. W. Watts*; Oct., 1895).

Previously recorded from New South Wales,* but no locality given.

RHAPHIDOSTEGIUM PSEUDO-HOMOMALLUM, C.M.

Murwillumbah (*W. Forsyth*; Nov. 3rd, 1898); Richmond River (*Rev. W. W. Watts*; July 7th, 1898); Wyong (*A. A. Hamilton*; April 4th, 1898).

Previously recorded from New South Wales (Homebush; *T. Whitelegge*, 1885).

ACANTHOCLADIUM, Mitten.

ACANTHOCLADIUM EXTENUATUM, Bridel.

Turramurra (*W. Forsyth*; Aug. 14th, 1898); Jenolan Caves (*H. Malthouse*; Aug., 1898).

Previously recorded from Tasmania, Victoria, Queensland*; and New South Wales) Macquarie River (*Ball*).

Tribe xvii. **STEREODONTEÆ.**

ISOPTERYGIUM, Mitten.

ISOPTERYGIUM CANDIDUM, C.M.

Mosman's Bay (*W. Forsyth*; Sept. 17th, 1898); Richmond River (*Rev. W. W. Watts*; Jan. 5th, 1897).

Previously recorded from "Near Sydney" (*Kayser*) and Queensland.*

I have thought it desirable to record these localities, thus making it definite.

ISOPTERYGIUM VIRIDI-PALLIDUS, C.M.

Cooper Estate, Woollahra (*W. Forsyth*; Aug., 1898); La Perouse (July, 1898); Wyong (*A. A. Hamilton*; April, 1899); Richmond River (*Rev. W. W. Watts*).

I can find no previous record.

ECTROPOTHECIUM, Mitten.

ECTROPOTHECIUM UMBILICATUM, C.M.

Ballina (*W. Forsyth*; Oct., 1898); Richmond River (*Rev. W. W. Watts*; May 2nd, 1896).

I cannot find any previous record of this species; probably Queensland.

Tribe xviii. **HYPNEÆ.**

FABRONIA, Raddi.

FABRONIA SCOTTIÆ, C.M.

Como (*E. Cheel*; Nov., 1898); Richmond River, Tentenbar Road (*Rev. W. W. Watts*; Nov., 1896).

Previously recorded from Queensland* and New South Wales (Hunter River; *Mrs. Ford*).

RHYNCHOSTEGIUM, Schimper.

RHYNCHOSTEGIUM TENUIFOLIUM, Hedwig.

National Park (*W. Forsyth*; Aug., 1898); King's Tableland (Oct., 1898).

Previously recorded from Victoria.

BRACHYTHECIUM, Schimper.

BRACHYTHECIUM (HYPNUM) PARADOXUM, Hook. & Wils.

Merritt's Camp, Kosciusko (*W. Forsyth*; Jan., 1899).

Previously recorded from Tasmania and Victoria.

THUIDIUM, Schimper.

THUIDIUM FURFUROSUM, Hook. & Wils.

National Park (*W. Forsyth*; July, 1898); Jenolan (*H. Malthouse*; Aug., 1898).

Previously recorded from Tasmania and Victoria.

THUIDIUM PROTENSULA, C.M.

Burringbar (*W. Forsyth*; Nov. 5th, 1898).

I cannot find any record of this species.

Tribe xix. SKITOPHYLLEÆ.

FISSIDENS, Bridel.

FISSIDENS TENELLUS, Hook. & Wils.

Lane Cove (*W. Forsyth*; Aug., 1898); Richmond River (*Rev. W. W. Watts*; June 22nd, 1896).

Previously recorded from Tasmania and Victoria.

FISSIDENS PALLIDUS, Hook. & Wils.

Mt. Tomah (*J. H. Maiden*; Nov., 1898); National Park (*W. Forsyth*; July, 1898); Richmond River (*Rev. W. W. Watts*; Aug. 4th, 1896); Lawson (*E Betche*; Aug., 1895).

Previously recorded from Tasmania.

FISSIDENS COARCTATUS, C.M.

National Park (*W. Forsyth*; July, 1898); Richmond River (*Rev. W. W. Watts*; June 29th, 1896, and Aug. 1st, 1896).

Previously recorded from New South Wales.*

FISSIDENS LILIPUTANO-INCURVUS, C.M.

Lane Cove (*W. Forsyth*; July, 1898), National Park (July, 1898).

Previously recorded from Victoria.*

FISSIDENS SEMILIMBATUS, Hpe. & C.M.

Lane Cove (*W. Forsyth*; Sept., 1898).

Previously recorded from Tasmania* and Victoria.

FISSIDENS INCURVO-BRYOIDES, C.M.

Rookwood (*E. Cheel*; Aug. 7th, 1898).

I cannot find any record of this species.

Tribe xx. POLYTRICHEÆ.

PSILOPILUM, Bridel.

PSILOPILUM AUSTRALE, Hook. & Wils.

Mt. Kosciusko (*W. Forsyth*; Jan., 1899).

Previously recorded from Tasmania.

Pogonatum, Bridel.

Pogonatum alpinum, Linn.

Mt. Kosciusko (*W. Forsyth*; Jan., 1899).

Previously recorded from Tasmania and Victoria.

Pogonatum australasicum, Hpe. & C.M.

National Park (*W. Forsyth*; 10th Sept., 1898), Burringbar (Nov. 5th, 1898); Lawson (*A. A. Hamilton*; Oct. 15th, 1898).

Previously recorded from Victoria.*

Polytrichum, Dillenius.

Polytrichum juniperinum, Willd.

Mt. Kosciusko (*W. Forsyth*; Jan., 1899).

Previously recorded from Tasmania and Victoria.

CONTRIBUTIONS TO A KNOWLEDGE OF THE AUSTRALIAN CRUSTACEAN FAUNA.

No. ii.—On *Sacculina*, parasitic upon *Pilumnopeus serratifrons*.

By David G. Stead.

The species treated of in this note—*Pilumnopeus serratifrons*, Kinahan—is very abundant in Port Jackson. It is purely a littoral form, and is common on rocky shores, between high- and low-tide marks, wherever there are boulders, under which it seeks concealment. When disturbed, it has the habit of drawing up its legs close to the body and remaining quite still. This enables it often to escape observation entirely, as its dull-coloured body readily assimilates with the surrounding pebbles and *debris*.

In colour, it is subject to a good deal of variation. Though usually of a uniform dark brown (with the exception of the external portion of the propodos of each cheliped, which is of a lighter hue), specimens are occasionally met with of a dirty-white colour, this latter variety being connected with the former by a series of intermediate mottled forms. The colour seems to depend in some measure upon the animal's surroundings.*

The females arrive at maturity at a comparatively early age, specimens of very small proportions being found carrying ova.

Upon an observer's examining a good number of these crabs, he will most likely come across one or two which will at once

---

* This modification of colour to suit surroundings is especially conspicuous in another Port Jackson species—*Leptodius exaratus*—of which there are four varieties, viz., white, red-and-white, black-and-white, and black.

arrest his attention because of the sac-like body—of a yellowish colour—which is to be found attached by a stalk to the sternal aspect of the pleon. This sometimes attracts especial notice, as the parasite is occasionally as large as the body of its host, thereby causing very great inconvenience to the crab when it walks. This parasite is the *Sacculina*, which forms the subject of the present note.

Professor Haswell recorded some years ago, in the Proceedings of this Society,* the occurrence of *Sacculina* on one of our semi-pelagic species—*Nectocarcinus integrifrons*—but, as I shall show, the effect produced in his case is a great deal different from that which I have found in *Pilumnopeus serratifrons*. In *Nectocarcinus*, Prof. Haswell found that only specimens of the male sex were attacked; but in *Pilumnopeus* this state of affairs does not obtain; instead, I find that the parasite appears to be about equally distributed between the two sexes.

A very noticeable feature in connection with this *Sacculina* is, that out of all the specimens of its host which I examined, none were of a large size. From this one would, of course, infer that it has to a great extent (and to a greater extent as it—the parasite—becomes larger) the effect of arresting any further development of the crab which it has attacked. In one case I found the most unusual occurrence of two specimens of *Sacculina* having attacked the same individual. They were both of the same size, and were attached side by side.

Both male and female pleons consist of 7 movable segments, the only difference being that in the female this portion is considerably wider than that of the male.

Quite contrary to my expectations, neither the pleons nor the abdominal appendages of either sex are in any way affected by the parasites. This in itself stamps the present case as being considerably different from that memorable one described by Prof. A. Giard† and the before-mentioned case of *Nectocarcinus integ-*

---

† P.L.S.N.S.W. (2), Vol. ii., 1888.

‡ Parasitic castration and its influence upon the male sex in the Decapod Crustacea." Ann. Mag. Nat. Hist. (5), Vol. xix. pp. 325-345, 1887.

rifrons as recorded by Prof. Haswell. Prof. Giard, in speaking of a *Sacculina* parasitic upon *Stenorhynchus phalangium*, says:— "In the infested females the influence of the parasite . . . . betrays itself externally by a profound modification of the 4 pairs of ovigerous feet. These are very inferior in size to the normal state."

As before stated, in the present case no such modifications as the foregoing have taken place.

In some specimens there was a slight difference in the form of the pleon. This unimportant difference, consisting as it did of a slight narrowing, could not in any way be attributed to the parasite, as the same could be found in specimens which had not been attacked by the *Sacculina*.

As would be expected, it is quite evident that the parasites prevent their hosts from reproducing their young, as no signs of ova were to be seen on attacked females, although at the time that I procured my specimens it was the breeding season, and many *ovigerous* females could be found roundabout.

As will be seen by referring to the following 12 examples taken indiscriminately, the parasites do not always attack the same part of the pleon, nor do they favour especially either sex.

Sex.	*Diam.*	*Situation of Sacculina.*
♀ ...	11 mm. ...	On right side of intestinal canal under 3rd segm. (Same width as host.)
♂ ...	11 ,, ...	On right side of intestinal canal under 5th segm.
♀ ...	5 ,, ...	Middle of intest. canal under 3rd segm.
♀ ...	8 ,, ...	,, ,, ,, ,, 4th ,,
♀ ...	8 ,, ...	,, ,, ,, ,, 4th ,,
♂ ...	— ,, ...	This *had been* attached to the junction of pleon and pereion, but had been dislodged—whether by its host or accident, I know not—before the crab came into my possession.
♀ ...	1 ,, ...	On left side of intest. canal under 4th segm.
♀ ...	6 ,, } 6 ,, } ...	Both together on the middle of intest. canal under 3rd segm. These two *Sacculinæ*—as larvæ—must have gone "hand-in-hand," as they were both attached to same spot, and were also of the same size.

Sex.	*Diam.*	*Situation of Sacculina.*
♀ ...	6 mm. ..	Middle of intest. canal under 3rd segm.
♂ ...	7 ,, ...	,, ,, ,, ,, 3rd ,,
♂ ...	1	On left side of intest. canal nnder 4th segm.
♂ ...	1 ,, ...	Middle ,, ,, ,, ,, 5th ,,

Though quite able to reach it with their chelæ, the crabs never seem to interfere with the *Sacculina*, apparently regarding it as a part of themselves. Only by repeatedly wounding the parasites, have I succeeded in making their hosts interfere with them, and in one instance the crab pulled so hard that he completely dislodged the *Sacculina*, thus showing that, in some instances at least, it would be possible for the crab to remove the parasite, if driven to it either by irritation or any other cause.

ON THE REPRODUCTIVE SYSTEM OF *DIGASTER (DIDYMOGASTER) SYLVATICUS*, FLETCH.

BY SARAH O. BRENNAN, M.A., B.SC.

(From the Biological Laboratory of Sydney University.)

(Plates liii.-liv.)

The present paper contains an account of the reproductive organs of the above-mentioned Earthworm, based on dissections and serial sections, and is to be regarded, so far as concerns this system of parts, as supplementary to the account given by Mr. J. J. Fletcher in his diagnosis of the genus, published in the Proceedings of this Society for the year 1886.*

Female organs.—My observations on the female organs are in complete agreement with those of Fletcher as described by him. They comprise a pair of ovaries, a pair of oviducts, and three pairs of spermathecæ.

(a) *Ovaries*—The two ovaries (fig. 1, *ov.*) are attached to the anterior septum of segment xiii., and hang freely from it into the cœlom. In the mature worm the free end of each ovary is frayed out into a number of processes consisting of strings of ova in different stages of development. The mature ovum measures in diameter about ·08 mm., is spherical in shape and invested by a definite membrane. Its nucleus is placed excentrically, and contains a deeply-staining nucleolus. In young females the ovaries resemble the testes in shape. Egg-sacs are not present.

* Fletcher, J. J. Notes on Australian Earthworms, Part i. P.L.S.N.S.W. (2) i. 1886, p. 554.

(b) *Oviducts.*—The oviducts are a pair of short ciliated tubes with muscular walls, whose swollen ciliated funnels (fig. 1, *f.o.*) open in the hinder part of segment xiii. After perforating the mesentery between segments xiii.-xiv., the tubes pass obliquely downwards and backwards through the body wall to open by the small oviducal pores (fig. 2 *op. o.*) situated, one on either side of the mid line, in segment xiv.

In one specimen examined, in addition to normal ovaries and oviducts in the usual position, there is present an extra complete oviduct (fig. 3, *o'.*) on the left side in segment xii. This perforates the mesentery between segments xii., and xiii., and opens to the exterior in the latter segment. An extra ovary was not observed. So far as I can learn from recorded cases of variation* in the reproductive system of Oligochætes, the present appears to be the only case on record in which an extra oviduct has been found unassociated with a corresponding ovary.

(c) *Spermathecæ.*—There are, as Fletcher† describes, "three pairs of somewhat rounded or pyriform spermathecæ, a pair in each of segments vii.-ix., and of which the posterior pair are sometimes the larger" (fig. 1, *sp.' sp.'' sp.'''*). Each spermatheca is furnished antero-ventrally with a small pear-shaped diverticulum, the stalk of which is connected with the duct of the spermatheca. Their ducts, which are comparatively large and muscular, run backwards in the body wall to open "to the exterior two segments behind those which contain the spermathecæ to which they belong," viz., on segments ix., x., and xi. The spermathecal pouches are lined by a single layer of tall columnar non-ciliated cells and do not contain spermatozoa. Their ducts are lined by an epithelium, which is not the same throughout its extent. For about one-third of the thickness of the body wall the lining consists merely of invaginated epidermis differing in no way from that of the outer surface of the body. Over the

* W. Bateson. Materials for the Study of Variation, pp. 160-165.

† *Loc. cit.*, p. 558.

remainder of the duct the lining consists of tall narrow columnar cells, whose ends, bordering on the lumen of the duct, stain lightly, while the main portions of the cells, especially their inner ends, stain very deeply. The diverticulum differs considerably in its histological character from the pouch itself. The lumen of its narrow stalk is essentially similar to that of the main duct, though the cells are smaller, while the interior of the diverticulum is lined by an irregularly-ridged epithelium with bundles of spermatozoa attached between the ridges. The muscular investment of the diverticulum further is much thicker than that of the main pouch. In a young specimen 32 mm. in length (preserved) the spermathecæ are represented by simple invaginations of the epidermis ·3 mm. in length, extending to about the middle of the thickness of the body wall.

Male organs.—These comprise two pairs of testes (fig. 1, *a.t.*, *p.t.*); two pairs of funnels (*a.r.*, *p.r.*) leading into a pair of vasa deferentia (*v.d.*); two pairs of lateral seminal vesicles (anterior and posterior, *a.s.s.*, *p.s.s.*); two median sperm reservoirs (*a.s.r.*, *p.s.r.*) occupying a segment each; and a pair of bilobed spermiducal (prostate) glands (*sp.g.*).

Following Hensen's terminology in use at the time Fletcher wrote his account, the median sperm reservoirs and the seminal vesicles are described as the testes, and as a consequence the true testes were not observed.

(a) *Testes.*—The two pairs of testes (*a.t.*, *p.t.*) are situated in segments x. and xi. Each is a somewhat pear-shaped body, attached by its broader end to the anterior septum of the segment. Opposite the testes, and situated in the posterior portion of the segments, are the rosettes (*a.r.*, *p.r.*) of the vasa deferentia, whose ciliated lips are very greatly folded. The duct from the anterior rosette of each side is joined by the duct from the posterior rosette about the middle of segment xii., (fig. 1, *v.d.u.*), thence the vas deferens (*v.d.*) passes back as a straight, exceedingly slender tube (·019 mm. in diameter) lying below the cœlomic peritoneum and partially embedded in the musculature of the body wall. At its posterior end it penetrates the base of the prostate gland and joins the main muscular duct of the latter at the point where it, just formed by the union of several small ducts, is about to enter the body wall. The short conjoint ducts open by two slit-like pores situated on prominent papillæ on segment xviii.

In the immature specimen already referred to, the vasa deferentia are in an exceedingly interesting condition. The two ducts from the anterior and posterior rosettes of each side, instead of uniting in segment xii., remain distinct throughout their entire course. On the one side they appear to join the duct of the prostate separately, while on the other appearances suggest that the two ducts unite before entering the common duct. There are thus present in this young specimen two distinct pairs of vasa deferentia. Whether the single vas deferens of each side in the adult arises through fusion of the two ducts present in the young, or whether one of the two primitive ducts disappears, future investigation must decide. In this connection it is worthy of note that according to Beddard* in embryos of *Octochætus* there are at first traces of four genital ducts in correspondence with the four gonads (there being in those embryos an additional pair of ovaries in segment xii.).

(b) *Sperm reservoirs.*—In segments x. and xi. the anterior and posterior testes and rosettes, together with the ventral nerve cord and the ventral vessel, are enclosed in two medianly situated special compartments of the cœlom functioning as sperm reservoirs. In fig. 1 the right side halves of the reservoirs are shown intact (*a.s.r.*, *p.s.r.*), while on the left they have been opened to expose the contained organs. The cavity of each reservoir is undivided, and contains numbers of developing sperms (fig. 2).

(c) *Seminal vesicles.*—Into the reservoirs there open the seminal vesicles or sperm sacs, of which there are two pairs, situated in segments ix. and xii. The anterior vesicles (*a.s.s.*) are

* Beddard, F. E. A Monograph of the Order of Oligochæta, p. 104.

outgrowths of the posterior septum of segment ix., the posterior (*p.s.s.*) are outgrowths of the anterior septum of segment xii. They are comparatively large, smooth, white bodies, which are prolonged into finger-shaped processes, terminating in whip-like extremities. The cavity of each is divided up into a series of inter-communicating compartments in which developing sperms also occur. The fully developed sperms, with an average length of ·07 mm., become attached in bundles by their heads to the ciliated epithelium of the rosettes. In the immature specimen the sperm reservoirs have already attained the adult condition, while the seminal vesicles are represented by small digitiform outgrowths of the septa.

(d) *Spermiducal (Prostate) glands.*—These are, as Fletcher describes, a pair of large flattened bilobed masses situated in segment xviii., and confined to that segment (fig. 1, *sp.g.*). The lobes are invested by peritoneum and are richly supplied with blood vessels. They present the usual structure, *i.e.*, the finer ductules into which open the large glandular cells unite to form larger ducts, and these eventually unite to form a single main duct. This latter, directly after its formation, penetrates the body wall and opens to the exterior on a prominent papilla on the ventral surface of segment xviii. All the ducts are lined by a low columnar epithelium. There do not appear to be any specialised genital or penial setæ in the neighbourhood of the spermiducal apertures. The base of the anterior lobe of each gland is traversed by the vas deferens, which, as already mentioned, opens into the main duct just after its formation.

In the before-mentioned immature specimen the prostate is represented by the common duct, from which sprout out a small number of slightly-branched blindly-ending tubes lined by columnar epithelium. There is as yet no trace of the proper prostatic cells.

Clitellum.—The clitellum extends from segment xiii. or xiv. to xviii. Histologically it presents no features of special interest.

EXPLANATION OF PLATES.

Reference letters.

a.r. Anterior rosette. *a.s.r.* Anterior median sperm reservoir. *a.s.s.* Anterior sperm sac. *a.t.* Anterior testis. *clit.* Clitellum. *f.o.* Funnel of oviduct. *mes.* ix.-x. Mesentery between segments ix.-x. *neph.* Nephridium. *o.* Oviduct. *o.'* Extra oviduct. *op.o.* Opening of oviduct. *op.o.'* Opening of extra oviduct. *ov.* Ovary. *p.r.* Posterior rosette. *p.s.r.* Posterior sperm reservoir. *p.s.s.* Posterior sperm sac. *p.t.* Posterior testis. *sp.' sp.'' sp.'''* First, second and third spermathecæ. *sp.g.* Spermiducal glands. *v.d.* Vas deferens. *v.d.u.* Point of union of the two vasa deferentia. *v.n.c.* Ventral nerve cord.

Plate liii.

Digaster (Didymogaster) sylvaticus.

Fig. 1.—Dissection of the reproductive organs. The left halves of the sperm reservoirs have been removed, exposing the testes and ciliated rosettes of the left side. (×3).

Plate liv.

Digaster (Didymogaster) sylvaticus.

Fig. 2.—Longitudinal section passing to one side of median line and including segments ix.-xiv. (×13½).

Fig. 3.—Longitudinal section showing presence of extra oviduct. *o.'* (×42).

NOTES AND EXHIBITS.

Mr. Steel exhibited specimens of a kind of cigar from Fiji, where it is called *seluka*, made by wrapping sun-dried raw tobacco loosely in a piece of dried plantain leaf.

Mr. Maiden exhibited a fresh flower of *Dendrobium undulatum* var. *Woodfordianum* in illustration of his paper.

Mr. Forsyth exhibited a collection of twenty of the most interesting Mosses recorded in his paper.

Mr. R. Greig Smith showed a series of microphotographs of the nodule organism of the Leguminosæ to illustrate his paper.

Mr. Stead exhibited preparations of the Crustacean *Pilumnopeus serratifrons*, and numerous specimens of an undetermined Nematode from the stomachs of Jew-fishes *(Sciæna antarctica)*, with the following Note thereon :—

Upon examining a large number of Jew-fishes recently, I was extremely surprised to find that a great percentage of the stomachs did not contain anything in the shape of food. In many cases, also, this organ was completely everted, and hung out of the mouth like a huge tongue. Of those that contained food, the contents consisted of crustaceans (mostly Squillæ) and fishes, chiefly the former. From most of the foodless stomachs, and from a few of the others, I obtained the Nematodes exhibited. The occurrence of so many empty stomachs would lead one to assume that these fishes vomit their food upon being caught.

Mr. Froggatt exhibited specimens of (1) a new "plague-locust" (*Pachytylus* sp.) very numerous and destructive at present in the south-western districts of the Colony, different from and smaller than the well-known depredator *P. australis*, and the ovipositing females of which are attended in a remarkable manner by numerous males: (2) the large composite woody galls of *Brachyscelis fletcheri*, Oll., so numerous on a large Eucalypt (*E. melliodora*) near Wagga as to threaten its destruction: and (3) the foliage of a Eucalypt from Mittagong showing abundant formation of manna after the operations of the phytophagous larvæ of a Chrysomelid beetle (*Paropsis reticulata*), living examples of which were also shown.

[Printed off April 4th, 1900.]

F. Cunninghame & Co., Printers, 146 Pitt Street

INDEX.

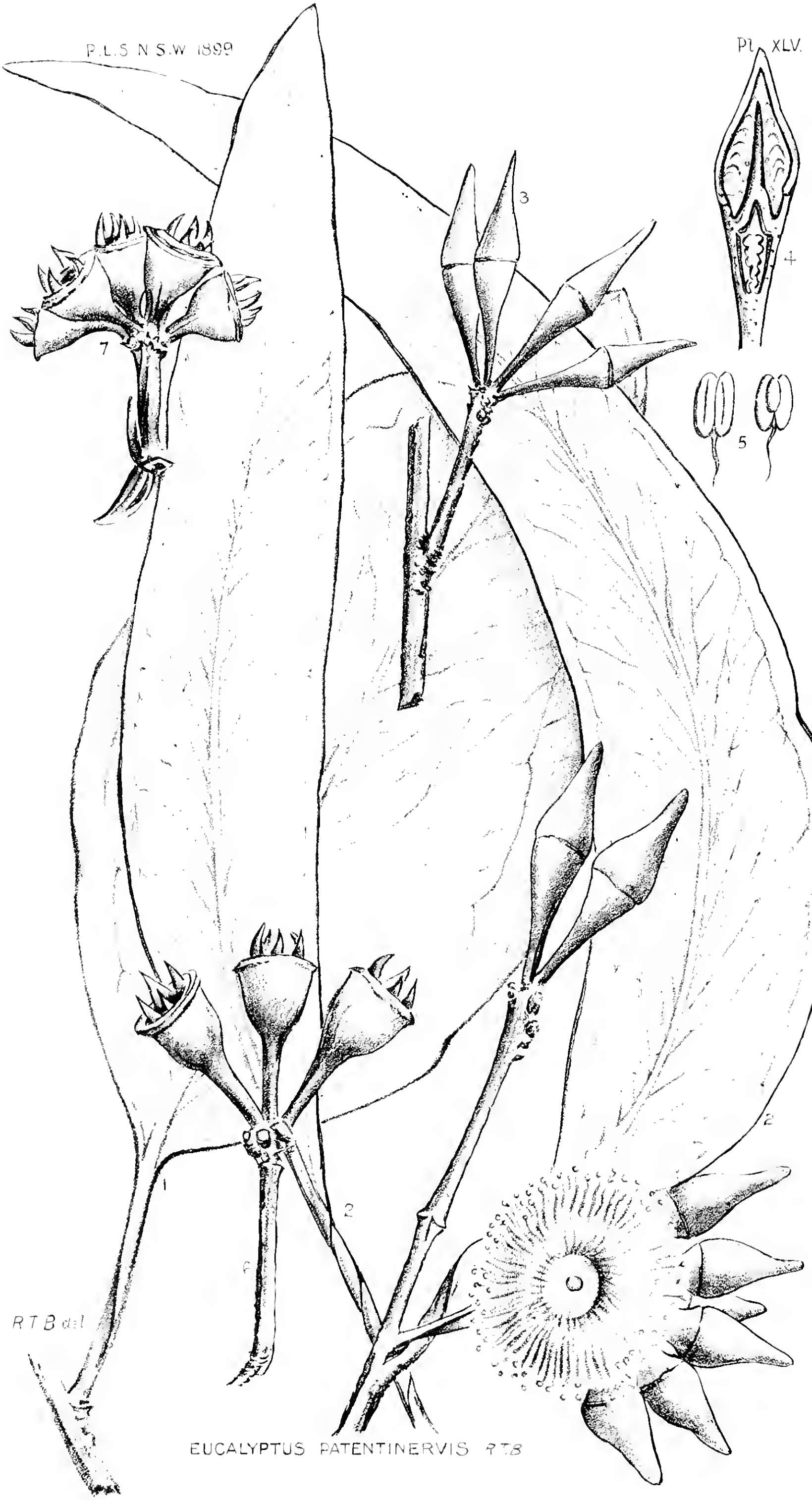
(1899.)

Names in Italics are synonyms.

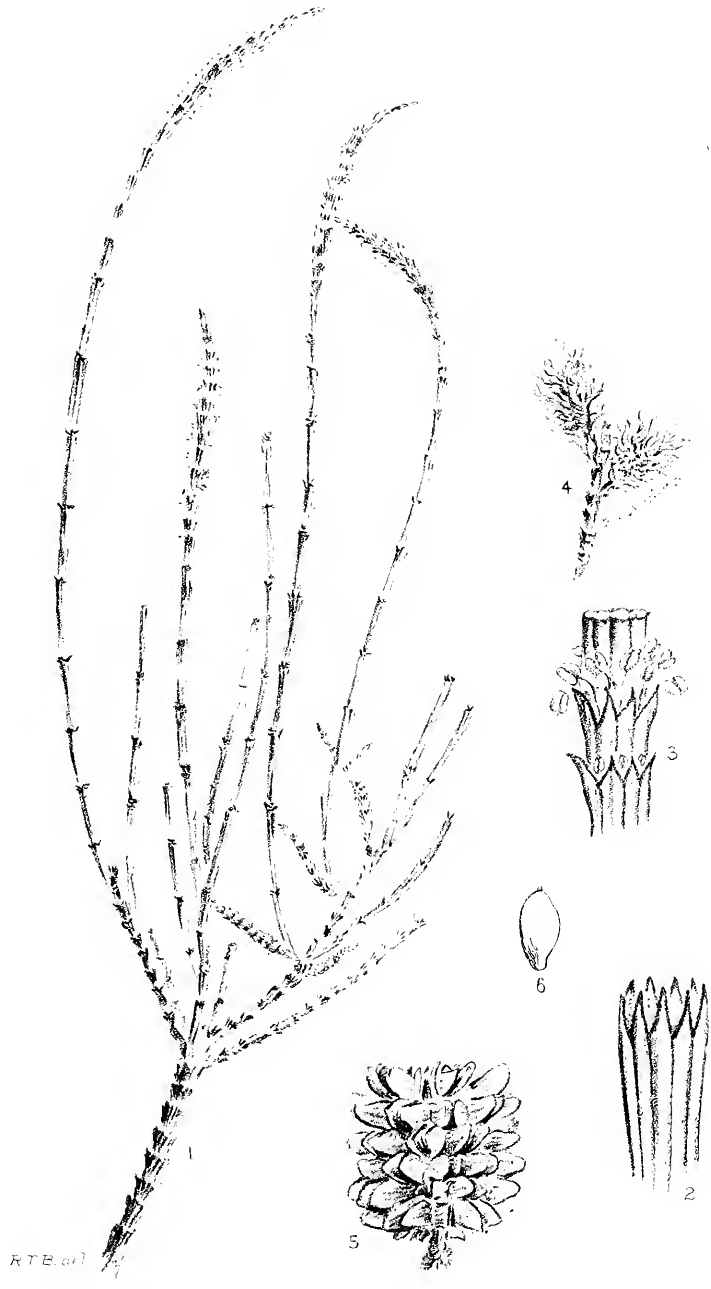
[Printed off April 4th, 1900.]

R.T.B. del.

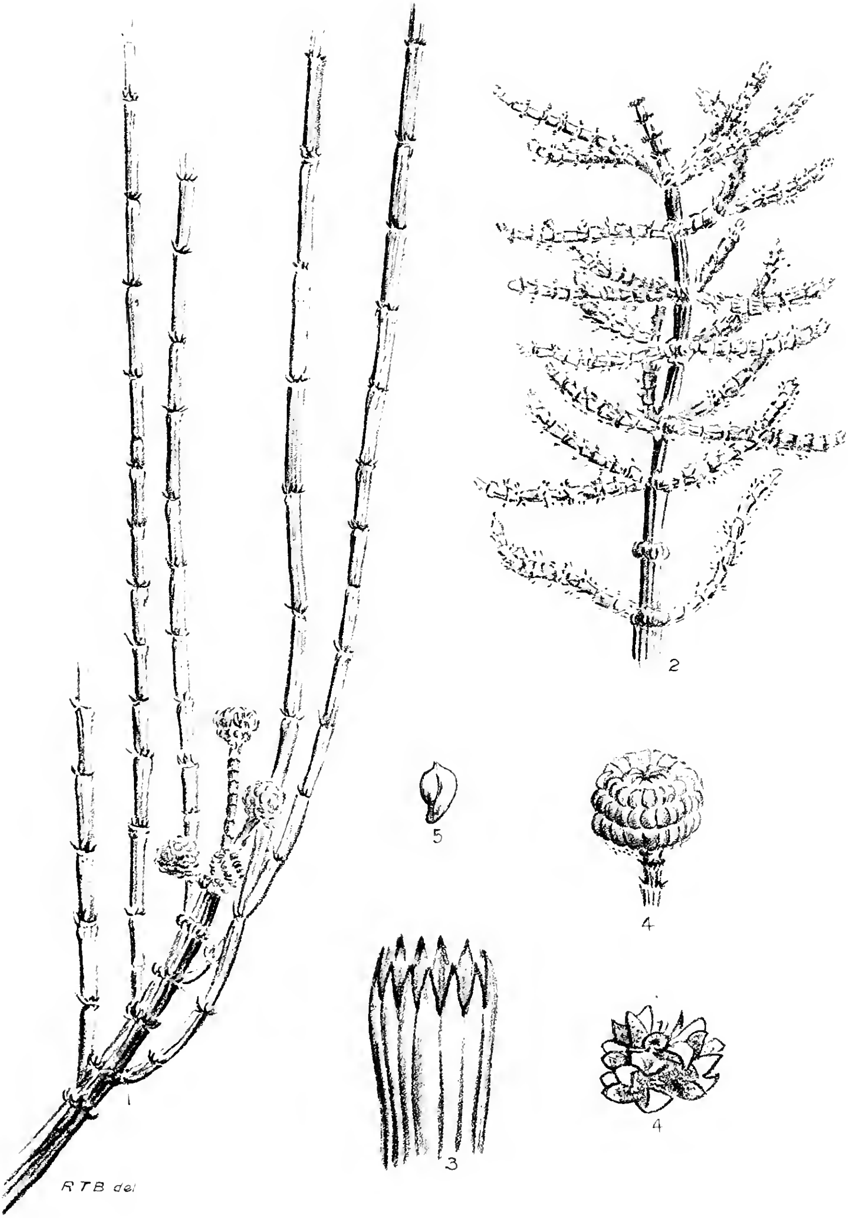
EUCALYPTUS MACULOSA, R.T.B.



EUCALYPTUS PATENTINERVIS R.T.B.



"BELAH"
CASUARINA CAMBAGEI, R.T.B.



BULL OAK

CASUARINA LUEHMANNI, R.T.B.

E. CONICA E. SQUAMOSA (Figs 4-5)

EUCALYPTUS AGGREGATA, D.& M.

E. NOVA-ANGLICA

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RHIZOBIUM LEGUMINOSARUM.

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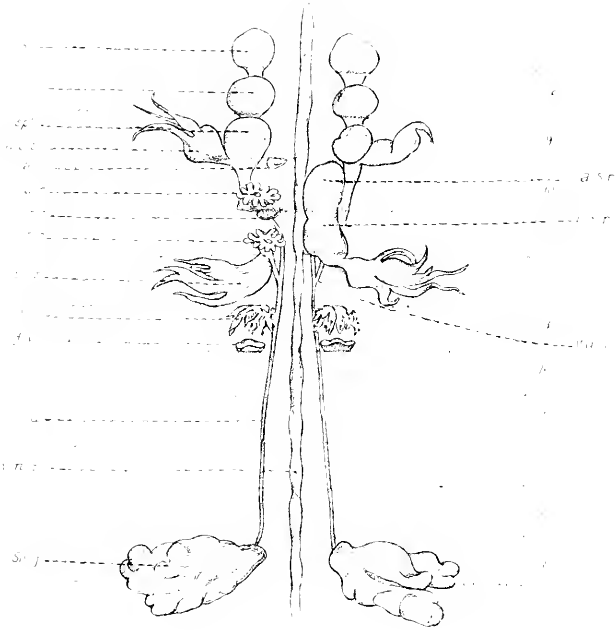
RHIZOBIUM LEGUMINOSARUM.



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Issued August 8th, 1899.

Vol. XXIV.
Part 1.

No. 93.

THE

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,, ,, ,,	Part 3	...	...	1	0	0
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PROCEEDINGS, 1898, PART 1.

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Issued October 10th, 1899.

Vol. XXIV.
Part 2.

No. 94.

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OF THE

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FOR THE YEAR

1899.

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Previous to Mr. Man's Ethnological researches in the Andaman Islands, Major-General Lane-Fox had also remarked* on the close resemblance this "particular mode of covering the head and parts of the face with white when in mourning, *Og-da*," bore to the Australian custom. It is not the only resemblance the Andamanese bear to our Aborigines.

It was my intention to have made some remarks on the use of black as a sign of mourning amongst the Australian Indigenes, but the present subject has extended beyond the limits I at first contemplated.

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* Journ. Anthrop. Inst., 1878, vii. p. 445.

[Printed off 7th October, 1899.]

PROCEEDINGS, 1899, PART 2.

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Note.—By an oversight the first line on p. 4 of the cover of the first Part of this Volume appears as Proceedings, 1898, Part 4, instead of 1899, Part 1.

Also the last 6 plates in this Part should have been lettered xxvi.-xxxi. instead of xxv.-xxx.

Issued December 9th, 1899.

Vol. XXV.
Part 3.

No. 95.

THE

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FOR THE YEAR

1899.

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Proceedings for 1890, Vol. V.	—Part 1	... ...	0	11	0
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P. nigrita, Chp.—This species belongs to subgroup i. The description does not indicate the characters necessary for that determination, but I have recently obtained a specimen from Chapuis' locality (S. Australia) which is evidently his insect. In my tabulation (P.L.S N.S.W., 1898) the name should stand on p. 226 under "B. General colour black or brassy or bluish-black," but as my specimen is a female I cannot say whether it belongs to the aggregate "C" or "CC." It, however, differs, *inter alia*, from *irina* by its very much finer elytral series of punctures, from *circumdata* and *subseriata* by the very much closer puncturation of its elytral interstices, and from all three by its much greater convexity and entirely black colouring (except the under surface of its tarsi and of the base of the antennæ).

P. cassidoides, Boisd., *punctulata*, Boisd., *testacea*, Oliv., and *vicina*, Boisd.—The descriptions of these are such that it is impossible to connect them with any insect unless the types could be examined.

P. ustulata, Oliv.—This is in almost the same condition of uncertainty as the preceding four. The description of the colours, however, suggests the possibility of its being founded on a variety of the insect that Germar described as *P. suturalis*. This is little more than a guess, but varieties of *suturalis* are the only *Paropses* I have seen agreeing with the colours attributed to *ustulata*.

P. æmula, Chp., *mitis*, Chp., *maculicollis*, Clk., and *venusta*, Er. All these are names that I cannot associate with any insect, and the descriptions do not furnish the necessary information for placing them in my subgroups. All are small species (long. $2\frac{1}{2}$ lines or less) and they appear to me likely to be members of my subgroup iv.

In dealing with Group vi. I have enumerated 191 names which have been applied to its species. Of these I have recognised and tabulated 133 as representing valid species known to me, have indicated 32 as more or less certainly synonyms, and have been unable to furnish definite information concerning 26. The species of my own naming are 42.

[Printed off December 6th, 1899.]

PROCEEDINGS, 1899, PART 3.

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Note.—As two Plates in the last Part are lettered xxv., there is no Plate xxxi. in this Part.

Issued April 7th, 1900.

Vol. XXIV. Part 4.

No. 96.

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