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# THE AUSTRALIAN NATURALIST

THE JOURNAL OF THE NATURALISTS' SOCIETY  
OF NEW SOUTH WALES

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# The Australian Naturalist

Vol. X.

APRIL, 1937.

Part 1.

WALTER WILSON FROGGATT, F.R.Z.S., 1858-1937.

## PASSING OF A GREAT PIONEER NATURALIST.

The year 1937 will be a memorable one—in a melancholy sort of way—in the annals of the Naturalists' Society of New South Wales, because of the death of our old friend and President, Walter Wilson Froggatt, who was one of our principal founders, and who had occupied the presidential chair for so many years past that he had come to be regarded and venerated by members, rather as a kind of patriarch, than as an official head of our organisation. His death occurred at his home at Croydon, New South Wales, on Thursday, March 18, after a comparatively short illness, in the 79th year of his age.

But, noteworthy as this sad event is to the Naturalists' Society, it possesses a much wider national, and even international significance, because, by the passing of Froggatt, a great link with the pioneering days of economic entomology, as well as of general scientific endeavour in Australia, has been sundered. For, apart altogether from his great work in Australia as a general field naturalist, this distinguished nature student was world famous for his great and long-continued researches, and for the vast volume of his published works, in agricultural and forest entomology. In descriptive work, too, his labours were immense, and so we have it, on the authority of Anthony Musgrave, in his "Bibliography of Australian Entomology", 1775-1930 (p. 101), that Froggatt "produced more papers on Australian insects than any other worker".

**INFLUENCE OF NATURALISTS' SOCIETY.**—We may return to a brief consideration of his life work in science a little later, but here, I would like to refer specially to the genesis of this Naturalists' Society, with whose fortunes and development our late President was so closely connected, during its lifetime of close on 37 years since its foundation.

Here, perhaps, I may interpolate with all humility, that it appears to me to be particularly fitting that I should have the privilege of recording these facts, for I was associated with Froggatt and others of the older naturalists in our early formative days, and was witness to the splendid work put in by them in creating an organisation, which, despite its unassuming and modest conduct at all times, has proved to be a veritable power in helping to shape the thoughts, and even the destinies of many of Australia's scientific workers and thinkers to-day, and during its career. In that, too, I claim to be not merely a witness, but may speak as one who gained greatly at all times, spiritually and mentally, from my own association with this Society, which was founded with just such a purpose in view, with the love of wild Nature paramount, the desire to broadcast a knowledge and understanding of natural history in Australia, and the wish to create a happy meeting ground for our field naturalists.

None, familiar with the course of our development and history, will deny that the aims of our founders have been well met; while the spread of knowledge through the activities of the Society, and the mutual enjoyment of members in its excursions and meetings and the other functions of the organisation, have abundantly justified the hopes which were expressed at the foundation meetings, in August of 1900. Looking along the years one sees a whole cavalcade—largely of youth—coming into the ambit of the Society's influence and work; while, all through it, there looms up the figure of Froggatt—guide, friend and philosopher, as he appeared to so many, and the most continuously consistent supporter and guardian of the Society since its inception. Not that there have been wanting many other great figures in our history; but it would be unfair to Froggatt's memory not to single him out in the way indicated.

A GALAXY OF NATURALISTS.—By a strange coincidence we have recorded in this same issue of our journal a biographical note concerning another naturalist—A. H. S. Lucas—the first President of this organisation, who also recently died. This passing of both Froggatt and Lucas leaves only three remaining members of the original Council of the New South Wales Naturalists' Club, as we first called it—Professor James P. Hill, of London University, Dr. G. A. Waterhouse, the leading authority on the Butterflies of Australia, and myself. This first Council included





WALTER W. FROGGATT, F.R.Z.S.

quite a galaxy of naturalists among its members, elected at the formative meeting, held in the Science Room, at the Sydney Grammar School, on August 13, 1900. Among these, in addition to Froggatt, Waterhouse, Hill and Lucas, there were such veterans as Thomas Whitelegge, Thomas Steel, Charles Hedley, and W. J. Rainbow; while, very soon, many famous naturalists were attracted, in a spirit of mutual helpfulness, to our banner; and these contributed in no small measure to the edification and recreative enjoyment of that legion of beginners and general field naturalists which has accompanied us at various times during our interesting and useful history.

Froggatt, himself, recently contributed to the columns of this journal, a short history of the Naturalists' Society, which I commend to the attention of our members and friends. Part 1 of this necessarily brief account was published in January, and Part 2 in May, of last year. There are many outstanding incidents in our history which I would like to deal with myself, in a number of which our late President was concerned; but I feel that I must limit myself more particularly to the personal side in this place. I cannot pass from this general discussion, however, without referring particularly to the mark set upon so many of our naturalist students, collectors and teachers—both of schools and universities in Australia—by their association with the friendly and helpful work and advice of the Naturalists' Society, or because of the outlet which it gave to them during the earlier developmental period of their own particular studies. Many of these members, now widely scattered, have told me personally, or have stated, before our meetings, or in the course of our correspondence over many years past, of this helpfulness and of the joy experienced in their association with our meetings and discussions. The knowledge of this widespread appreciation greatly inspired our late President in his efforts for the Society's welfare at all times, and brought him much happiness in the later days of his life.

**FROGGATT'S VARIED LIFE.**—Walter Wilson Froggatt was born on June 13, 1858, in Melbourne, Victoria. His father was George W. Froggatt, a mining expert. He received a general education at the Corporate High School in Bendigo, Victoria. His interest in Mother Nature showed itself at an early age. Because of ill health he was sent to the country, and spent some years on the land in the north-west of Victoria. Later he tried his luck on the goldfields.

He devoted his leisure to the study of insects mainly, and this led to his meeting with Baron Ferdinand von Mueller, who was then Government Botanist in Melbourne. In the year 1880, at the age of 22, he made entomological and other collections at the Mount Brown Goldfield, in the Grey Ranges, on the border between New South Wales and South Australia, and a little later, in 1882, he collected on the Flinders River in Queensland. The knowledge of the Australian bush which Froggatt gained during these and later years was of incalculable value to him later on in life in dealing with many of his economic problems in entomological research. In these years, also, he founded his great love of our trees and flowers, and birds, which, while adding so much to his ultimate knowledge, helped him to remain young, and made him such a useful aid in the building up of other field naturalists.

In 1885, when the Australian States (or colonies as they were then called) voted money to the Royal Geographical Society of New South Wales to enable a scientific expedition to be sent to New Guinea, Froggatt was appointed Assistant Zoologist and Entomologist, on the recommendation of Baron von Mueller. Returning to Sydney on December 4 of the same year, Sir William Macleay offered him the position of collector for Sir William's private museum—which ultimately became known as the Macleay Museum, now at the University of Sydney—and in 1886 he collected for this museum at Cairns, Russell River, Daintree and Mossman Rivers in North Queensland. In 1887 and 1888 he collected for the Macleay Museum in the north-west Kimberley district, at Derby, the Barrier Range, Lennard and Fitzroy Rivers. Later, Froggatt visited England, and on his return was placed in charge of the Macleay Museum, until it was removed to the University. In 1891 he was appointed a collector to the Technological Museum in Sydney, and five years later was appointed to the post of Government Entomologist, in the Department of Agriculture—in which position he became world famous.

INVESTIGATIONS ABROAD.—During 1907 and 1908 Froggatt made a world tour of investigation, inquiring into insect pests in general and the Fruit Fly in particular, on behalf of New South Wales, Victoria, South Australia, and Queensland. During this work he visited many places in America, Europe, Africa and Asia. In 1909 he also made investigations into Coconut Palm pests in the Solomon Islands for Lever's Pacific Plantations, by arrangement with Gov-

ernment, and in 1913 investigated the Palm Leaf Beetle for the French Planters' Association. In 1923 he retired from his position of Government Entomologist, but was appointed by the New South Wales Forestry Commission as Forest Entomologist; a position which he held for four years. While occupying this post he particularly investigated timber borer and other timber pests. In 1927 he disposed of his collection of insects to the Australian Commonwealth Government, and it is now housed at Canberra, the Federal Capital. Though he retired from official work in 1927, his life work did not cease, and the last ten years were full of activity and interest. During this latter period he has contributed many popular articles to newspapers and to scientific magazines, and has frequently lectured on one or other of his natural history and allied subjects.

FROGGATT'S PUBLISHED WORKS.—Members of the Naturalists' Society, and others interested, are specially referred to Musgrave's long list of Froggatt's books and papers, published in the "Bibliography of Australian Entomology", before referred to, as it is quite impracticable here to deal with these at any length. An examination of the list will reveal the wide scope of Froggatt's work in both economic and systematic entomology, as well as in other directions in the study of animated nature. Here, I may mention specially, his great book, "Australian Insects", 1907, "Some Useful Australian Birds", 1921, "Forest Insects of Australia", 1923, "Forest Insects and Timber Borers", 1927, "The Insect Book", 1933, and the useful little book on Spiders and their relatives, the Ticks and Scorpions, published recently by the Royal Zoological Society of New South Wales.

SOME ORGANISATIONAL ACTIVITIES.—Froggatt's mental activity and love of Nature stimulated him to a great interest in various organisations associated with science, and the great outdoors. He was a member of long-standing in the Royal Society of New South Wales and the Linnean Society of New South Wales—of which he was a councillor and past-president—a past-president of the Royal Zoological Society of New South Wales, a councillor of the Royal Australian Historical Society and of the Australian National Research Council. He was one of the founders of the Australian Wattle League, and one of its principal supporters throughout its career. He was also a co-founder of the Gould League of Bird Lovers and of the Wild Life Preservation Society of Australia, and, for a number of

years past, a member of the Council of the Australian Forest League.

Mention of the Forest League reminds me, that I must not dismiss this short account of our late President, without mentioning his intense interest in the bushlands, and their preservation, and his love for the propagation and cultivation of our native trees and shrubs. Many, many trees have been planted as a result of his activities in this direction, and right up to the time of his death he had a large number of seedling trees and shrubs growing in preparation for planting out at Ball's Head and other places during the 1937 season.—DAVID G. STEAD.

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ARTHUR HENRY SHAKESPEARE LUCAS, M.A.  
(Oxon. and Melb.)

---

Born May 7, 1853. Died June 10, 1936.

A botanist and geologist by heredity, a mathematician, physicist and chemist by education, a zoologist in the widest sense by self-training and love of nature, a linguist with a marvellous aptitude for the acquisition of tongues; Lucas was the most learned man and the greatest teacher I have known.

The son of the Rev. Samuel Lucas, F.G.S., a Wesleyan minister with a strong interest in natural science, whose calling took him over the greater part of England, holding short tenancies in various towns, Arthur Lucas readily imbibed a love of nature that never left him. So deeply had he drunk at this fount and so thorough was this early training, that, when a medical student in London, he won the gold medal, awarded for botany by the Apothecaries' Society. (N.B.—The great T. H. Huxley achieved only the bronze medal in his day.)

From his father, too, he learned geology—not from books, but from constant field observation and in ardent fossil hunting—especially in the Lias strata, near Stow-on-the-Wold. Small wonder was it that with this upbringing he took to school life like a duck to water, and in his seven years at the New Kingswood School, Bath, he rose to be head boy and the winner of an exhibition to Baliol College, Oxford. This was awarded annually to the leading boys in the Senior Oxford Local Examination in all England. At Oxford he came under the notice of the famous Jowett,

and, obtaining a first-class in Mods Mathematics, had an unfortunate illness that interfered with his finals—being allowed a special honour degree. In order to show his mettle, he took a post-graduate course and won the open University prize—the Burdett-Coutts—against all-comers. He then entered on a medical course in London, but when half-way through this he sacrificed career and medical ambition, in order to bring financial aid to his family. His father was dead, his older brother, a practising doctor in London, first lost his wife, and then his health, and was ordered abroad. He sailed to Australia, leaving three young children to the care of Arthur, who promptly accepted an appointment as mathematical and science master at the Leys School, Cambridge. Here he introduced the subject of nature study, founded a Natural History Society and a Museum to which he presented the valuable collection of fossils, inherited from his father. In 1883 he came out to Wesley College, Melbourne, as mathematics and science master, and later became tutor and natural science lecturer at Trinity, Ormond and Queen's Colleges, of Melbourne University. In Melbourne, as also subsequently in Sydney, he was a founder and president of the Field Naturalists' Club, taking an active part in botanical and zoological research. During this period he published papers on the lizards of Australia and wrote the well known "Introduction to Botany", in conjunction with Professor Dendy. From 1893 to 1898 he was headmaster of Newington College, Sydney, a position he resigned to become mathematics and science master of the Sydney Grammar School. Here for 25 years—as headmaster during the later years—he achieved a memorable series of scholastic triumphs. An inquiry into his prodigious range of learning disclosed the fact that his personal pupils won the medals given for supremacy in the senior University examinations in thirteen different subjects. As a side-line he took the lectures in geology and physiography at the Sydney University during the absence of Professor David. To most men retirement from active work at the age of 70 would be welcome. It was, however, characteristic of Lucas that he should accept a turn as acting-professor of mathematics at the University of Tasmania. In November, 1923, he wrote from Hobart:—

"I have enjoyed the work, though it has been rather strenuous, as I was very rusty. They have asked me to continue through next year, but I think I shall be glad to

begin to rest". In Tasmania he spent his vacations collecting algae with his friends, Mr. and Mrs. F. Perrin, of Georgetown. In this quest they jointly visited the Barrier Reef and Lord Howe Island. During the last decade of his life Lucas became a world-wide authority on Australian seaweeds, publishing several papers in the Linnean Society, including a revised list and classification, as his presidential address in 1909. The Commonwealth Government sent him on a special mission to report on the economic possibilities of the seaweeds of Western Australia. Each summer found him visiting Victoria and Tasmania in this research. Alas! his last visit to Warrnambool overtaxed his strength. A cold brought on pneumonia. Taken ill on his train journey homeward, he died in the Albury Hospital from heart weakness.

Lucas was an encyclopaedia of scientific lore and could probably have filled a University chair in most branches of science as efficiently as he did that of mathematics. His presidential address to the Linnean Society in 1908 on the Relations of Science and Government was a masterpiece of sane pleading. He was specially selected by the Society to give the memorial lecture on his friend and brother botanist, the late J. J. Fletcher. A paper on the Marine Algae of Lord Howe Island was his last Linnean contribution. Since his death, Part I, of "The Seaweeds of South Australia", has appeared in the Handbook of the Flora and Fauna of South Australia. All these papers contain many figures from his own drawing, for, as with David, Tillyard and so many scientific men, Lucas was a first-rate draughtsman. He also wrote the article on "Algae" for the Australian Encyclopaedia. Besides his botanical work, with Warwick Le Souef, he wrote two books on the "Birds" and "The Animals of Australia" respectively. Remarkable too were his linguistic powers. A sound scholar of Latin, Greek, French, he used to spend vacations in acquiring a new language. German first, then Italian, in order to study De Toni on Seaweeds. One summer we were together at Eden, he was reading Don Quixote in the original Spanish. During the war he was requisitioned as the only man in Sydney who could interpret Russian in a Law Court for some Russian refugees. A ripe English scholar, he had a rich fund of quotations, often humourously introduced with a twinkle in his eye, e.g., when he quoted Browning at me—

“One friend of mine wears out his eyes,  
 Slighting the stupid joys of sense,  
 In patient hope that ten years hence,  
 ‘Somewhat completer’ he may say,  
 My list of coleoptera.”

He not infrequently wrote English verse himself. Here are a couple of stanzas from a poem on his early days—

“Of a year of my childhood the scenes I behold,  
 Where we lived on the hillside of Stow on the Wold,  
 For its fields and its faces remain with me yet,  
 And the folks and the flowers I never forget,  
 Where the winds blow cold,  
 On old Stow on the Wold.

For a bargain in fossils the parson was keen,  
 And he knew them from Cambrian to Post-Pliocene.  
 When he lectured, the Clergy looked wise as they knew,  
 For the Squire in the Chair gave the Clergy the clue—  
 We must science uphold  
 In old Stow on the Wold.”

He has left behind an interesting autobiography, written a few years ago. The MSS has been lent me by his daughter, Mrs. Cortis-Jones, and some of his old Melbourne friends are anxious to get this published.

Few men have earned the title “scholar” so thoroughly as he, whose whole life was spent in the pursuit of knowledge—and this, not to be stored as mental lumber, but utilised to the full for the good of his fellow men. Mathematics, botany, zoology, geology, chemistry, physics, physiology, and at least seven languages. What a range! Well might his friends wonder.

“And still the wonder grew,  
 That one small head could carry all he knew.”

And beneath all this lay a simple nature, prone to and sincere in friendship, combined with the highest sense of duty and truth sprung from those grand old Puritan traditions of a past day.—H. J. CARTER.



ROBIN JOHN TILLYARD, M.A. (Camb.), D.Sc. (Syd.),  
F.R.S., F.L.S., F.G.S., F.E.S., C.M.Z.S.

---

1881-1937.

Born at Norwich, England, January 31, 1881, Tillyard was educated at Dover College—a school famous as a pioneer in co-education—and Queen's College, Cambridge, graduating in honours in mathematics. In February, 1902, he joined the staff of the Sydney Grammar School as second mathematical master, and soon became prominent as a field entomologist. Hitherto interested chiefly in Lepidoptera, he now transferred his attention to dragon flies (*Odonata*). With Tillyard, to enter any branch of science, meant a fierce concentration of body and mind on that subject. The writer accompanied him, this first year, on a bicycle trip from Tenterfield to Coraki, and can testify to the ardour of his pursuit, modified, even then, by rheumatic troubles. But he was not satisfied till he had investigated the forests of North Queensland, after exhausting the mountain and other regions of New South Wales and Victoria, and in a few years became an acknowledged master of the Australian species. Then, later, the study of fossil insects occupied him, and he had become also a world authority on the venation of insect's wings; we find him advancing an entirely new notation for the venation of the Order Odonata (1).

During the early years of his Australian life he married Patricia Craske, a brilliant young Newnham student of chemistry, with artistic talents. During his first 10 years in Sydney, Tillyard contributed some 33 papers to the Linnean Society, chiefly on dragon flies. In 1912 he took the bold step—especially as a married man with 2 or 3 children—of resigning his mastership and taking the science course at the University in order to qualify for a Macleay Fellowship. Awarded a Science Research Scholarship in 1913, he graduated in 1915 and was the first entomologist to become a Macleay Fellow. In 1918 he became D.Sc., and had made some stir in the world of science as the author of "The Biology of Dragonflies", published by the Cambridge University Press. A brilliant period of original work, largely on fossil insects, was recognised in England by the award of the Crisp Medal of the Linnean Society, London, and that Blue Ribbon of Science, a Fellowship of the Royal Society, in 1926.

(1) "The Insects of Australia and New Zealand," p. 68.

From 1920-1928 he was chief of the Biological Department of the Cawthron Institute, Nelson, New Zealand. In 1926 his second great work appeared "The Insects of Australia and New Zealand", perhaps the most comprehensive and helpful work of the kind ever produced. In this he was helped in the very large number of plates and drawings by his gifted wife and A. Tonnoir.

In 1928 he was appointed chief Commonwealth entomologist and director of the entomological work of the Council of Scientific and Industrial Research at Canberra. Although dogged by weak health, intensified by a railway accident, he led a strenuous life, visiting America twice and England, giving frequent lectures and attending scientific congresses. His second visit to America led to a serious breakdown and retirement from the Commonwealth service. During recent years improved conditions led to further activities in wider fields, including an interest in mining. In January he left home by car for Sydney, en route for the New Zealand Science Congress, when the tragic accident, near Goulburn, caused by a skid, so injured his spine that he died in Goulburn Hospital, January 12.

He was borne to his last rest at Canberra by his late colleagues, attended by a large number of representatives of the Government and of science.

Like so many leading men of science, Dr. Tillyard was a man of versatile gifts. So accomplished a draughtsman was he that the late Professor Haswell told the writer that his drawings alone, in his final science exam., would have won him a first class. He was also a musician and a man of letters—a joint editor of the new "Commonwealth Review", of which the first number appeared recently. He leaves a widow and four talented daughters.—H. J. CARTER.

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#### CAROLINE STEINBECK.

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Since our last annual meeting, Miss Steinbeck, one of our most widely known and dearly loved members, passed quietly away.

Miss Steinbeck contracted what she termed an "ordinary cold", but pneumonia developed, and, almost before her nearest and dearest realised the danger, she had passed away in a private hospital at Waverley.

Though always unassuming in demeanour, Miss Steinbeck was a woman highly gifted by Nature, and her kindly influence has benefited thousands of young people, with whom she came in contact. To us, Miss Steinbeck's name recalls her keen sense of humour, her apt little anecdotes, and the practical advice that characterised her conversation.

Excursions of the Naturalists' Society to Mangrove Mountain, Ourimbah, etc., arranged by Miss Steinbeck, are unforgettable.

In 1916-17, Miss Steinbeck studied entomology at the Sydney Technical College, and no member of that group was more popular or considerate to fellow students than she.

A few years later, she compiled a bright, helpful little book, with a foreword by Mr. W. B. Gurney, but unfortunately this "Butterflies and Their Neighbours" has not been published.

As a teacher, and life member of the Gould League of Bird Lovers', Miss Steinbeck's beneficent influence and guidance will be reflected in the lives of many citizens, who as children passed through her class at the Waverley Superior Public School. Pupils love to sing her songs, which have won prizes in Gould League competitions.

Beyond the circle of Naturalists, many fellow teachers and thousands of ex-pupils, scattered over the State, are proud to have been associated with her, and this is a further tribute to a well-spent life.—H. McANENE.

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#### LEWIS JOSEPH ABRAHAMS.

Born October 18, 1872. Died May 15, 1936.

Mr. Abrahams was a keen student of entomology and was one of the older members of the Society, but resigned. He rejoined the Society in October, 1934.

In 1907, he visited the Solomon Islands, and returned the following year, then he was for two years in Cobar, after which he resided on the Blue Mountains until 1920.

Recently he resided at North Strathfield, and remained, till the last, a keen student of Nature, and anything appertaining thereto.—W. W. FROGGATT.

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MRS. M. HOWELL.—*An Appreciation:* By the death of Mrs. M. Howell, the Naturalists' Society has lost a most enthusiastic member. For many years Mrs. Howell's field notes and other observations added interest and zest to our

monthly meetings. On many occasions, also, she took part in the Society's monthly outings, as far as opportunity and health allowed; and these field excursions she greatly enjoyed.

In our Natural History exhibitions of some years ago, she gave considerable personal assistance, but for some time past, owing to ill health, she has been absent from our meetings, and we all deplore her death.

Mrs. Howell's interest also spread into other associated avenues of Nature Study. She was, for a number of years, a member of the Council of the Wild Life Preservation Society of Australia, and assisted materially in spreading a love of, and a desire to protect and preserve our Australian wild life.—DAVID G. STEAD.

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#### THE LIFTING POWER OF THE ROOTS OF TREES.

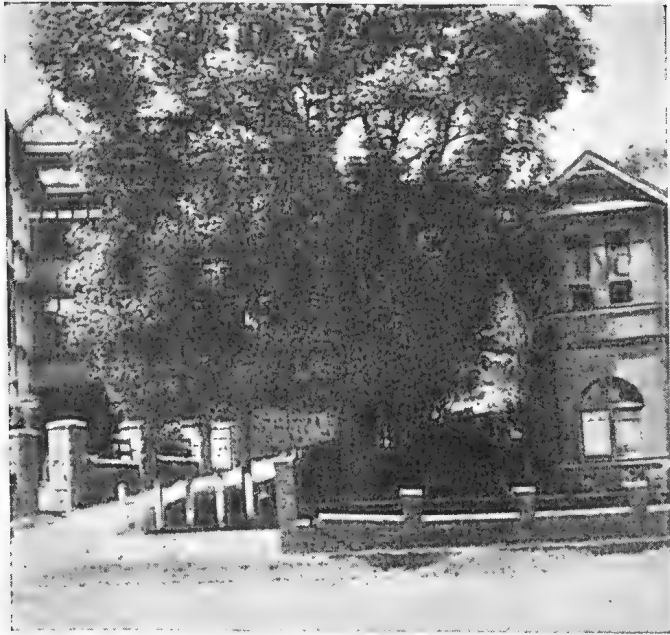
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By JOHN HAWLEY, Dip. Arch.

Although much work has been done in England and to a lesser degree in America, investigating the many functions of the roots of plants and trees, the work in that direction is far from complete. Scientists are unanimous in their conclusions that roots are something more than mere organs of fixation, nutrition or respiration; they are at once the feeders and the anchors of the trees, as well as the underground lungs and storehouse against an evil day. In addition, trees use the roots to throw off and toss away substances which are injurious, or useless to the tree. Roots also exercise a corroding chemical influence on certain hard bodies.

I watched for some time the gradual raising of a dwarf wall (built of brick and cement mortar, in Beach Road, Rushcutters' Bay, Sydney), by the roots of a camphor tree (*Cinnamomum Camphora*) to a height of eight inches, and outwards also eight inches, and the final complete tossing of the wall out of the way. On counting the number of bricks, and ascertaining their weight, together with that of the mortar, and allowing for the weight and pull of the adhering soil, I estimated the weight lifted to be 30 cwt. The accompanying photograph shows the fractured brick-work prior to being thrown out of the tree's way.

There is on record that an English Oak, eight years old, lifted a block of stone seven tons weight for some inches.



THE FRACTURED WALL (see article p 14.)

### SOME OF OUR TREES.

Abstract of lecture delivered before Society, July, 1936,  
By THISTLE Y. HARRIS, B.Sc.

Over a vast continent such as Australia one expects to find a variety of vegetation, on account of the vast differences in climate and in geological formations. Broadly speaking, however, the flora of this continent may be divided into two great classes:—(a) Brush or Indo-malayan types confined to the Eastern coast. (b) Endemic types which are predominant, and which either originated here, or were modified here, in direct response to the climate. This element in our flora is unique.

Geological records show that Australia once enjoyed a climate far more approaching present tropical conditions than it does to-day and that, at such a time, the continent was clothed in a mesophytic vegetation, represented to-day, by the remnants of brush forest, which remain on the coast of Queensland and in such isolated spots on the coast

of New South Wales, as Tweed River, Dorrigo, Barrington Tops, Cambewarra, Bulli and Otford. The trees of this vegetation are tall, straight limbed types, growing up rapidly to the light and only branching at a considerable distance from the ground, bearing masses of dark green, soft foliage with no means of conserving moisture. Among such plants little undergrowth was to be found on account of the poor light conditions, but creepers and epiphytes of various kinds were common.

Gradually, as the climate changed, and desiccation set in together with the drying up of the shallow central sea, the mesophytes were unable to continue their existence unmodified. Gradually, therefore, there was built up a flora more in harmony with the new conditions, the endemic Australian flora. During the process, of course, many hundreds of species of mesophytes, unable to adapt themselves to the changing conditions must have been completely wiped out of existence. Others, in favoured situations, such as mountain gullies and basalt-capped plateaux, managed to survive in an almost unmodified form and constitute the rain forests of to-day. That these trees provide protection to one another is only too easily seen when a little clearing is done in brush country. Exposure to the elements through the removal of surrounding trees causes rapid deterioration of the remaining flora and poor growth and disease inevitably follow. Among the best known of the rain forest types are: Coachwood, Sassafras, Rosewood, Palms and Tree Ferns, Cedar and Silky Oak.

The modified plants, which have learned to adapt themselves to the more arid conditions of the changed climate, have developed all sorts of devices to ensure that too much water is not lost by evaporation. The two chief genera of this group are *Eucalyptus* and *Acacia*. In the former the leaves are usually covered with a protective elastic covering, emit an ethereal oil, and frequently twist on their leaf-stalks away from the direct rays of the sun to avoid too rapid transpiration. In the latter genus the true leaf is frequently replaced by a flattened leaf-stalk or phyllode which contains a far lesser number of pores than the true leaf and therefore does not permit of too much loss of water.

It is of interest to note, also, that while Acacias with the feathery true leaf are to be found in many parts of the world, the phyllodinous types occur only in Australia and may, therefore, be truly regarded as the national em-

blem. The probability is that they originated in Australia in response to the gradually encroaching arid conditions. In regard to these two important genera, it is of interest to note that both show atavistic tendencies, which indicate that they have arisen from mesophytic types. In the Eucalypts the juvenile foliage is frequently very different from the mature foliage, does not possess the same power of preventing loss of water by transpiration. The juvenile foliage of the Acacias consists, in every case, of pinnate leaves similar to the adult foliage of some Australian and all northern types.

The rain forest trees which have managed to survive in isolated spots show none of the modifications to changed conditions that are exhibited by the inhabitants of the barer and more exposed areas. Their survival is largely due to the protection they have afforded to one another. That they cannot stand exposure is easily seen by clearing a little of this remnant of brush when the exposed trees rapidly succumb to exposure, become weak and sickly and liable to attack by parasites such as smuts and scales. There is, therefore, much danger in opening up brush country, as has so often been shown in Australia. While the number of trees actually removed may be small, the number which succumb to the ravages of parasites and exposure is invariably much greater. The greater security of such types has made them less adaptable to change, but this greater security has also resulted in an irregular flowering, and the production of flowers only after several years of growth. The plant is so much in harmony with its environment, that its chances of elimination are consequently small, and so it can delay its flowering period. Xerophytes, such as gums and wattles, which live a much more precarious life, and which are in constant danger of being wiped out of existence on account of the harsh nature of their environment, produce flowers as rapidly as possible. Hence the great floriferousness of many arid areas.

In general, then, the nature and distribution of Australian plant life is a useful indication of the geological periods through which this vast continent must have passed.

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GROW OUR NATIVE TREES AND ENCOURAGE  
OUR NATIVE BIRDS.

By MASIE HOWELL.

"Whenever the day seemed long  
And his heart was beginning to fail,  
She would sing a more wonderful song,  
Or tell a more marvellous tale."

—*Longfellow.*

Brought up on the backblocks of our new selection, my duty was minding the sheep, not a very interesting job in itself, but I learned to observe the things around me—native animals, birds and "wogs". Indeed, it became my hobby, and has been so ever since, when I had spare time. Even now, as I lie bedridden, I have heard "A more wonderful song", than perhaps I would have heard, had my good health been continued.

In laying out my garden (only 50 ft. x 150 ft.), I had in mind encouraging our native birds and insects, and there I planted several Gums, Tea-trees, Paper-barks, Lillie-pillie, Blue-berry Ash, Bottle Brush and various other trees, vines and shrubs. These have flourished, and into them have come our native birds, not only to rest, but also to nest.

It is now that I am thankful for having observed our wildlings in days gone by. Have you ever noticed what the sweet herald of the dawn is? Well, in my garden it is Blue Wren, who, with a superb warble, welcomes the first gleam of light, even before Kookaburra breaks into his peals of laughter in the tall trees in the gully. Blue Wren has built its nest in my garden many times, in a vine by the door of the garage, in the mandarin tree, and several times in one of the little Bottle Brush shrubs. Such a dainty nest it is, the entrance being at the side. I have often wondered, when I saw the little lady sitting on the eggs, wherever did she tuck her perky little tail! I have also noticed that when the young are hatched, that the father does the household cleaning, and also that the mother generally brings four meals to her babies to the father's one. One year the Sparrows became nasty, and, when Blue Wrens' nest was half built, they deliberately pulled it to pieces. It was a pitiful sight to see Blue Wren and his wife scolding and hopping along with tails dragging on the twigs. We never seem to get more than one



father bird with his blue cap, though I can distinctly pick out the young males, as they have black beaks, heads and tails.

The next songster of early morning is the Silver-eye. As she sits in the Wattle tree, her song to welcome the day is quite as sweet as that of any canary. She, too, builds in my native trees, and often in the wistaria vine. She builds a cosy cup-shaped nest, making use of household rubbish, in the way of threads from polish mops, and fluff from woollens, kapok and many other things which help to make a warm lining. One year a cat tore a nest down. In a few days another spot in the tree was selected, and, being in a hurry, the Silver-eyes went to the rubbish heap for building material, and, finding a combing of human hair, used that in forming the nest, laying in it, later, two dainty blue eggs. But, alas! a storm came, and once again disaster, as the hair pulled away when the twig strained in the wind. I have known them to move a half built nest when the position seemed too exposed, or easy of human access.

Willie Wagtail wakes early; indeed, during some moonlight nights, he keeps reminding one that he is a "sweet pretty creature". This year Willie built in the same gum tree as the Pee-wit. Both built cup-shaped nests, and both were raided by Butcher-bird and Kookaburra. I love the Kookaburra and Butcher-bird for their hearty laugh and lovely song, but they are cruel to the young birds. I suppose it is another case where man has been the cause by upsetting the balance of nature, in killing out rodents and reptiles.

My next early songster is the Spine-billed Honey-eater, greeting the day with his silver, bell-like, call as he flitters 'neath the red Bottle Brush flowers and extracts the sweet honey. They, too, have built near. I have not seen the nest, but when the baby is introduced to the red Bottle Brush, its beak is only short with a very slight curve, and it also lacks the white bib.

The Pardalote is about early. It is very pretty, and is not much bigger than one's thumb. It has a very sweet echo whistle call, and moves about very quickly among the gum leaves from which it gets its food.

Next to form the morning chorus are the introduced birds, the Bul-buls, who call "you pretty girl". This bird is very quick, grey in colour, with red under the tail, and a quaint black crest. They have built many times in my trees, once hatching a Pallid Cuckoo. They always began

building by collecting a piece of paper or white rag and working it firmly into the small three or four forked branch of a small tree; then they built up with bark, and grass, finishing up with a flat cup-shaped nest, not nearly as smoothly finished as those of the smaller birds. Generally they lay only two eggs, and the young leave the nest before they grow a crest.

There are plenty of Sparrows and Doves, also Starlings, with musical voices, but later in the day comes a Grey Thrush, just one, and its song is ever so sweet.

Jacky Winter is a quiet fellow, as he watches from the top of a garden post for a delicious grub from my garden.

There are other birds, too, all a joy to me as I lie here. I just see them all in my mind's eye, and when the wind blows I hear the rustle of the leaves, and thrill that my hobby of Nature Study, and growing our native trees is one of the few joys left me, but certainly the most wonderful.

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#### VISIT TO LAMINGTON NATIONAL PARK, QUEENSLAND.

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By JOHN POWELL.

I recently spent a few very interesting and enjoyable days at the Queensland National Park, on the McPherson Range, which is situated about 86 miles south of Brisbane. It is reached by car, from Brisbane, to within about  $1\frac{1}{2}$  miles from the hostel, whence one proceeds the remainder of the journey on horseback, through thick bush. The Park consists of 48,100 acres of beautiful pine forest. It is reserved as a National Park under the provisions of the State Forest and National Park Act (Queensland), and is situated on one of the ridges of the McPherson Range, with an elevation of 3,150 feet, from which one can get a wonderful view of the surrounding country, on the west and north, Mts. Lindsay, Barney, Roberts and Huntly, over the Tamborine and Mt. Flinders to Brisbane and the Glass House Mountains, 100 miles distant.

The mountains are intersected by fertile valleys, deep gorges, precipitous cliffs, with jungle-mantled slopes, and several beautiful waterfalls. Beyond the National Park are miles of Hoop Pine (*Araucaria Cunninghamii*), forest, which is being cut for timber. The mountains are composed of volcanic rocks, mostly basalt, and the combina-

tion of a large rainfall, and good soil, have produced a subtropical luxuriance of trees, creepers, ferns and flowers. In the gorges large tree-ferns grow forty feet in height, raising their wide horizontal fronds. Palms, and a great variety of ferns adorn the gullies, and rock-lillies and other orchids, of which there are over thirty varieties, grow in profusion; stag-horns, elk-horns and other ferns com-



ELABANA FALLS.  
Lamington National Park, Qld.

pete with the leaves and branches of the trees for a place in the sun. Bird life is there in abundance; several varieties of parrots, Wonga pigeons, the Bronze pigeons, Brush turkey, Lyrebird, Bowerbird and numerous other kinds. Animals are well represented, the most prominent of which are the rock-wallabies, opossums, native rats, native cats and several other varieties.

Above all, the trees stand out, as being the most notable feature of the country. The Crow's foot elms (*Tarrietia argyrodendron*), have developed buttress flanges over ten feet in height and fifteen feet in width, this being necessary to hold their gigantic forms in the soft rich soil during heavy storms; often covered with the fig-tree parasite, which, with its living, sap-sucking strands, is a green horror in squeezing and draining its living hosts. Another natural wonder is the Antarctic or Negro-head Beech (*Nothofagus Moorei*), some of which are over thirty feet in diameter. This occurs through the beech decaying and creating new roots and wood, and apparently having found for itself the secret of rejuvenation. The bases of these trees are covered by a mould of many centuries and have deep dank recesses, but the green tops display that everything is quite all right at their hearts, and some have evolved into group existence. It is calculated that these trees are several thousand years old.

Amongst other trees, I saw the Hoop Pine (*Araucaria Cunninghamii*), Silky Oak (*Grevillia robusta*), Rosewood (*Dysoxylon Fraserianum*), Marara (*Weinmannia lachnocarpa*), Crow's Ash (*Flindersia australis*), and a large variety of eucalypts. The Giant Flame tree (*Brachychiton acerifolius*), the Wheel-tree (*Stenocarpus sinuatus*), Giant or Brush Box (*Tristania conferta*), the terrible stinging tree (*Laportea gigas*), *Angophora subvelutina*, the wild *Wistaria*, Wild Salvia, Moreton Bay Chestnut (*Castanospermum australe*), and Red Cedar (*Cedrela toona*). Some of these giants attain a height of over two hundred feet. The Park is a naturalist's paradise, and, as one wanders through its shady gullies, something of interest is seen every few yards, the struggle for life that is continually going on, the trees forcing their way upwards, entwined with creepers and vines, with large epiphytes on their boughs, and various forms and colours in the fungi, which occur amongst the mosses and lichen covering the decayed wood.

## THE PURAIRI DELTA, PAPUA.

By G. W. LUPSON.

The Purairi delta extends along the coast of Papua, roughly, from the Alele River to Port Romilly, a distance of about fifty miles, the rivers between being the Aive, Panoroa, Urika, Apai, Baroi and Wami. These rivers join the Purairi about forty miles inland, and all the rivers are connected by innumerable creeks running in all directions—a very complicated network of waterways. There are large numbers of native villages all through the delta. The delta is of the usual kind, mud everywhere, soil a heavy clay and the vegetation of the rain forest type. Mosquitoes abound in places, but some parts of the delta are fairly free of them, but sandflies are numerous.

Although under Government control, the Purairi delta is very little known, even to-day. There has been quite a number of white men passing through, from place to place, but they see very little of it.

Two or three traders have lived here, but they are all dead now. There is an L.M.S. Missionary Station at Urika which has been in existence, I believe, for about ten years, and there is a saw mill, situated on the Wami River, which has been there about fifteen years. The distance between the saw mill and the Mission Station is about forty miles by river, and the next white people to be met with are at the Government Station at Kikori, about eighty miles away, so you will see the white population is not congested.

The only means of transport is by water, and with high tides or heavy rains practically the whole of the delta is covered with water.

The natives themselves are as a rule of small stature compared with others outside the delta, probably owing to their having so little walking exercise and travelling in canoes. There are many races of natives on the delta, some of the principal of which are the Vaimuru, Kaimari, Oiravi, Koiravi, Evara, Koriki, Lari, Maipor and Akirau. At present some of the tribes intermarry and others keep to themselves; but it is believed that they all originated from the Vaimuru. It is impossible to say, as one cannot get to the bottom of it. Perhaps they do not know themselves. Up to a short time ago they were cannibals.

In bygone days their chief pastime appears to have been for one tribe to raid another, carry off what women, pigs, and garden produce they needed, kill the men and

preserve their skulls. Many of the skulls remain to this day. Now they are under Government control. Those that are not working for Europeans lead a lazy life in the villages—sleep most of the day and on occasions dance all night.

Polygamy is practised and, although most have only one wife, numbers have two or more, and I know of one who has twelve. Before the missionaries came, there appears to have been no religion, except perhaps a kind of ancestor worship, but to the present day there appears to be a strong belief in witchcraft. Work is proportioned out between the men and women, but I think the woman's lot is by far the harder. The man's work consists of building houses, getting food, such as animals, birds, and making the gardens, cutting down the sago palms, making canoes, etc. The women fish, make sago, carry in the produce of the gardens, make sleeping mats, fishing traps and nets.

Native food consists of cassowary, pig, snakes, small birds, rats, lizards, cuscus, larvae of beetles and fish of all kinds, crabs, prawns, etc., pawpaw, wild plums, and other wild fruits and berries, roots of plants and the leaves of certain trees, taro, manihot, bananas, coconuts, sweet potatoes, yams, etc. They have no intoxicating drinks, but chew betel nut with lime and pepper (piper).

For building houses they use hardwood posts and frames, soft wood in other parts, tied together with the lawyer vine (*Calamus*), and a thatch of Nipa palm.

For killing large birds and animals they use spears made of hardwood or black palm, clubs made of hardwood and bows and arrows. The bows are made of black palm with a string of lawyer vine; the arrows are made of a stout grass, bamboo or light wood, tipped with hardwood, bone or the quills of birds; for the smaller game, bows and arrows are used.

When looking for a pig they generally fell a sago palm, and when the pig is busy eating they all rush in with clubs and spears and kill the poor animal.

For their canoes they generally fell a light, soft wood, *Ilimo Octomeles sumatrana*, and then cut out the inside with axe and adze. (In the old days they were burnt out with hot stones, etc.) They then shape the outside and carve them; some are quite works of art; each tribe has its own design, both in the decoration and the shape of the canoe. In the manufacture of sago, after the palm has been felled by the men, the women start operations;

first they scrape all the pith out and then construct a sloping trough of the sago stem. They put the pulp and pith into the trough, add a little water, and beat it with a stick to separate the sago from the fibres. By continually adding water, and beating, the sago slides down the trough into a kind of basin, also made of the stem of the sago palm, and there settles into a hard mass or stiff paste. It is then tied up in bundles with sago leaves and is ready for use.

Many kinds of fish are caught and eaten by the natives, some large scale fish, jew fish and cat fish are caught with a hook and line. In past times the hooks were made of thorns of trees from the bush and pieces of shell cut to shape, and the line was made of fibre from certain trees; at the present time they are using the commercial lines and hooks. The small fish are caught with hand nets made from materials obtained in the bush. They often drive stakes into the mud across the mouth of a creek, and at low tide collect any fish that happen to be trapped. To catch prawns they weave conical nets or traps which they jab into the mud and then turn over quickly and remove their captures. For crabs they either use their hands or a stick. They collect many kinds of shell fish, bivalves and univalves; some of these they eat raw and others are thrown on a fire and half roasted.

As far as recreation is concerned, the dance seems to be the principal form of enjoyment. They have many different dances for various occasions—when anyone dies in the village; if there is an abundance of food in the gardens; if they kill a wild pig or when a large canoe is finished. The only musical instruments used are drums; these are made in various sizes and shapes. The drums are made of different kinds of wood, but mostly of a wood very much like rosewood (Marava) *Pterocarpus indicus*.

The small boys play various games of ball and shuttlecock, and also play with spears and small bows and arrows.

The villages are usually in a filthy condition, but the natives seem to thrive for all that.

The Purairi delta is one of the most interesting places I have seen, both from a botanical and entomological point of view. The waterways are wonderful, but it is also very depressing. After spending three years there, working and collecting, I was pleased to get away; as during the last part of my stay there I was very ill with fever. At the same time I would like to see the place again.

## CARNIVOROUS PLANTS.

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A Suggestion as to Their Origin.

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By THISTLE Y. HARRIS, B.Sc.

The Society was fortunate enough, in May, to hear Professor F. E. Lloyd, of McGill University, Montreal, deliver a fascinating lecture on the structure and habits of some carnivorous plants. The many interesting points which the Professor brought forward were illustrated by an extraordinarily fine set of lantern slides, many of them made from microphotographs.

Although not offering a suggestion during the course of his lecture as to the possible origin of these strange plants, Professor Lloyd did say that he could not hold natural selection responsible for the evolution of the present flora. This gave considerable shock to many of us who have found in natural selection a satisfactory explanation for many diverse forms in nature.

May I offer the following theory concerning the origin of these quaint plants?

Nitrogen, being one of the elements which constitute the living matter, protoplasm, is essential to all life. Atmospheric nitrogen is so inert that it appears to be impossible for the living cells to cause it to unite within themselves and, for this reason, the elemental nitrogen of the air is not available to plants or animals.

Plants obtain their nitrogen from soluble nitrites, nitrates and ammonium salts in the soil, and animals use the nitrogenous substances manufactured by plants from these.

The soluble nitrogen salts in the soil are manufactured from atmospheric nitrogen by certain bacteria (several species) which are usually abundant in well-aerated soil. When, however, the soil aeration is low, the bacteria do not flourish, since this means a lack of nitrogen.

Competition among plants must have led to the migration of some types on to land, which, on account of its poor aeration, due to a large amount of water in the soil, was poor in nitrogen-fixing bacteria and hence poor in available nitrogen.

Plants possess certain enzymes or digestive juices which have the power of converting the protein they have manufactured, either immediately or after a period of storage into the living protoplasm. One could conceive,



therefore, that, as the struggle for existence became more and more urgent, many plants were forced into a region where the supply of available nitrogen was so low that the plants either succumbed and the species was eliminated or some special means of obtaining nitrogen was devised.

In certain of the plants forced in this way on to unfavourable areas, the secretion of the digestive juices would be greater than in others. If, in some cases, the enzyme were actually excreted on to plant remains (of those which were continually being forced on to this region by stronger types and which succumbed) it would be able to digest the proteins which that plant had stored away. These proteins, however, do not form a great bulk of plant storage material, the greater portion being stored as carbohydrate. In order to continue in existence, therefore, the plant would require to devise a surer supply of available nitrogen. It is not a very far cry from the digestion of plant to the digestion of animal protein. The mechanical devices adopted by some insectivorous plants to secure their prey would follow later as a natural corollary to the secretion of the digestive juices. Later, the processes were reversed for economic reasons, the plant not being desirous of pouring out precious digestive juice before it was quite certain that its prey would not escape.

One usually finds, in nature, that where some special organ or method of living is devised by a group of plants, that the group does not develop in other directions. This is probably due to the fact that the special device makes their survival surer. Thus, the orchids, with their ingenious methods of pollination, cannot compete in size, with many orders of plants, generally regarded as lower in the evolutionary scale, because the greater chance of fertilisation these methods have given them, makes it unnecessary for them to compete in size with other plants. So, with the carnivorous plants, their special nitrogen-catching device makes it impossible for other plants without this device to compete with them, and so they have the boggy regions more or less to themselves.

When they did, in some cases, later succeed in developing in regions where it was not necessary for them to use animals for the purpose of obtaining nitrogen, they still retained their carnivorous habits. This is commonly found in nature also. When a device has taken many generations to perfect, it is not likely to be eliminated immediately the need for it has passed.

On account, however, of the relative delicacy of their structure, none of the carnivorous plants is likely to prove a serious enemy to its more robust relatives. Thus they remain, for the most part, as dwellers of those regions they have so successfully invaded.

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NOTES ON A FAMILY OF ROOT PARASITES,  
*BALANOPHORACEAE*.

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(Communicated by Albert Booth.)

[The accompanying article was written for me by Mr. Gardiner, of Ongarue, New Zealand, when I visited that district and obtained the specimen, which I exhibited at the November meeting.—A..B]

DISTRIBUTION.—A small family, chiefly tropical, of which *Balanophora* and *Cynomorium* are the principal genera. The latter was the Fungus *Melitensis* of the Crusaders. The New Zealand species is endemic.

There is, perhaps, no more remarkable family of flowering plants than this. Its members are all root-parasites, and, like all parasites, have become very much reduced in structure.

The life history of one of the *Balanophoraceae* is briefly as follows:—

The seed, which is rudimentary, falls to the ground and so reaches a suitable host root buried under the vegetable mould of the forest floor. It adheres to the host root, and forms a small tubercle. The bark of the host is broken open and an extraordinary series of developments take place, that has, as yet, received no adequate explanation. The wood fibres of the host separate into a fan-like mass, and, being diverted from their original course, pass up towards the parasite. This in its turn sends out cells and vessels, which penetrate between the ascending vascular bundles of the host, and by the coalescence of the tissues of the two plants, an intermediate zone is formed, composed partly of the cells of each, though, in some stranger cases, there are also developed cells, whose origin cannot be definitely referred to either plant. This phenomenon somewhat resembles a natural grafting, but it is a grafting between plants of completely different types.

The tubercle now grows to the size of a fist, or larger, and short, thick, fleshy shoots are sent out from it. These do not develop true leaves, but in many cases produce scales, which surround the flower-heads.

The flowers are either terminal or in spikes, and the colouring of these flower shoots is often most remarkable. They are fungoid in appearance; indeed, early writers of the nineteenth century were so puzzled by their resemblance to fungi, that they considered them to be, in some fashion, crosses between a fungus and a flowering plant. Such an idea, of course, seems ridiculous in the light of modern knowledge, as crosses, or hybrids, only occur between closely allied forms.

The *Balanophoraceae* are true flowering plants, that have become highly specialised in order to maintain their existence. Although they mimic fungoid growths, they are in no way related to the fungi. There is only one representative of the order in New Zealand, *Dactylanthus Taylori* (1), and this solitary species forms a distinct tribe by itself. It was originally discovered in New Zealand by the Rev. R. Taylor, in 1857, growing on roots of *Pittosporum*, and *Nothofagus*, somewhere near the head waters of the Whanganui.

Since then it has been met with on several occasions in widely different parts of the North Island, but it is evidently not common. Mr. Taylor describes it as having an earthy and rather unpleasant smell. On the other hand, Mr. Hill, who found it in the East Cape district, states that it was "the sweet, daphne-like fragrance which it emitted" that first drew his attention to it. Our plant has not the foul-smelling properties of fungoid forms, although the flowering stems are inconspicuous and of a dull-brown colour, and are clothed with overlapping, fleshy scales. According to Taylor, the "petals of the flowers are slightly tinged with pink in the centre, but, in general, they are of a dirty white and brown colour".

By the Maoris the plant is called "Pau-o-te-reinga". (The Flower of Hades.) Why so called is not clear, but it seems not inappropriate.

It has been found on the roots of *Schefflera digitata*, and *Coprosma grandiflora*, as well as on the roots of the plants already mentioned.

*Fusanus Cunninghamii* and *Euphrasia cuneatra* are also, it is believed, partly root parasites.

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(1) (The name *Dactylanthus* is from the Greek, mean-finger-flowered, in allusion to the finger-like spike.)

## NATURALISTS' SOCIETY OF NEW SOUTH WALES.

*Proceedings.*

APRIL, 1936.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on April 7, 1936, at 8 p.m.

The President (Mr. W. W. Froggatt), in the chair, with about 40 members and visitors present.

Correspondence.—Mr. Herriott. Mr. Edwards re outing. Miss Clarke. Invitation from Junior Tree Wardens' League. Chief Secretary Brisbane re Sanctuary in Hinchinbrook Shire. Miss Steinbeck. Mr. C. Love. Mr. Sanders. Mr. Welch. Dr. Finckh re outing.

New Members.—Miss E. Ellison, Miss A. Boone, Miss D. McCulloch, and Mr. Harold G. Davies were unanimously elected members of the Society.

Nomination of Members.—Mrs. Pace, 8 Arthursleigh Street, Burwood. Nominated by Mrs. Harris, seconded by Miss D. Dobbin. Mrs. Henderson, Manning Road, Double Bay. Nominated by Mrs. Rudder, seconded by Miss D. Dobbin. Mr. Cecil S. Love, Hill Street, Muswellbrook. Nominated by Mr. W. W. Froggatt, seconded by Miss D. Dobbin. Mrs. Ringham, 240 Military Road, Cremorne. Nominated by Miss Luckie, seconded by Miss Stevenson.

Announcements.—The President welcomed Dr. Eric Pockley to the meeting.

Exhibition of Specimens.—Mr. J. G. R. MacCallum: Specimen of a gall and a saw-fly larva from Barrington Tops.

Miss T. Y. Harris.—Specimens of *Eugenia myrtifolia* with edible berries. Cape Honeysuckle, *Protea*, from Africa, which grows well in Australia.

Mr. Luke Gallard.—Specimen of Great Swift-Moth, *Leto staceyi*, found at Cattai Creek, and collection of Lady-bird beetles, *Coccinellidae*.

Mr. John Hawley.—Portion of Cuttlefish.

Mr. S. Ashley.—Specimen of a "mud-dauber" wasp's nest.

Miss McKellow.—Nest of the Golden-headed fantail warbler.

Mrs. Chambers.—Specimens of shells and polished kauri gum from New Zealand. Bags made of fibre, from pith of umbrella palm, by aboriginal women. Native hand-made pipe.

Mr. J. W. Hawley.—Specimen of a moth.

Mr. W. W. Froggatt.—Specimen of *Oxypetalum coeruleum*, which spreads rapidly by means of parachute-like seeds. Mr. Froggatt also read a postcard received from Mr. Bryce in Cuba.

Mr. Monaghan.—Specimen of a robber fly, *Asilidae*, wingless cricket, eggs of a leaf-cutting bee and bee bread.

Mr. Curnow (of Goulburn).—Specimen of a robber fly.

Lecture.—Mr. J. R. Kinghorn, C.M.Z.S. (Ornithologist to the Australian Museum), delivered an extremely interesting lecture on "The Homes of Birds", illustrated with numerous lantern slides. The lecturer was accorded a hearty vote of thanks.

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MAY, 1936.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, May 5, 1936, at 8 p.m.

The President (Mr. W. W. Froggatt), in the chair, with about 100 members and visitors present.

Correspondence.—Mrs. Pace re subscription. Mr. G. R. MacCallum re badge.

New Members.—Mrs. Pace, Mrs. Henderson, Mr. Cecil S. Love, and Mrs. Ringham were unanimously elected members of the Society.

Exhibition of Specimens.—Mrs. F. Johnson (Peak Hill): Specimens of the green tree-hopper, *Sextius virescens* (Family *Membracidae*), which feeds on the Blackwattle, *Acacia decurrens*.

Mr. E. P. Bailey.—Specimen of a Cotton boll and a species of *Drosera*, which was described by Mr. Froggatt.

Mr. Luke Gallard.—Specimen of a carnivorous pitcher plant, *Nepenthes*, obtained at the Walker Hospital. Larvae of the Emperor gum moth, *Antheraea eucalypti*, *Chelepteryx collesi*, which is covered with stinging hairs and a pupa of a wood-moth, *Pielis* sp.

Lecture.—Professor F. E. Lloyd, of the University of Montreal, Canada, delivered an extremely interesting and instructive lecture, entitled "Carnivorous Plants". The lecture was illustrated with numerous and beautifully coloured lantern slides, and was appreciated by all. The vote of thanks, which was carried, was moved by Mr. A. G. Hamilton, and seconded by Mr. Edwin Cheel. Mr. Gallard also supported the motion.

JUNE, 1936.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, June 2, 1936, at 8 p.m.

The President (Mr. W. W. Froggatt), in the chair, with about 40 members and visitors present.

Correspondence.—Letter from Chief Secretary (Mr. F. Chaffey) re Reserve at Dobroyd Head. He advised having referred the Society's letter to the Minister for Works and Local Government. Minister for Works and Local Government re Reserve. Mr. Dickinson. Mr. G. W. Lupson, Port Moresby. Linnean Society of New South Wales. Queensland Museum. Queen Victoria Museum and Art Gallery, Launceston, re Journal. Mr. H. G. Johnson re Berman testimonial. Parks and Playgrounds Movement of N.S.W. Master J. G. R. MacCallum re bees. Perpetual Trustee Co., Ltd., re Cope bequest. Chief Secretary's Department re protection and partial protection of birds of prey.

Announcements.—The President announced that Mr. L. Abrahams had died a few days ago. That the Perpetual Trustee Co., Ltd., had £1,000 under the Cope bequest, for distribution amongst Societies for the Preservation of Native Flora and Fauna, and that this Society had applied for a grant.

The President also advised members of the sets of Journals which were available for sale.

Mr. D. G. Stead suggested that a notice to that effect be placed on the back page of the Journal.

Exhibition of Specimens.—Mr. E. P. Bailey: Read notes from Mrs. Pace, on the winged seeds of *Cardiospermum*.

Mr. E. O. E. Edwards.—Described how grape vines were budded on wild stocks to help in resistance to disease and showed the method of budding. He also mentioned the names of different varieties used to provide vines suitable for growing in different soils and different climates.

Mr. A. E. Watson.—Specimens of seed pods of a Waratah, gathered inland from Kiama, and described a cultivated waratah at Jamberoo, which was flowering 6 months out of season. Also a specimen of *Acacia suaveolens* which had pinnate leaflets growing from nodes, and *pittosporum* seed-pods.

Mr. Luke Gallard.—Specimens collected on excursion to Centennial Park. Bird of Paradise Fly (*Coccidae*). Lacewing. fly and stalked eggs. Notes and drawings which had been made for Professor Lloyd, of a Pitcher plant, *Nepenthes*, grown at Parramatta.

Mr. S. Ashley.—A pipe fish and a collection of shells which were described by Mr. Stead.

Mr. W. W. Froggatt.—Described specimens of pressed flowers from West Australia and the rattle of the rattle-snake of California, exhibited by Miss D. Tebbutt.

Mr. E. P. Bailey.—Specimens of Froghoppers taken at Chullóra, and described by Mr. Froggatt.

Mr. W. W. Froggatt.—Specimens of the She-oak, *Casuarina equisetifolia* (Bull oak). Mr. Stead mentioned that in Honolulu they had planted a drive one and a half miles in length with an avenue of Casuarinas. Mr. Froggatt also described Maiden Hair Fern weevils and a specimen of *Hardenbergia* from Wentworth Falls, and read notes made on Pitcher plants by Mr. Maiden.

Mr. John Powell.—Exhibited lantern slides of the fire-walkers of Fiji.

Mr. David G. Stead.—Lantern slides of sharks, sword-fish and whales, which were present in numbers on the coast.

Mr. E. E. Larcombe.—Exhibited slides of various trees which had been marked by the early explorers, amongst which were those of Captain Flinders, Captain Sturt, McDouall Stuart, Burke and Wills, Dr. A. W. Howitt, Dr. Leichhardt, and A. C. Gregory.

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#### JULY, 1936.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, July 7, 1936, at 8 p.m.

The President (Mr. W. W. Froggatt), in the chair, with about 45 members and visitors present.

Correspondence.—Mr. E. J. Bickford and E. J. Bryce re notices. Mr. H. Clay. Mrs. Pace. Mr. F. Johnson (Peak Hill) re mites in chaff.

Nomination of Members.—Miss G. M. Jordon, 5 Dongan Street, Ashfield. Nominated by Miss Thompson, seconded by Miss McAnene. Master Stan Nicholls, 82 Farr Street, Rockdale. Nominated by Mr. C. S. Ashley, seconded by Mr. W. W. Froggatt.

Announcements.—The President announced the death of Mr. A. H. S. Lucas, the first President of the Society, and Miss L. Steinbeck. It was moved by the President, and seconded by Mr. Barnett, that a letter of sympathy be forwarded to Mr. Watson on his recent accident.

Exhibition of Specimens.—Miss T. Y. Harris: Specimens of *Hakea* from West Australia, *Grevillea rosmarinifolia*, *Cassia* sp., and fruit of a northern brush tree, flower spike of an aloe from Neutral Bay and photograph of Leopard wood.

Mrs. H. Matthews.—Donated a photograph of a Honey Locust tree, taken at old Burdekin House, to the Society.

Mr. S. Ashley.—Specimens of seed of which the aborigines used the pith to make a drink. The plants grow along the coast of West Australia, but are not known elsewhere.

Mr. Tebbutt.—Specimen of a spider.

Miss Peterson.—Seeds of granadilla.

Mr. Barnett.—Leaves of Brush box, *Tristania conferta*, and described the caterpillars which were destroying them.

Mr. Tebbutt.—Specimen of a cocoon of a case moth.

Mr. John Powell.—Specimen of a coccid gall, *Sphaerococcus* sp.

Mr. W. W. Froggatt called for volunteers for the position of Librarian.

Lecture.—Miss Thistle Y. Harris, B.Sc., delivered an extremely interesting and instructive lecture, entitled "A Talk About Some of Our Trees". The lecture was illustrated with many excellent lantern slides, and was much appreciated by the members. The lecturer was accorded a very hearty vote of thanks.

#### AUGUST, 1936.

The annual meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, August 4, 1936, at 8 p.m.

Mr. E. H. F. Swain, Commissioner for Forests, in the chair. The President (Mr. W. W. Froggatt), with about 100 members and visitors present.

Apologies.—Apologies for non-attendance were received from Mr. Frank Chaffey, Mr. Ross-Thomas, Mr. Harkness, Miss Thistle Y. Harris, and Mr. Hicks.

Election of office-bearers for year 1936-1937:—

President: Mr. Walter W. Froggatt, F.R.Z.S.

Vice-Presidents: Messrs. David G. Stead, A. E. Watson, Luke Gallard.

Hon. Secretary: Miss Dolce Dobbin.

Hon. Assistant Secretary: Miss Lillian Halloran.

Hon. Treasurer: Mr. John Powell.

Hon. Assistant Treasurer: Miss L. Kaylock.



Hon. Editor: Mr. E. H. Zeck.

Hon. Lanternists: Messrs. G. White and A. Booth.

Other Members of Council: Mesdames A. E. Watson, C. A. Messmer, Miss H. McAnene, Messrs. P. E. B. Barnett, M. S. Barnett, F. J. Ludowici, J. W. Hawley, J. C. Wiburd, A. E. Tebbutt, N. L. Roberts, and C. S. Ashley.

New Members.—Miss G. M. Jordon and Master Stan Nicholls were unanimously elected members of the Society.

Nomination of Members.—Mr. L. E. Tickner, Public School, Termeil, via Milton. Nominated by Mr. W. W. Froggatt, seconded by Miss D. Dobbin. Mrs. F. L. Bird, 60 Griffiths Street, Manly. Nominated by Mrs. Crisford, seconded by Miss D. Dobbin. Mrs. Lobban, 593 Willoughby Road, Willoughby. Proposed by Miss H. McAnene, seconded by Mrs. Jenkins. Miss Ross, 24 Fleet Street, Carlton. Nominated by Miss H. McAnene, seconded by Miss D. Dobbin. Mr. L. W. Roberts, 14 Brunswick Parade, Ashfield. Nominated by Mr. J. C. Wiburd, seconded by Mr. C. S. Ashley.

Annual Report.—The Hon. Secretary (Miss Dolce Dobbin), submitted the annual report upon the activities of the Society during the past year.

Treasurer's Statement.—The Hon. Treasurer (Mr. John Powell), submitted his financial report for the year ended July 31, 1936, as given elsewhere in this issue.

Presidential Address.—The President delivered his presidential address, entitled, "Notes on the Natural History of Central Australia", illustrated with lantern slides, many of which had been loaned by Professor J. B. Cleland, of Adelaide University.

Lecture.—Mr. E. J. Bryce delivered an extremely interesting and informative address on "Travel Notes, including notes on a Zoological Garden in Russia", which was illustrated with a large number of very beautiful lantern slides.

Exhibition of Specimens.—Miss T. Y. Harris: Collection of native flowers.

Miss Black.—A leaf from the garden of Gethsemane.

Department of Agriculture.—Collection of insects, including butterflies, galls, moths, etc.

Miss H. C. Butler.—A large collection of dried flowers from Broken Hill.

Mr. John Hawley.—Specimens of New South Wales timber, including white Beech, Rosewood, Red Mahogany, etc.

Mr. J. C. Wiburd.—Collection of insects and shell flower pots.

Mr. C. S. Ashley.—A large collection of minerals, specimens of merino wool, and Cascara bean.

Miss Dolce Dobbin.—Collection of shells, sea urchins and corals from Lord Howe Island, also collection of photographs taken on the Island.

Mr. W. W. Froggatt.—Collection of wild flower plants, and named specimens of wattles.

Mr. Luke Gallard.—A box of spirit specimens of insects, chiefly flies, which pupate in the earth and a collection of mixed insects.

Mr. M. S. Barnett.—Collection of mineral specimens.

Mr. J. W. Hawley.—Collection of mineral specimens.

Miss H. McAnene.—Prickly pear leaf showing cochineal insects.

Mr. Fifield (Bogan Gate).—Collection of native flowers.

Mr. M. E. Gray.—Specimens of insects.

Mr. Harris.—Pot plants and Moreton Bay chestnut seeds.

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EXTRACTS FROM ANNUAL REPORT OF THE HON. SECRETARY.

(Read at the Annual Meeting, August 4, 1936.)

The Naturalists' Society, now in the thirty-sixth year of its existence, can look back on another interesting and successful year, holding its own among similar societies, both at home and abroad, aiding and stimulating the study of natural history in all its branches.

Many inquiries have been received from country members, and specimens have been brought to our monthly meetings by members for identification.

We have received many courtesies from the Department of Education and have assisted many school teachers in their nature study work.

Parts 6, 7 and 8 of Volume 9, of the "Australian Naturalist", have been published, thus completing the ninth volume of our Journal.

Lectures have been delivered by experts in their particular subjects, and we here tender our thanks to them for their valuable assistance. The lectures given to the Society have been given in the Proceedings of each particular monthly meeting.

Our field excursions, under expert leaders, have, as in previous years, been well attended. Berry Island; East

Hills; Engadine; The Gorge, Glenbrook; Burning Palms Beach, National Park; the Boy Scouts' Camp, Pennant Hills; Cowan Creek; Epping; the Grotto, Middle Harbour; National Park; Ball's Head; Taronga Park Zoo and Waterfall were visited during the past year.

The fifth annual planting of Australian trees and shrubs was carried out by the North Sydney Council and the Naturalists' Society, at Ball's Head, on Saturday, July 4, 1936, when 250 trees, contributed by the Botanic Gardens, the Gordon Council and the Naturalists' Society were planted. The Assistant Minister (Mr. Shand), unveiled a dedication bronze at the entrance to the Reserve.

We have a large exchange list with our Journal and correspond with 63 kindred societies and museums, both at home and abroad, and we have in this way had many additions to our library, which contains many valuable books, but we have not a room where we can house them and place them before the members, so at the present time they are stored in five locked bookcases, at the end of a corridor, in the Education Building.

At our last annual meeting the membership had reached 197. During the year 23 new members have been elected, 2 have resigned, and death has claimed 4. The membership now totals 214.

On behalf of the Council I would call attention to the valuable assistance we have received from our Hon. Editor (Mr. E. H. Zeck), and the very able manner in which Mr. G. White, our Hon. Lanternist, has assisted at all our lectures.

In conclusion, I want to thank the President, the Council and my assistant (Miss L. Halloran), for their great help to me during the past year.

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#### SEPTEMBER, 1936.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, September 1, 1936.

The President (Mr. W. W. Froggatt), in the chair, with about 30 members and visitors present.

Correspondence.—Letter from Mr. H. H. Reece. G. W. Lupson, Port Moresby, forwarding specimens. Mr. F. A. Chaffey. Secretary Queensland Naturalists' Society. Parks and Playground Movement. Mrs. B. McCausland. Mr. A. Brown. Australian Forestry School. The Australian and New Zealand Association for the Advancement of Science.

Mr. E. H. F. Swain. The Acting Premier (Mr. Bruxner), re Government grant to Society. Mr. F. Chaffey re annual meeting. Mr. F. Johnson. (Held over from August.)

Letter from the Australian and New Zealand Association for the Advancement of Science re delegate. Minister for Works and Local Government re Grotto Point.

New Members.—Mr. L. E. Tickner, Mrs. F. L. Bird, Mrs. Lobban, Miss Ross, and Mr. L. W. Roberts were unanimously elected members of the Society.

Members' Evening.—Mr. M. E. Gray: Exhibited a mud-crab from Concord and fresh water sponges from Port Hacking.

Mr. C. S. Ashley.—Specimens of Bird's-eye Maple. Carved five-ply Japanese panel, and specimen of white Scotch Heather grown at Rockdale.

Mr. A. E. Watson.—Various botanical specimens, including *Macrozamia spiralis*, Lawyer Vine, *Calamus*, Walkinstick palm, etc.

Mr. W. W. Froggatt.—Stated that the seeds of *Calamus* are eaten by the aborigines. He exhibited specimens of the West Australian Golden wattle, *Acacia spectabilis*, *Acacia discolor*, *A. cyanophylla*, *Eriostemon myrtrioides*. Mr. Froggatt also mentioned that he had received a letter from Mr. H. C. Wintle, Flora Valley Station, via Halls Creek, East Kimberley (some 400 miles inland), giving an account of the Night Parrot, *Geopsittacus occidentalis*.

Mr. Luke Gallard.—Exhibited lantern slides, illustrating the life history of a dragon fly, daddy-longlegs fly, a lacewing and several timber moths, also various slides of other insects.

Miss Jean Colditz.—Lantern slides showing seed testing incubators.

Mr. M. E. Gray.—Slides showing beauty spots on Heathcote Creek and creeks in National Park.

Mr. David G. Stead.—Exhibited many beautiful slides illustrating the jungle flora of the Malay Peninsula.

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#### OCTOBER, 1936.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, October 6, 1936, at 8 p.m.

The President (Mr. W. W. Froggatt), in the chair, with about 45 members and visitors present.

Correspondence.—Messrs. J. Powell, P. E. B. Barnett, J. W. Hawley, N. L. Roberts. Miss L. Kaylock. Master J.

G. Ramsay McCallum, Chatswood Council, re destruction of trees. Field Naturalists' Society, Adelaide, re contribution of flowers for show. Parks and Playground Movement. Miss T. Y. Harris re flowers sent to Queensland Naturalists' Society. Perpetual Trustee Co., Ltd., stating that the Society could not participate in the Cope bequest. Miss B. McCausland, Coonabarabran. Taronga Park. Mary Barnfield. Miss E. Barling. Mr. H. C. Wintle, Kimberley.

Nomination of Members.—Miss Jessie Jamieson, 69 Grandview Street, Pymble. Nominated by Miss P. Watts, seconded by Miss D. Dobbin. Mr. H. C. Wintle, "Euroto", No. 3 Bore, via Hall's Creek, East Kimberley, West Australia. Nominated by Mr. W. W. Froggatt, seconded by Miss D. Dobbin.

Announcements.—The President announced that the Warringah Shire Council had now purchased the Dee Why Lagoon, and it was hoped that the Council would convert it into a sanctuary.

Exhibition of Specimens.—Mr. A. E. Watson, specimens of a weed. Mr. Watson also described Mr. Ashley's exhibit, *Banksia latifolia*, and Mr. Wiburd's exhibit, *Grevillea* sp., and *Banksia fosteri*, which resembles a silky oak, *Grevillea robusta*.

Mr. John Hawley.—Necklaces of shells made by aborigines of the Illawarra tribe fifty years ago.

Mr. Ingram.—A collection of various insects.

Miss H. McAnene.—Collection of shells from the Solomon Islands.

Mr. W. W. Froggatt.—Seeds of the *Jacaranda*, the pods of which contained approximately 75 seeds, and specimens of *Acacia sentis*.

Lecture.—Miss Joyce Allen delivered an extremely interesting and instructive lecture, entitled "The Life and Habits of Shells", illustrated by numerous lantern slides. The lecturer was accorded a hearty vote of thanks.

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#### NOVEMBER, 1936.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, November 3, 1936, at 8 p.m.

The President (Mr. W. W. Froggatt), in the chair, with about 50 members and visitors present.

Correspondence.—Letter from Miss L. V. Kenneth, Miss R. Parkinson, Commonwealth Quarantine officer, re visit of members to Quarantine grounds. Mr. E. J. Bryce re

lecture. Mr. Ashley. Parks and Playgrounds Movement. Chatswood Council re Reserve at Artarmon. Mr. Welch re lecture.

New Members.—Miss J. Jamieson and Mr. H. C. Wintle were unanimously elected members of the Society.

Nomination of Members.—Mr. T. E. Rofe, Woonona Avenue, Turramurra. Nominated by Mr. W. W. Froggatt, seconded by Mr. John Hawley. Mr. M. Reid, Battersea Road, Abbotsford. Nominated by Mr. W. W. Froggatt, seconded by Miss D. Dobbin.

Lecture.—Mr. Walter F. Gale delivered an extremely interesting and informative address on "Recent Advances in Astronomy", illustrated with many fine lantern slides. The lecturer was accorded a hearty vote of thanks.

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DECEMBER, 1936.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, December 1, 1936, at 8 p.m.

The President (Mr. W. W. Froggatt), in the chair, with about 70 members and visitors present.

Correspondence.—Postmaster-General, Mr. M. B. Welch, Miss Peterson, Miss K. Maccabee, Mr. Lupson, Parks and Playgrounds Movement.

New Members.—Mr. T. E. Rofe and Mr. M. Reid were unanimously elected members of the Society.

Exhibition of Specimens.—Miss T. Y. Harris: Specimens of green-flowering *Callistemon*, from East Hills. Miss Harris also called attention to the profuse flowering of Banksias, Silky Oaks, etc., in Sydney gardens, which she thought was due to the continuous dry weather.

Miss H. Butler.—Specimens of Shamrock and Clover.

Mr. Luke Gallard.—Specimen of moth found on "Native Broom" at Forbes.

Mr. John Hawley.—Specimens of Kauri Pine, White Pine, and a sample of soft wood, which had been immersed in sea water and had been attacked by marine borers.

Mr. A. E. Watson.—Specimens of Fennel, Bladder-Wort and Cape Chestnut, collected by Mr. Ashley.

Miss McKellow.—Grey fan-tail's nest from the Richmond River. Miss McKellow also mentioned that the Ibis and Heron were not nesting this year in the Richmond and Clarence districts, owing to the dry weather.

Mr. A. Booth.—Cast of maori head, and kiwi, new Zealand snail, specimens of wood turning into coal, a

deer's head showing antlers, and a rare type of parasitic root fungus. Mr. Booth mentioned that red deer had become a pest in New Zealand and were causing great damage to the undergrowth.

Mr. W. W. Froggatt.—Specimen of pink-flowering Eucalyptus.

Miss Peterson.—Various botanical specimens.

Mr. S. Ashley.—Specimens of timbers.

Lecture.—Mr. M. B. Welch, B.Sc. (senior research officer, Forestry Commission), delivered an extremely interesting and instructive lecture, entitled "A Trip Through New Zealand", illustrated with numerous lantern slides, and also an excellent series of films, showing the cities and beauty spots of New Zealand, loaned by the New Zealand Tourist and Trade Commission and demonstrated by Mr. Inglis, of that Department. The lecturer was accorded a hearty vote of thanks.

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#### FEBRUARY, 1937!

The ordinary monthly meeting of the Society was held in the Art Gallery, Department of Education, on Tuesday, February 2, 1937, at 8 p.m.

Mr. David G. Stead in the chair, with about 45 members and visitors present.

Correspondence.—Department of Education re Assembly Hall. Miss P. Bourke. Miss Dorothy Jones. Miss D. M. Anderson.

Announcements.—Mr. Stead announced the death of Mrs. M. Howell, and referred to the illness of the President (Mr. W. W. Froggatt).

Exhibition of Specimens.—Mr. John Powell: A cone shell from the Barrier Reef.

Miss T. Y. Harris.—Specimen of pink-flowering tea-tree, *Leptospermum*, which had been cultivated.

Miss Jean Garling.—Specimen of paper bark, jasper and fossil of a fish from Victoria.

Mr. A. E. Watson.—Seedling of the Grey-Bark tree, grown from seeds collected by Miss Dobbin at Lord Howe Island.

Mr. S. Ashley.—Collection of plants which were described by Mr. Watson.

Miss D. Dobbin.—Coloured photograph of *Poinciana regia*, and seed-pod of same, also seed-pod of Kurrajong and a fan made from various Queensland timbers.

Mrs. Rudder.—Flowers of *Cobaea scandens*.

Mr. J. C. Wiburd.—Flower pot made of concrete and decorated with shells from Sydney beaches.

Mrs. H. Matthews.—Suggested re bi-centenary next year that the Naturalists' Society and the Historical Society unite and present a floral clock to the city. The clock to occupy the space where the rose bed marks the centre of the old Exhibition Building in the Palace Garden Grounds.

Mr. Stead suggested that the question be put to the Historical Society at their next meeting, and then referred back to this Society for discussion.

Mr. D. G. Stead.—Stated that members had probably noticed paragraphs in the papers re sword fish. These spear fish, black and striped marlins, were present in the Sydney waters, and five fish of from 80 to 200 lb. in weight had been taken off Watson's Bay during the past week. Three of these fish had been cut up and sold at Watson's Bay, for the first time in the history of Sydney.

Mr. Stead also stated that he had previously mentioned that these fish were present in our waters, but they were not surface fish, and needed special tackle for fishing; he predicted that deep sea game fishing would be of special interest to tourists in Sydney.

Lecture.—Mr. K. A. Hindwood, R.A.O.U., delivered an extremely interesting and informative lecture, entitled "Birds of the Sydney district", illustrated with numerous lantern slides. The photographs of most of the birds shown had been taken by the lecturer. At the conclusion of his address, Mr. Hindwood was accorded a hearty vote of thanks.

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#### NOTICE TO COUNTRY MEMBERS.

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Country members may obtain reliable information about any specimens of natural history they may collect and forward, addressed to the Hon. Secretary of the Society, Box 2178 L.L., G.P.O., Sydney.

No members should be afraid to forward specimens because they are common to their district; they may be rare and interesting examples of our flora or fauna not found elsewhere, and, if of general interest, notes on such specimens could be published from time to time in "The Australian Naturalist."



## SPECIAL NOTICE.

## Exchange and Mart.

It is particularly desired to draw the attention of members to an innovation, of importance to many, which it is proposed to introduce at the monthly meetings.

Beginning with our meeting on June 1 next, and thereafter as may be determined by the Council, it is proposed to conduct an "*Exchange and Mart*", following the usual formal business. This, it is hoped, should prove mutually advantageous to members and to the funds of the Society.

BOOKS, POTTED SEEDLING SHRUBS and TREES, also suitable NATURAL HISTORY SPECIMENS, which are the property of individual members, may be brought to the meeting and disposed of by Sale or Exchange, under the following conditions:—

(1) In cases of EXCHANGE, the Book, Seedling or Specimen shall be submitted to the Honorary Secretary, and shall be laid on the table for inspection by members. The resultant exchange shall be effected publicly in the presence of the assembled members.

(2) In cases of SALE, the Book, Seedling or Specimen shall be handed to the Honorary Secretary, or to an official elected for that purpose, and shall then be laid on the table for inspection by members. The Price shall be affixed to the Book, Seedling or Specimen, and the object shall be offered by the Chairman, at the marked price—or a lower one if acceptable at the time—

*PROVIDED, that in each and every case a discount off the price received, of not less than one-third, shall be paid into the funds of the Society.*

All Sales shall be made in public before the members assembled and only during the time allotted by the Chairman for such purpose.

(3) In the event of there being a large number of exchanges or sale offerings, the Chairman's ruling shall be accepted, as to which, or as to how many, shall be brought forward at that meeting.

Due notice of the above will be inserted in the monthly notice for the JUNE meeting, but members are given this advance notice to enable them to set aside or to prepare objects coming within this scheme which may be deemed suitable.

THE SNAIL (*HELIX*).

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In the left and right spirals, the volute of the Ionic Column of the order of Ionic Architecture, we have evidence in early history that the meek and lowly snail had impressed its form and dignity in leitropic (left-handed) and dixitropic (right-handed) spirals on the volute, that with grace and neatness, supported the heavy beams and lintels above the entrance doors of palaces in ancient Iona.

Strange to say, since those far away days, in nature, the left-handed spiral has given way to the right-handed spiral, and left-handed, with few exceptions, exist to-day.

On the English coast, near Bournemouth, fossil left-handed shells are found in the chalk deposits, whilst right-handed are living close by at the present time.

The snail has the credit of being one of the first marine creatures to desert the sea, the reason given, is that, as the rivers carried dissolved mineral salts to the ocean, it became more saline, and grew distasteful to the snail's well-being. Then, step by step, the snail made its way by inlet and estuary to brackish freshwater, and thence to land, and also, from the carnivorous, became a vegetarian tribe.

The composition of the shell varied in texture, and is now composed of calcium carbonate matrix, conchoyolin, a horny substance somewhat similar to the covering of insects, lined inside with a layer of nacreous argonite.

It is still interesting to watch the snail on the garden path, and the direction in which it travels.—J. W. HAWLEY.

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## NOTICE TO MEMBERS.

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Members are reminded of rule 4 of the Society which reads: "All subscriptions shall become due on the first day of August and shall be payable in advance."

# The Australian Naturalist

Vol. X.

NOVEMBER, 1937.

Part 2.

## THE NATURALIST IN AUSTRALIA AND AN OUTLINE OF THE FAUNA OF AUSTRALIA.

By DAVID G. STEAD.

(Presidential Address, given at the Annual Meeting  
of the Society, August 3, 1937.)

### INTRODUCTORY.

Probably no country in the world has ever offered such an attractive field to the naturalist as Australia has, right from its earliest beginnings.

In saying this I think that I may safely claim that it applies even when we use the term naturalist in a very wide sense—to include not only the field naturalist and simple nature lover, but students and specialists of fauna and flora groups of all kinds, and the geographer inquiring into the basic earth conditions under which the plant and animal life of this Continent developed and have their existence to-day. It seems to me to be peculiarly fitting that this should be so, in view of the fact that Australia is, very particularly, the child of bright-eyed science and that we owe our occupancy of this land to the explorations of James Cook, whose geographical researches and discoveries were incidental or complementary to the pursuit of astronomical studies in southern seas, at the behest of that great English scientific society, the Royal Society of London.

From earliest times, the scientific explorer visiting these shores marvelled at the strangeness of the plant and animal life which he found—plants of altogether unknown groups and animals, some of which, at least, seemed to defy the classification of the time. The deeper these inquirers delved the more were they amazed at their discoveries—the glory and the beauty and the wonder of our trees and many of the flowering plants, the marvellous native animal life without a parallel in any other part of the globe.

And then, shortly, as discovery proceeded, a further fact emerged—that not only were many of the representatives of the fauna and flora of an archaic type, but that quite a number were what we might term biological out-livers, survivals from past geological ages. Thus was justified the appellation so shortly to be given to Australia, “the Land of Living Fossils”.

#### AUSTRALIA'S EARLY FAME.

So, because of these outlandish botanical and zoological features, rather than for any particular interest in human affairs or colonial development, Australia very shortly came into a mighty fame right throughout the world, and a great demand set in for information of all kinds relating to the country.

I might here mention just one fact to give point to what I have just said. Australians are perhaps justly proud of beautiful Port Jackson (Sydney Harbour), and, when abroad, in other countries, they find it to be well known. But the fame of Port Jackson arose, I think principally, because it was the home of that most ancient fish survival, that living fossil, the Port Jackson Shark. This has been described and illustrated in every great school and college and other seat of learning in all the principal parts of the world for many years past, until quite a large number of world citizens think only of Port Jackson as the home of this strange shark—and even expect to see it here, reveling in the waters in large numbers, if they should happen to come here!

The Australian plant world also revealed these living fossils at an early stage, and such collections as reached Europe created great interest. On every side were strange new species of plants of the most diversified character. Joseph Banks, to whom Australians as a whole owe so much, was the first to perceive the glory of this exotic flora, and must have been occasioned much joy and interest as he beheld the vast range of even those species with which he came in contact. One feels that Yarrington, in his poem, “*Coelestia*”, did not overstrain this when he made Banks to say, in his dialogue with Cook:—

“Our soul o'erflows with joy as we behold  
The lovely blooms which gem the woodlands fair,  
Unknown, unseen before by any eye  
That kens the wonder of Botanic lore.

These trees are new, these orchids, ferns and flowers,  
With strange mysterious petals, all unknown;  
They are but emblems of a myriad truths  
Which yet shall yield their treasure to man's gaze."

The Banksian collections, of which some are at the Botanic Gardens Herbarium in Sydney, actually formed the basis of our systematised knowledge of Australia's flora. Here, it is interesting to repeat what I have mentioned elsewhere, that, through the agency of some of Banks' seed collections, Australian trees were actually growing in England before the foundation of the colony of New South Wales.

#### OUR DEBT TO LINNAEUS.

While it is not my object in this address to give either a historical or a systematic account of the development of our knowledge of our fauna and flora, it is opportune to refer to our debt to Linnaeus, that towering genius in the systematic study of animated Nature.

Perhaps I may quote shortly from a previous article on Australian Nature Books, written two years ago, in which it was pointed out that the twelfth and last edition of the mighty "Systema Naturae", published during the years 1766-68, just made its appearance at the psychological moment to aid the investigators who were to do so much in making known the flora and the fauna of Australia. It contained a systematic exposition of all that was known on the subjects of Botany and Zoology expressed in terse and precise language. This work appeared just in time to be assimilated, in readiness for the assembling of knowledge of an unknown land, which was to offer the most extraordinary types of animal and plant life that the world had ever known. This epoch-making work made it possible to lay the foundations of a classification—without which there could be no real understanding—of the living wonders of the Australian region, in such a way as to prevent such subsequent confusion. Banks, let us remember, was one of the few English followers of Linnaeus at the time, while Solander (who accompanied Banks) was a favourite pupil of Linnaeus.

The naturalist will understand the importance of these features of our early nature study. It is one thing to merely admire Nature, but we do not get very far without the aid of the systematic naturalist to tell us what it is that we are looking at.

## EXQUISITE BEAUTY OF BIRDS.

In his Journal, Captain Cook, after speaking of the great variety of plants collected by Banks—which caused him to name the place Botany Bay—said: “The woods abound with birds of exquisite beauty”. In other places he and Banks have referred to these Australian birds.

It is of special interest to read what the very earliest observers had to say about these and others of Australia's natural faunal possessions, for, a little later, after settlement had begun, the naturalist was not very prominent in the inhabitants. Indeed, it was rather the fashion to decry Australia's birds for long afterwards. But one may put this down, not as a result of actual observation, but to the fact that life was so hard in those early days of the Port Jackson Settlement. As settlement advanced and the Australian countryside was opened up, an admiration and love of Nature soon asserted itself, and with this came understanding. To-day our bird lovers in Australia go in legions, while quite a considerable number of observing naturalists are continually adding to our knowledge of these sweet bushland creatures, which are an essential part of the make-up of Australia, in the esteem of even the ordinary everyday Australian.

In those early days there was not much understanding of, or admiration for, the bush itself; but again, only because of the difficulties surrounding existence, and the cruel hardships endured in endeavouring to wrest a living from the unwilling soil. The forest was then, to most, an enemy—even a gaoler—preventing the sadly inexperienced settler from finding suitable lands for agricultural development. But later on, again, with the advent of more prosperous conditions, due to the opening up and development of the country, a better realisation of the beauty and economic utility of the trees and forests grew up—though, sadly enough, not before vast damage had been done by needless destruction or ill-managed forest exploitation.

A passing thought might be set down here: That it may be taken as a *sine qua non* that, although an appreciation of Nature varies so largely among individuals, it is clear that there can be no general appreciation in a community which has not reached at least a moderate stage of economic development and security.

## WHERE ARE THE TREES?

The bush-loving naturalist and the tree-lover of to-day must sometimes sigh for some of the native beauty which once existed upon the actual sites of our capital cities. A few years after Cook and Banks saw and admired our forest trees and exquisite birds and had marvelled at the marsupials, when Governor Phillip landed and made our first settlement, he also found these woods filled with these wonderful and charming birds.

And so on, wherever the white man went in his settlement, at least of the coastal fringe of Australia, he found these beautiful bushlands filled with feathered songsters. And now, what has happened to these trees and birds which Cook and Phillip so loved? Over large areas of Australia they have both gone, because we have destroyed them. At least we destroyed the bush, and when the bush was gone the birds were without homes, and without their food providers, the trees.

A great deal of the destruction of the bushlands was, of course, inevitable. Houses had to be built and trees cut away to make room for them; land had to be cleared of trees to make room for crops of wheat, corn and barley, vegetables and fruit trees. Large tracts of land had to be made bare of trees to grow grass for sheep and cattle and horses. Then, again, thousands of trees had to be cut down to make room for railways, roads and other purposes. It is obvious, therefore, that under the best of circumstances we could not have avoided a considerable amount of tree destruction as a concomitant to ordinary development—in providing for our needs in building cities, towns and villages, in growing our food supplies and wool, in getting our timber and firewood, and in arranging our transport, so that we could easily move about the country and could move our food commodities, our timber, our coal and other things.

But, unfortunately, our tree destruction did not stop there; and so we have destroyed countless thousands of other trees by burning and chopping them down all over Australia, when we might have preserved them for their beauty, for their shade, and for their vast present-day utility for forestry work, rainfall conservation and prevention of erosion. Incidentally, we might have still possessed on many lands which are wasted and laid bare, a great tree and even forest cover, filled with our birds and other indigenous wild life, to remind us that this is still Australia.

## INCREASING INTEREST IN NATURE.

I am afraid that I may be arraigned for turning this Nature talk into a general discussion on wild life and tree conservation. Though that is not my intention, it is almost impossible for the naturalist to discuss the interests or the problems of the naturalist in Australia without dwelling to some extent on what might have been, and what may still be, with care and united effort as a nation.

I have been discussing mainly the birds and trees, but a very large part of our marsupial life has gone, too; and this very largely by defying the advice of the informed naturalist—and by callous, cruel and most unworthy considerations of some temporary financial gain to be had by a small part of the population at the expense of the most interesting wild fauna in the world.

The naturalist cannot take such things lying down. It is his privilege, because of his knowledge, and his bounden duty, to fight in every way for preservation and restoration work of the most effective kinds—to stop senseless and cruel slaughter likewise and to endeavour to bring back to the remaining bushlands as much as possible of the native wild life. And this, not as some people seem to think, that he may have them only for his own personal enjoyment, but that the people may have, for all time, something of that real wild Australia—that fascinating and charming land, which our forebears found, and which belongs, not to any one generation, but to all peoples of rising and future generations.

But now I come to a gratifying aspect of this matter: During the last thirty years or so there has been a steadily rising flood of interest in wild Nature throughout the whole of Australia. This has exhibited itself in various ways, such as love of outdoor life, in every form; bush walking and seaside rambling; actual Nature or Natural History study; close and detailed attention to botanical, zoological and geographical subjects; the study of natural resources from the economic standpoint; a widespread interest in forest, and other bushland conservation measures; and the preservation and restoration of our wild life. Concomitant to this—partly a cause and partly a result—has been an ever-increasing stream of books, papers, and other publications on almost every conceivable aspect of the various subjects. Further, there is a greater and still greater tendency for attention to be paid to these important things in the educational systems of the various States; and this



alone, must, in the end, bear very good fruit; for, in the long run, education must be considered as far more effective than all forms of restriction or enforced behaviour by law or ordinance—it does, in fact, create the atmosphere for a universal law, subscribed to by the people-at-large out of their own intelligent understanding.

#### ORGANISATIONAL ACTIVITIES.

A crystallization of this growing interest is also to be found in the increasing tendency toward the formation of young people's organisations such as the Gould League of Bird Lovers, the Junior Tree Wardens (both with membership of tens of thousands), various School Tree Lovers' Leagues and Nature Study Clubs; while among the youth and older people we find a constantly growing list of clubs and leagues of hikers, of field naturalists, of public Tree Lovers' Civic Leagues, and of general organisations of a State-wide or even a national character, devoted to the study and the preservation of wild life and the flora, as well as of rural scenery and the forwarding of forestry work.

And all this is additional to the steady flow of detailed scientific work that is being put out by the old-established societies, by Government Departments of States and Commonwealth, and by various Museum organisations—covering many departments of botanical, zoological, geographical, forestry, and other work in which the naturalist in Australia is distinguishing himself. Use of that masculine last word, reminds me to say, also, that not the least gratifying thing about all this increased attention is that quite a good deal of it is being contributed by the women of Australia; many of whom are highly distinguished in their particular class of work.

In a recent article referring to the late president of the Naturalists' Society of New South Wales, published in the previous number of "The Australian Naturalist", I gave some details of the work and influence of this Society during its thirty-seven years of existence, so I will content myself here by saying that it has maintained a consistent usefulness in producing Nature students, in promoting knowledge and experience for rising naturalists, while furnishing to many advanced naturalist-specialists a convenient and useful ground for the furtherance of their work. The operations of this Society alone have taken us into the widest fields of Nature in Australia, and into many

obscure corners! And, geographically, they have carried us from "The Leeuwin" to Cape York, from the uttermost points of Tasmania to the Far Nor'West; with, also, many a journey to the vast interior, thrown in for good measure.

I now proceed to the Second Part of this address, in which I have furnished "An Outline of the Fauna of Australia".

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### AN OUTLINE OF THE FAUNA OF AUSTRALIA.

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In the following outline of the fauna of Australia, I have endeavoured to deal shortly with the subject and in such a way as to indicate to the reader the principal types in the make-up of that fauna, rather than to attempt any detailed consideration of any particular group. This, it is thought, will satisfy the preliminary needs of the general student of our wild life, while giving to the teacher, and school or college student, a handy little general guide to the subject.

#### 1.—MAMMALS.

Australian indigenous mammals are included in the following orders or natural groups:—(a) MONOTREMATA, the egg-laying Monotremes; (b) MARSUPIALIA, the Marsupials; (c) CETACEA, the Whales and Dolphins; (d) SIRENIA, the Dugongs; (e) CARNIVORA, Wild Dogs (Dingo) and Seals; (f) RODENTIA, the Water Rats and true Bush Rats; and (g) CHIROPTERA, the Bats and "Flying Foxes".

Ungulates or hoofed animals, Edentates such as Armadillos, Sloths, etc., and Insectivora like Moles, Shrews, Hedgehogs, etc., are absent from the Australian fauna, as are representatives of the Primates other than man himself.

(a) MONOTREMES.—In this order are included three highly extraordinary mammals, which, in some respects, are akin to the birds and reptiles. These are the Duck-billed Platypus or Mallangong, *Ornithorhynchus anatinus*, the Porcupine Ant-eater, *Tachyglossus aculeatus*, and the curious *Proechidna* or *Zaglossus* of Papua and other parts of New Guinea.

From its earliest discovery in Australia, the Platypus has been a sort of world wonder and animal paradox. Certainly it has been more widely discussed by both scientists and laymen than any other existing animal. While it is a true mammal—furnished with functioning mammary or

milk glands—the female produces eggs. These are about eighteen millimeters in diameter and are deposited in a very carefully prepared nest at the end of a long burrow in the bank of some stream or lagoon. The nest may be bedded with grass, leaves, shredded reed-stems, roots of aquatic plants, etc. As soon as the nest is completed and before the eggs are laid, the female plugs the burrow at intervals with thick septa or partitions of hard clay-like matter (individually up to as much as nine inches in thickness). As many as nine of these plugs have been noted in a single burrow! At the end of the burrow, safe from all intruders, the female Platypus incubates her eggs. Usually there are two of these. The young are quite naked at birth, and for some weeks after.

The adult Platypus attains to about 700 millimetres in the male, and about 475 mm. in the female. The body is entirely fur-covered, with the exception of the webbed feet and the smooth muzzle, which are covered with a soft black kid-like skin. The male has a large perforated spine on each hind limb, connected with a gland (called the crural gland) which secretes a venomous fluid. These spurs are weapons of offence and defence, and are also used as organs of prehension in holding the female.

The habitat of the Platypus is confined to that part of Australia (including Tasmania) lying to the east of 138 deg. E. long., excepting York Peninsula, from which it has not yet been recorded.

Though it seeks its food entirely in the water, the Platypus is normally not able to stay submerged longer than two or three minutes. The food, which consists of aquatic organisms of various kinds, is stowed away by the horny tongue into cheek pouches to be masticated at leisure. Among the food taken by myself from Platypus on the Murrumbidgee River some years ago, I found large numbers of the very young pond snails; for size, like large grains of sand.

The Porcupine Ant-eater or Echidna is entirely a land animal and is covered with a great array of porcupine-like spines. It is, however, not in any way related to the true porcupines, which are rodent animals. The muzzle in the Echidna is much reduced in size, compared to the Platypus, and is almost tubular. The tongue is extremely long and is highly extensible. It is used by the animal in its raids upon the nests of both termites or white ants and the true ants. It is covered with a very viscous fluid, to

which the insects adhere as the tongue searches their galleries.

This monotreme is to be found all over Australia, with the exception of certain desert parts, as well as Tasmania and parts of Papua.

The feet are well-adapted for rapid burrowing; being armed with great recurved claws. In the Australian mainland varieties or species of this animal the strong spines are interspersed with harsh bristles. In the Tasmanian form the bristles are very pronounced. In the two species of *Zaglossus* (*Proechidna*) found in Papua, the muzzle is very prolonged and is curved somewhat like the beak of the Ibis.

In all of these monotremes, as in birds, reptiles and amphibians (frogs, newts, etc.)—there is but a single cloaca or chamber into which open the reproductory, urinary and intestinal canals.

(b) MARSUPIALS.—Most prominent amongst this group of typically Australian mammals are the Kangaroos and Wallabies and allied terrestrial—or, more properly, ground-dwelling—animals. But many of the species are wholly arboreal in habit, and have been adapted for all conditions of living which in Europe would be occupied by mammals of the orders Carnivora and Insectivora. In fact, this statement may be said to be true of the marsupials as a whole; which, in Australia, occupy—or have occupied in past geological times—almost every position taken up in other lands by mammals of every known group.

Kangaroos and Wallabies and their kind, are marked by a great development of the hinder limbs; so that progression is made by a series of leaps. Slower progress is also normally made—such as in feeding—on all fours. During their leaping movements the Kangaroos are steadied only by their thick and heavy tails, which play no other part in progression. It is as well to emphasise this in view of frequent statements, even among Australians, that the tail is a kind of supplementary ambulatory organ. Quite a number of fairly reliable works also have perpetuated the erroneous statement as to the alleged violent thumping of the ground by the tail to expedite the movement of the animals over the ground.

The largest species is the Great Grey Kangaroo, *Macropus giganteus*. This is very widespread in Australia, as is the common Red Kangaroo, *Macropus rufus*. The latter is particularly abundant on the vast stretches of red

soil country in the eastern parts of inland Australia, while the former is more generally diffused over the continent. Probably the next most important would be the well-known Wallaroo, *Macropus robustus*, a hill or mountain kind, very widely distributed and undergoing so much variation, according to locality, that several well-marked varieties are recognised. This species, though not so tall as the Great Grey Kangaroo, is relatively more heavily built and is certainly one of our largest marsupials.

One of the most distinctive varieties (by some recognised as quite a distinct species) is the beautiful Isabelline Kangaroo, *Macropus isabellinus*, of Barrow Island, in Western Australia. A slender large species inhabiting central northern parts of Australia, is the Antilopine Kangaroo, *Macropus antilopinus*.

The smaller types of Kangaroo are known generally in Australia as Wallabies; but there is no real generic difference between the two groups—or perhaps I should say more properly that there are not really two groups. Many kinds of Wallaby inhabit the coastal scrubs, as well as inland forest country. A notable and very beautiful kind is the Rock Wallaby, *Petrogale penicillata*, which occurs in a coastal strip of hill and mountain country reaching from Queensland to Victoria. This brightly coloured little marsupial has long fur-like hair, has smaller and more prehensile hind feet, and a tail which is soft and pliant—as compared with the stiff rounded tails of the ordinary ground kangaroos and wallabies. There is a brush-like end to the tail, hence the name sometimes applied, of “Brush-tailed Kangaroo”. These extraordinary marsupials are able to make their way through the roughest of mountain country, leaping from rock to rock with goat-like agility. In some places they scale almost perpendicular faces of cliffs; notably in the limestone regions of Jenolan Caves in New South Wales.

The Rat-Kangaroos (more commonly known as Kangaroo-Rats) are small species inhabiting bush country. They are principally nocturnal in habit. The hind legs, although well developed, are used more for squatting on; and in ordinary progress through the bush the four of the limbs are used freely. There is a good deal of variation among these smaller kangaroo kind, and several genera are known from different parts of the continent. The most abundant is the common Rat-Kangaroo or Potoroo (native

name), *Potorous tridactylus*, found in south-eastern Australia and Tasmania.

One of the most interesting forms of marsupial life to the naturalist—because of its departure from the terrestrial existence without much change of form—is the Tree Kangaroo, *Dendrolagus*, several species of which are found in the far north of Queensland and in Papua. In these the limbs are more nearly equal, although the general kangaroo form is, in the main, maintained. They are true tree dwellers, living in forest and mountain country.

The Australian Phalangers (*Phalangeridae*) or 'Possums' are arboreal marsupials in which the four limbs, and the tail as well, are strongly prehensile. There are several well-known species; notably the Common Possum, *Trichosurus vulpecula*, found all over the habitable parts of Australia—except the extreme north. The Cuscuses (*Phalanger*), of the Austro-Malayan area, are also represented in the Cape York region by one species. The Ring-tailed Possums, *Pseudochirus*, in which the tails are highly prehensile and not brushy as in the Common Possum, build globular nests in dense bushes. These nests are remarkably like those of some of our birds. The so-called Flying Possums and Flying Squirrels are aberrant forms of great interest. In these there is a skin extension which may be held out parachute-like to enable the animals to soar down from some tree to the ground or to the base of a neighbouring tree. Progression by this means through a forest is quite rapid. Smaller species, of the genus *Petaurus*—one of which is known as the Sugar Squirrel—are very beautiful. Like others of their type they are nocturnal and seldom seen. In the author's boyhood days they were quite common in the bush all round Sydney, particularly in the vicinity of Middle Harbour, Port Jackson.

The smallest species of the Phalangers, and of the flying type, is the so-called Flying Mouse, *Acrobates pygmaeus*. It is quite minute, with a small mouse-like body, with tiny "wing" extensions, and a flattened tail, very like a feather and having the hair arranged like the lateral webbing in birds' feathers. Needless to say, that, although the term mouse has been applied to this marsupial, it is in no way related to the true mice.

In all of these flying phalangers the tail is of great importance in stabilising the body during its passage through the air. In the Pigmy Phalangers or Dormouse Possums, which are like tiny replicas of the Common

Possums, the tails are very prehensile, and have a smooth almost rat-like appearance. These dainty little animals are found in the forest country of south-eastern Australia and in Tasmania. Timber getters in big timber often come across them when felling trees.

The Koala (pronounced almost Ko-la) or Native Bear, *Phascolarctos* is a member also of the *Phalangeridae*, though very different in many ways to the other species. It is entirely arboreal, subsisting upon gum (*Eucalyptus*) leaves, and has grasping feet, wonderfully adapted for holding on to the tree branches, while it is feeding. The hind feet are particularly developed to this end. Though a true marsupial and therefore in no way related to the bears of the Eur-Asian or American continents, there is some justification for the application of the familiar name of "Native Bear" popularly applied to this extraordinary species. The Koala is tailless, has a short thick body, woolly ears, and a naked round black muzzle. It grows to about the size of a small European Bear. One young one is produced each year, about July or August. After the young leaves the pouch or marsupium, the mother carries it about on her back until it is able to fend for itself.

The Koala exists naturally in Queensland, New South Wales and Victoria. Very great destruction of this species has taken place in recent years, and efforts are being made to resuscitate it as far as possible over at least the main portion of its original habitat.

The Wombats, *Phascolomys*, are heavily-built bear-like marsupials, living entirely on the ground, in which they dig large holes for their homes. They are restricted to the south-eastern corner of Australia and Tasmania. In these, the muzzle is very short and stout and the claws are strongly developed to aid their digging operations. Like the Koala, the Wombats are tailless.

All of the foregoing marsupials belong to the section known as *Diprotodontia*, characterised by the possession of two prominent front teeth in each jaw—giving to these animals a passing resemblance to the *Rodentia* or rat family. The ancient *Diprotodon*, found only in a fossil state in Australia, and distantly related to the present Wombats, is an outstanding example of this section of the marsupials.

Many other marsupials, chiefly insectivorous or carnivorous, belong to the great group of *Polyprotodontia*, of which the extinct Pouched, or Marsupial, Lion, *Thylacoleo*,

is a prominent fossil example. The Polyprotodonts are strongly represented by a number of existing groups, of which the Dasyures or Native Cats are very widespread throughout Australia—especially in the eastern and south-eastern parts and Tasmania. In the latter State we have the Tasmanian “Wolf” or Tasmanian Tiger, *Thylacinus cynocephalus*, a large beast of nearly wolf-like proportions, but lower in build. The Tasmanian Devil, *Sarcophilus*, is a thick-set Dasyure of small but powerful build, and possessing a relatively very large head. Mainly the Dasyures are of small and slender build. They are of insectivorous or carnivorous habit, according to opportunity.

The Pouched “Mice” or Marsupial Rats are related to the Dasyures and range from a small mouse-like species, *Sminthopsis minutissima*, to others of the size of an adult rat. Closely related to these is the so-called Jumping Mouse or Jerboa Pouched Mouse, *Antechinomys*, which is found in certain desert regions in desert Australia.

Very nearly allied to the Dasyures is the strange little Banded Ant-eater or Myrmecobe, *Myrmecobius*, found in the more arid parts of south and western Australia. This has no marsupium or pouch. It attains to the size of a very large rat and obtains its food—ants, termites and other insects—either on the ground or in the trees. As it is well adapted to climbing, it is practically as much at home in the trees as on the ground.

The Australian Bandicoots, *Peramelidae*, with several genera, are spread over Australia; being most abundant in eastern and south-eastern parts. They subsist chiefly upon roots and insects, for which they usually grub in the surface of the ground. They do not make deep burrows, however. As in the *Dasyures*, the pouch opens backwards. The Rabbit Bandicoot or Bilbie (native name), of inland eastern Australia, which is nearly extinct, is one of the largest of this group; being about the size of the common introduced rabbit, though rather more slender in build.

Perhaps the most remarkable of all the marsupials and at the same time the most aberrant form of all, is the Marsupial Mole, *Notoryctes typhlops*, found in the sand-hill country of central Australia. Another form of this strange animal has been found in north-west Australia. These Marsupial Moles are truly mole-like in habit, but do not make permanent burrows, such as those of the true moles of Europe; merely tunnelling their way through the surface layers of sand in search of ants and other insects.



This red sandy country, by the way, is composed of a rather loamy type of material, which holds together very well when damp.

(c) CETACEA.—Whales and Dolphins of a considerable number of species are known to inhabit Australian seas; some in great abundance. Among the large whales, the most common among the group known technically as the *Mystacoceti* or Whalebone Whales, is the Humpback, *Megaptera*, which generally attains to a length of from thirty-five to forty-five feet in length. A length of as much as sixty-five feet is known on the Australian coast-line. This and other so-called finback whales, begin to travel northwards from the Southern Ocean, up both east and west coasts about June or July in each year and return towards the end of the year. The great Blue Whale or Sulphur-bottom, *Balaenoptera musculus*, is not uncommon in coastal waters, but becomes more abundant in southern waters. This whale attains commonly to a length of seventy-five to eighty feet, but is known to reach a length of at least one hundred feet. The "Finner" or Black Finback Whale, *Balaenoptera physalus*, is abundant also. This is a more slender form of whale, but reaches a large size; many of sixty feet being found. The small Pollack Whale or "Seihval" of the Norwegian whalers and the Little Pike (or Piked) Whale, *Balaenoptera acutorostrata*, are also abundant in Australian waters.

The valuable Southern Right Whale or Black Whale, *Balaena australis*, which appears to be quite identical with the Nordkaper or Sarde of northern seas, is not very common. It is more erratic in its movements than the great finbacks or rorquals. The Pigmy Right Whale, *Eubalaena marginata*, a small species of whalebone whale reaching about twenty feet in length is also found at times in our waters.

Among the Toothed Whales, belonging to the group known as *Odontoceti*, the great Sperm Whale or Cachalot, *Physeter macrocephalus*, stands out pre-eminently. This kind is found at rare intervals far up the coast of the southern half of Australia and may even be found in tropical waters. Its appearances are not regular like those of the whalebone whales previously mentioned, but when it does appear it may be found in great schools. Normally, it is not abundant except in the vicinity of Tasmania and New Zealand. The Sperm attains to a length of about sixty feet, one-third of which length may be made up by

the head alone. A small relative of the Sperm Whale is the Pigmy Sperm Whale, which appears to occur to some extent all round Australia. It grows to about ten feet in length.

The Beaked Whales, *Mesoplodon*, are represented in Australian seas by at least three known species of fairly small size. The Bottle-nose, *Hyperoodon*, and the Black-fish Whale, *Globiocephalus*, are also found—the latter in large schools—following up immense shoals of calamaries or squids.

The great Killer Whale, *Orca*, is found in numbers. Through the aid of this cetacean a spasmodic whale fishery has existed at Eden, New South Wales, for many years past. The Killers drive the whales such as the Humpback and Black Whale into the semi-enclosed waters of Twofold Bay, where they are captured by the waiting whalers. This animal attains to about thirty feet in length. The Lesser Killer, *Pseudorca*, is also found occasionally.

Of the smaller whale kind, or dolphins, speaking in general terms, the Common Dolphin, *Delphinus delphis*, is the chief one in Australian waters and is the most widely diffused over the Australian coastline. The larger Bottle-nosed Dolphin (not to be confused with the Bottle-nosed Whale), *Tursiops*, is moderately abundant, and Risso's Dolphin or Grampus, is widely distributed, though apparently not existing in any abundance. This is the type of dolphin known in New Zealand as "Pelorus Jack". A number of other dolphins are known to exist in various parts of the immense coastline of Australia, but much remains to be done in their investigation.

(d) SIRENIA.—The unique Dugong, *Halicore dugong*, is found in shallow tropical waters over a vast distance along the coastline of the northern half of Australia. In some places it is quite abundant, while in many others the attacks made upon the species by both savage and civilised man have seriously reduced their numbers. Apart from its interesting position in the zoological scale, this animal has always held a very special interest because of its association with the early tales of mermaids brought home to Europe from Eastern seas by the navigators of the sixteenth and seventeenth (and, it is to be feared, even the eighteenth) centuries. Though at close quarters there is certainly nothing either human or mermaid-like (as depicted) about this beast, there is a strangely human suggestion about the face when viewed at a distance in the water, and the manner

of the adult female in holding the baby Dugong to its breast during the process of suckling, has probably aided the mermaid story. The teats are in a pectoral position, and this necessitates the female standing upright in the water, with the head and "shoulders" out while nursing the young.

The Dugong reaches a length of about ten to twelve feet. It occurs naturally in herds along the shallow coasts in bays and estuaries, where it feeds upon seaweeds of various sorts. The name is worthy of a word in passing. It appears to have become twisted from its original pronunciation of "doo-yong", rendered by the Dutch in the East Indies as "dujong". It is a Malay name.

(e) CARNIVORA.—Though there are several indigenous kinds of this order in the Australian region, only one species occurs in a state of Nature on the dry land. This the Native Dog or Dingo, *Canis dingo*, which is distributed widely over the whole of Australia, excepting the most desert parts. Different varieties or races are found in various parts, according to climate, and general environment; those of the eastern uplands and forest country being large and almost wolf-like, while those of the arid or desert country are smaller. The normal colour of the Dingo is a general rufous or reddish-brown above, with the under surface lighter; but there are many natural variations. On the vast stretches of red sandy country in Central Australia the colour harmonises very well with the soil. On the great Nullarbor limestone plain or plateau, which extends for four hundred miles across the southern central parts of Australia, the Dingoes are very small and nearly white—hiding as they do in the small external caves of the limestone formation. This "concealing" coloration must be of great assistance to the animals when hunting their small prey in this open treeless area.

There is no permanent water or any watercourse in this area, or, indeed, in many of the parts of Australia in which the Dingo exists in comparative comfort.

At an early stage in the development of Australia, the Dingo became a pest to the raiser of live stock. As time went on the native animal became crossed with sheep dogs and cattle dogs, as well as with other dogs of the domestic type. This has had quite disastrous results as regards the destruction of sheep and lambs. In recent times their number has been greatly reduced through the concerted measures for pastures protection by many landholders, but

this has been done only at very great cost to the community. In some parts of the country the Dingoes hunt in packs like wolves. This is rare, however, as most commonly they hunt singly; and are then the worst killers of stock.

Fossil remains of the Dingo have been found in the "bone caves" and recent deposits of eastern Australia, along with the bones of extinct diprotodont marsupials. The general impression in scientific circles is that its arrival in Australia antedated the arrival of primitive man. Proof of this is wanting, however, and it seems probable that its introduction was due to man's agency. Colour is lent to such a suggestion when it is remembered that a native dog found in the Malay Peninsula is not very far removed structurally from our own Dingo. Indeed, after viewing the two animals, I would say that they have many points in common.

Though not indigenous to Australia, I can hardly dismiss the land carnivora without making some reference to the introduced Fox, *Canis vulpes*, and the Domestic Cat. The Fox has spread over a large part of Australia, where it has done immense harm, not only to the sheep and lambs, but also to the native bird fauna. Many thousands of these Foxes have been destroyed in a single year. A certain amount of destruction of rabbits by the foxes is the only relieving thing to be said for this serious pest.

The Domestic Cat run wild is also a very serious bird pest. Many thousands of the cats are distributed far and wide over the face of the country. In their wild state they develop into large and handsome beasts. They destroy a certain number of young rabbits here and there and their pelts find some demand.

What are termed the Pinniped Carnivora are represented in Australian waters by several genera and species of Seals. The most notable of these is the Australian Sea Bear, *Arctocephalus*, which is widely distributed on the southern coasts of the continent. On the southern portions of the east coast it is always to be found in small numbers as far north as the Seal Rocks, on the coast of New South Wales, and occasionally considerably to the northwards of that point. Another widely diffused species is the Leopard Seal or "Sea Leopard", *Ogmorhinus*. This is quite common, but is never so obvious because, owing to its more fish-like form, it is obliged to stay in the sea and cannot travel over rocky surfaces like the Sea Bear.

It is occasionally seen on coastal beaches, on which it rests, a little above the reach of the waves. Whereas the Sea Bear belongs to a small group of eared seals, able to progress with comparative ease along the rock shores, the Leopard Seal, having a long fusiform body, with the hind limbs acting like twin fish tails, to drive it through its watery environment, is only able to leave the water with considerable difficulty, even when it crawls or rather flaps its way on to some flat shelving rock or sloping beach.

While most of the seals subsist mainly upon fish, the Leopard Seal lives to a considerable extent upon the diving sea-birds, such as the Common Gannet (known often in England as the Solan Goose), *Sula*.

The Australian Sea Lion, *Arctocephalus cinereus*, which attains a large size, is found along south coasts; and the Crab-eating Seal, *Lobodon*, has been recorded also. The Sea Elephant or Elephant Seal, *Macrorhinus*, used to be found on certain islands in Bass Strait, but is not now found in Australian waters. It occurs in numbers at Macquarie Island, which is a dependency of Tasmania.

(To be continued.)

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### BALL'S HEAD RESERVE, NORTH SYDNEY.

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By JOHN HAWLEY (Dip. Arch.).

Among the many beauty spots on the northern side of Sydney Harbour, none surpasses in beauty, grandeur and distinctive charm, the Reserve, in, and under the control of the Municipality of North Sydney.

A record, well incised on a trachyte tablet at the entrance steps, states that 14 $\frac{3}{4}$  acres were dedicated as a Public Reserve, in June, 1926, and 8 $\frac{3}{4}$  acres in May, 1935.

The Municipal Council, under whose care the Reserve is, the Naturalists' Society of N.S.W., and various other Societies have held annual plantings of native trees and shrubs, just prior to Arbor Day. The first organised group planting was held on July 25, 1931.

Among the many hundreds of trees and shrubs planted, some 1,500 stand to the credit of the Society, and one gum tree (a "blackbutt") *Eucalyptus pilularis*, planted four years ago, has attained a height of 20 feet, a spread of

eight feet, and a base dimensions of eight inches. (The average annual increase of the "blackbutt", in a favourable situation, is set down as 1.32 to 1.74 inches in girth.)

Noticeable, during a recent ramble through the Reserve were she-oaks, wattles, blueberry ash, pittosporum, native cherry, etc.



Blackbutt Trees, growing in Ball's Head Reserve. The tree on the right now has attained a height of 20 feet.

Where, for some reason, the trees or shrubs may die, they are replaced by the N.S. Municipal Council.

There are signs of rabbits or hares being present on the Reserve, and some of the trees are wired in. Many of the trees and shrubs growing there may be seen in the tropical and temperate houses, at Kew Gardens, London.

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NORTH DALBY DOWNS  
AND BURNETT DISTRICT OF QUEENSLAND.

By JOHN POWELL.

I have just returned from an enjoyable and instructive trip through the North Dalby Downs and Burnett Districts of Queensland.

My first call was the town of Dalby, the early name of which was Myall Creek. Dalby is a new up-to-date town of about 4,000 inhabitants. The town itself is well laid out, and the population well catered for by the Progressive Town Council. It has fine Council Chambers and School of Arts with a good library. The Council has provided a bowling green, croquet lawn, golf links and a magnificent bath. Being in the artesian bore district, the bath is supplied with medicinal and radio active water, which comes up at a temperature of 101 degrees. The climate of Dalby is noted for its dry air and absence of sudden changes in temperature, which is so beneficial to health that many people go there to prolong their days. It has the lowest death rate in Australia.

Dalby is surrounded by the rich volcanic black soil plains, and it is now mostly a cattle and sheep rearing district, but it has great potentialities as a wheat growing area. Wheat has been grown on some farms to yield as much as 60 bushels to the acre, and its acreage is rapidly extending. Dalby has an average rainfall of 24 inches per year. There is also coal in the neighbourhood, and several mines are working. The district appeared to be one that could be successfully more closely settled.

Mr. Thomas Jack, the Mayor, has made several valuable discoveries of fossils of prehistoric animals from the bed of the Condamine River, near the town of Dalby, several of which are exhibited in the Brisbane Museum, notably fossil bones of the *Diprotodon Australis*, which belonged to the cainozoic age, post pliocene.

After leaving Dalby the Bunya Mountain Range was visited. I was enabled to do this through the kindness of Mr. Shaw Thompson, the Editor of the "Dalby Herald", who drove me to the top of Mount Mowbullen. The summit is 38 miles from Dalby, and the height 3,911 feet. It commands a wonderful view over the surrounding country, extending for miles over the Downs. On the way up was passed the grave of the early pioneer, Marie Gertrude

Carbine, who died in 1890. The grave is popularly known as Gertrude's Grave, and about which a great deal of romance has been written.

The field naturalist finds the Mountains a delightful place. They are mostly composed of basalt, and it is the disintegration of the basalt structure that has given the rich fertility to the plain below. A large area of 27,000 acres has been reserved as a national park. As the name indicates the Bunya Pine (*Araucaria Bidwilli*) dominates the landscape, out-topping in its height all other trees and often with a girth of 20 feet. The nuts of the pine, in the early days, attracted the aborigines, who used to gather in large numbers to feast upon the kernels. The older trees still bear the climbing cuts they made when gathering the fruit, but they no longer come to the annual feast. There are numbers of interesting walks, the most picturesque being to the Festoon Falls, where the water cascades under drooping vines and creepers. Outside the Reserve there is a vast amount of wealth in the timber which is being commercially exploited. The principal trees on the Mountains are:—Hoop Pine (*Araucaria Cunninghamsii*); Bunya Pine (*Araucaria Bidwilli*); Red Cedar (*Cedrela toona* var. *australis*); White Cedar (*Melia azedarach*); Tulip Wood (*Harpullea pendula*); Rose Walnut (*Cryptocarya erythroxylon*); Red Bean (*Dysoxylum Muellleri*) Stinging Tree (*Laportea gigas*); Blue Berry Ash (*Elaeocarpus obovatus*); Gray Caribeeene (*Echinocarpus Woolsii*); Wild Lime (*Capparis*) and several species of *Eugenia*. Intermingled with the trees are several species of palms, including the delicate Walking Stick Palm (*Bacularia monostachya*), and that terrible impediment to the rambler, the Lawyer Palm (*Calamus Muellleri*). Among the bush plants there is a beautiful specimen of the nightshade (*Solanum aviculare*) upon which grows a large orange-coloured berry. The ferns are well represented, the treefern (*Alsophila australis*) growing to a great height and spreading out its large fronds, together with the epiphytes, the elkhorn fern (*Platycterium allicorne*), and the staghorn fern (*Platycterium grande*). The trees are covered with parasites and epiphytes, mosses, vines and beautiful orchids giving the trees colour and a fairy-like appearance.

The abundance of berries and nuts attracts the birds, which abound in great numbers. The Scrub Turkey (*Alectura lathamii*) with its gigantic nest of leaves forms a mound in which the eggs are hatched by the natural heat





Bunya Pine, showing climbing cuts made by the Aborigines when gathering the nuts.

of the decaying vegetation. The handsome Prince Regent (*Sericulus chrysocephalus*) and Satin Bower (*Ptilonochynchus violaceus*) birds with their decorative playgrounds. The Cat Bird (*Ailuroedus crassirostus*) with its notes resembling the mewling of a cat. Coach Whip Bird (*Psophodes olivaceus*) whose call consists of a series of loud musical notes ending in a crack like that of a whip. Bronze Pigeon (*Phap chalcoptera*); Brown Pigeon (*Macropygia phasianella*) and numerous parrots and other birds.

The mountains are a real paradise for the naturalist, and a very enjoyable holiday could be spent there by the average tourist. There is very good accommodation at the Guest House, where one is well catered for by Mr. and Mrs. Craig, the proprietors.

After leaving the summit I went over the spur to Kingaroy, passing through Brigalow (*Acacia harpophylla*) country, intermingled with the large bottle tree (*Brachychiton rупrestris*). This tree with its huge trunk conserves a large quantity of water. I also found the Quinine tree (*Alstoria constructa*), the bark of which has similar medicinal qualities to the Peruvian bark of commerce. Kingaroy is quite a new town in a thriving centre of dairying and maize growing. It is also noted for the cultivation of peanuts, and has a large mill, where they are dried and shelled ready for sale. Eighty per cent. of the peanuts in Queensland are grown in this district.

Leaving Kingaroy, I came through the Blackbutt Mountains to Brisbane, thus bringing to an end a very instructive and enjoyable trip, having a wider knowledge of these fertile districts with their potentialities, which one day will support a much larger population than they do at present.

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#### NOTE ON THE POLLINATION OF *COBAEA SCANDENS*.

By T. Y. HARRIS.

The flowers of *Cobaea scandens* are protandrous (i.e., the stamens ripen before the pistil), and when they are first open they are colourless, or slightly tinged with green. The pistil is below the stamens and the unopened anthers are turned inwards.

The filaments of the three outermost stamens elongate and burst by longitudinal dehiscence, while the two inner

ones are yet unripe. The pistil is elongated slightly, but is still unfolded.

The corolla has now developed a light purple coloration, and, at this stage, is attractive to bees, which cannot help brushing against the ripe stamens which are now well exposed, but, if pollen is brushed against the pistil, self-pollination is not effected as the stigmatic surfaces are not exposed.

The two inner stamens now elongate and burst open (dehisce), thus exposing more pollen, and the stigma, still unfolded, has almost attained the length of the filaments.

The stamens, having now fulfilled their function, curve outwards and the stigma opens to expose a trifid stigmatic surface turned upwards in the direct path of the next bee visitor, which, if it is coming from a flower in an earlier stage of development will have pollen on it, and will thus effect cross-pollination.

By this time the flower is a deep purple in colour, and by a lengthening and twisting of the filaments the stamens are carried out until they hang limply from the corolla tube.

If, however, cross-pollination fails, the flower is able to effect self-pollination, as, just before the filaments have elongated to carry the anthers right out of the corolla tube, the trifid stigma bends down until the stigmatic surfaces are in contact with the stamens, which still contain some pollen.

Formation of the fruit then follows, whichever method has been effected.

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#### NOTES ON A PITCHER PLANT OF THE GENUS *NEPENTHES*.

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(Abstract from notes by Luke Gallard.)

The specimens of pitcher plants, *Nepenthes* sp., exhibited, had been preserved in formalin for 24 years. My chief interest in them was that they caught insects. The plants were found growing in a large fern-house which was constructed largely of tea-tree bushes.

The main stem of the vine had spread along the top of the house, among the tea-tree, and from this the leaves grew downwards. When a thin cord-like stem of a leaf of

*Nepenthes* reaches about half its ultimate length it makes a complete coil (to strengthen itself to carry the pitcher in an upright position) and then grows downward again, until finally it turns upward and the pitcher is developed.

During growth, the pitcher, which is entirely covered by a parchment-like lid, secretes a sweet glutinous substance, and, when fully-matured, the lid rises and allows insects, which are attracted to it, to enter the pitcher where they are "digested" by the plant.

Some of the pitchers I collected were half-filled with the glutinous liquid and contained a considerable number of insects.

In those forms of *Nepenthes* which have only small oblong pitchers, the coiled stem is not developed as they are able to remain upright without it.

[Mr. Gallard exhibited the specimens of *Nepenthes* when Professor Lloyd lectured to the Society.—Ed.]

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#### FURTHER NOTES ON *NEPENTHES*.

(Abstract from notes by Luke Gallard.)

Following on my previous exhibit, when Professor Lloyd lectured to the Society, and the surprise he expressed, that the plants should have been found growing under such conditions, I visited the place, but the gardener who was there previously had since died.

On being shown over the grounds I indicated the position to the present gardener, and he informed me that there had been an old fern-house there, but it had since been demolished, and that when he was first appointed some pitcher plants, *Nepenthes*, were there. When the new hot-house was built (it stands on the same spot) he had them hung up in it as he considered them to be hot-house plants.

Later, they were handed over to the Botanic Gardens.

The position of the old fern-house was within one hundred yards of the Parramatta River, at Concord, and the river is tidal.

I visited the Botanic Gardens later, to see whether the original plants, presented to them, were still growing, but I could not find either of the varieties I exhibited. A number of other varieties there, however, enabled me to study the nature and habits of the plants.

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FOSSIL SHELLS.

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The specimens of fossil shells exhibited showed the internal and external casts of various species of Pelecypods from the upper marine series of the Permian.

The genera represented in the collection were amongst those first to be described from Australian rocks, having been first collected by the United States exploring expedition in 1838-1842, in the Illawarra district, New South Wales, and described by Dana in 1847.

The specimens shown were from Broughton Village, near Berry, and the authorities of the Australian Museum stated that this collection of Permian Pelecypods will make an interesting addition to their collections.

Amongst them was a large wedge-shaped form of the genus *Chaenomya*, described by De Koninck in 1877, and some smaller species of the same genus which have not yet been identified and may prove to be new to science.—  
J. W. HAWLEY.

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The Secretary would be pleased to hear from any member of the Society who does not wish to retain or has spare numbers of the "Australian Naturalist", Volume 5, Parts 1-16, 1922-1925.

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NOTICE TO MEMBERS.

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Members are reminded of Rule 4 of the Society, which reads:—"All subscriptions shall become due on the first day of August and shall be payable in advance".

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NOTICE TO COUNTRY MEMBERS.

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Country members may obtain reliable information about any specimens of natural history they may collect and forward, addressed to the Hon. Secretary of the Society, Box 2178 L.L., G.P.O., Sydney.

No members should be afraid to forward specimens because they are common to their district; they may be rare and interesting examples of our flora or fauna not found elsewhere, and, if of general interest, notes on such specimens could be published from time to time in "The Australian Naturalist."

## NATURALISTS' SOCIETY OF NEW SOUTH WALES.

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### *Proceedings.*

MARCH, 1937.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, March 2, 1937, at 8 p.m.

In the absence of the President (Mr. W. W. Froggatt), Mr. D. G. Stead (Vice-President), occupied the chair. About 75 members and visitors were present.

Nomination of Members.—Miss Winifred Roslyn, Punchbowl (Junior member). Nominated by Miss T. Y. Harris, seconded by Mr. D. G. Stead. Miss Stout, Presbyterian Ladies' College, Croydon. Nominated by Miss D. Gray, seconded by Miss D. Dobbin.

Exhibition of Specimens.—Mrs. A. Pace: A cigarette holder from Port Moresby. Seed of tree from the same locality, the kernels of which are sold by the natives.

Miss J. Garling.—Specimen of brown coal from State Electrical Works coalfields, Victoria.

Mr. L. Gallard.—Specimens of the late Mr. Abrahams' collection of insects. Mr. Gallard described a large form of moth lace-wing.

Mr. M. S. Barnett described the outing to Mr. Ashley's home at Rockdale, where members viewed the large and varied collections of shells, corals, minerals, timbers, aboriginal weapons and tools, etc. A vote of thanks was passed to Mr. and Mrs. Ashley.

Lecture.—Mr. E. J. Bryce delivered an extremely interesting lecture, entitled, "Around the Caribbean Sea", illustrated with numerous lantern slides. The lecturer was accorded a hearty vote of thanks.

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APRIL, 1937.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, April 6, 1937, at 8 p.m.

Mr. D. G. Stead referred to the death of our late President (Mr. W. W. Froggatt), which occurred on March 18, 1937, and spoke of his ability as a naturalist and entomologist, which had gained him world-wide renown. It was moved that a letter be sent to Mrs. Froggatt and family. About 55 members were present.

Announcements.—Mr. Stead announced that at the Council meeting just held, he had been elected President, Mr. M. S. Barnett, Vice-President, and Miss T. Y. Harris and Mr. A. E. Hamilton appointed to the Council.

Miss Harris gave an account of the outing held on Easter Saturday to the Wild Life Preservation Society's property at Avalon, and also mentioned a natural graft between an Angophora and a Bloodwood.

Mr. Barnett gave an account of the visit of members to St. Michael's cave at Avalon. This cave was considered to be the largest on the coast of New South Wales, being some 400 to 500 feet in length.

New Members.—Miss Winifred Roslyn and Miss Stout were unanimously elected members of the Society.

Nomination of Members.—Miss E. Wright, 82 Pitt Street, Kirribilli. Nominated by Miss Coxhead, seconded by Miss Houston.

Exhibition of Specimens.—Mr. E. P. Bailey: A succulent plant known as "Moses in the Cradle".

Miss T. Y. Harris.—Specimen of *Protea*, Cape Honey-suckle, and West Australian plants bearing winged seeds.

Mrs. Jenkins.—Specimen of berries from Canberra.

Miss Garling.—Specimen of topaz from Beechworth, Victoria, which had been cut.

Miss Peterson.—Specimen of *Amaranthus*, known as Captain Cook's cabbage, an introduced weed used as a vegetable in the back country and Queensland.

Mr. F. J. Dodd.—Specimen of a sea horse from Kempsey, a singing moth, *Hecatesia fenestrata*, of the family *Noc-tuidae*, from Sefton. This moth makes a whistling sound during flight.

Mrs. A. E. Watson.—Specimen of West Australian red flowering gum, *Eucalyptus torquata*, from Mrs. Froggatt's garden. This is possibly the only specimen of this gum tree in New South Wales, and the late Mr. Froggatt had hoped to collect seeds from it this year.

Mr. L. Gallard.—Described a wood moth, *Zeuzera mac-leayi*, forwarded by Miss G. M. Hull from Mangrove Mountain, and insects exhibited by Mr. C. S. Ashley, including a hawk moth and plant bugs.

Mrs. H. A. J. Pace.—Collection of 127 varieties of shells found on Little Bay beach, specimens of caterpillars, and a sand mollusc from Wollondilly.

Mr. C. S. Ashley.—Seeds of Central African palm and fungus from Bellabula River.

Mr. J. Hawley.—Exhibited lantern slides of trees planted by members of the Society at Ball's Head, illustrating how well the trees were growing there.

Mr. M. E. Gray.—Collection of lantern slides, illustrating birds, insects, river and creek scenes, waterfalls, etc.

Mr. D. G. Stead.—Exhibited lantern slides, illustrating trees, reptiles and animals found in Malaya.

A motion was put before the meeting by Mr. E. J. Bryce, seconded by Mr. E. P. Bailey.—“That the Society endorse a motion that the sale of plumes of protected birds, in London, be prohibited, and that the Secretary be instructed to forward the following resolution to Mrs. Speedwell Massingham, 71 Nassan Road, Barnes, S.W.15, London, ‘as it is considered that an open market for the plumes and feathers of protected birds induces circumvention of the law, the sale of such should be prohibited.’”

Mrs. A. J. Pace also spoke in support of the motion.

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MAY, 1937. \*

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, May 4, 1937, at 8 p.m.

The President (Mr. David G. Stead), in the chair, with about 70 members and visitors present.

New Members.—Miss E. Wright was unanimously elected a member of the Society.

Nomination of Members.—Mr. W. Clark Chambers, M.U.I.O.O.F. Chambers, 185 Elizabeth Street, Sydney. Nominated by Mr. J. Powell, seconded by Miss D. Dobbin. Mr. F. R. Ball, 191 Stoney Creek Road, Bexley. Proposed by Mr. D. G. Stead, seconded by Mr. John Hawley. Miss D. Baalman, Flat 2, 41 Johnstone Street, Annandale. Nominated by Miss H. McAnene, seconded by Miss D. Dobbin. Miss A. Breyley, Flat 2, 41 Johnstone Street, Annandale. Nominated by Miss H. McAnene, seconded by Miss D. Dobbin.

Outing.—The outing to Hornsby, under the leadership of Mr. W. F. Blakely, was described by Mr. M. S. Barnett. Fifty species of plants representing thirty-five genera and seventeen families were collected. These were named by Mr. Barnett and exhibited at the meeting.

Correspondence.—Royal Zoological Society re importation of Californian quail. The President (Mr. D. G. Stead) stated that by the efforts of combined Societies



this importation had been prevented. Mr. Stead moved (1) that the Naturalists' Society of New South Wales strongly supports the recent agitation against the proposed importation of Californian quail for sporting purposes recognising a potential danger in displacing our own Australian wild life and the danger that the birds might prove inimical to our agricultural development; (2) that a copy of the foregoing resolution be forwarded to the Chief Secretary of New South Wales, and to the Minister for Customs at Canberra F.C.T., with a request, that, all proposals to introduce into Australia for acclimatisational purposes non-indigenous plant or animal life, at least one month's notice should be given to the public through the Government Gazettes and the daily press of the capital of each State. The above resolutions were seconded by Mr. J. C. Wiburd and carried unanimously. Copy of this resolution to be sent to the Royal Zoological Society.

Exhibition of Specimens.—Mr. Boland: Exhibited a hat made with cabbage tree palm leaves by his mother 46 years ago, and described the method of making same.

Mr. John Hawley.—Specimens of wood and bark of Blackbutt and Blue Gum trees.

Mrs. A. J. Pace.—Specimens of *Bossiaea heterophylla* showing differences produced by types of soil, and gall formed by mistletoe.

Mr. F. J. Ludowici.—Branch of pink flowered tea tree, *Leptospermum*.

Mr. A. E. Watson.—Specimen of iron ore from Mount Zion, Tasmania.

Mr. C. S. Ashley.—Specimen of *Banksia latifolia*, and a basket made from coconut palm leaves from Fiji.

Miss Peterson.—Seed pod of a creeper, *Bignonia tweediana*.

Miss McAnene.—Specimens of a western shrub used as fodder for animals.

Lecture.—Mr. E. le G. Troughton, C.M.Z.S. (Mammalogist and Osteologist, Australian Museum), delivered a most interesting and informative lecture, entitled, "Museum work in the Santa Cruz Group". The lecture was illustrated with excellent lantern slides, and was greatly appreciated by the members. The lecturer was accorded a very hearty vote of thanks.

## JUNE, 1937.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, June 1, 1937, at 8 p.m.

The President (Mr. David G. Stead), in the chair, with about 40 members and visitors present.

Correspondence.—Letter from the Minister for Customs, Canberra, F.C.T., regarding the prohibition of Californian quail. Mrs. A. J. Pace, apology for absence. Miss Grace Hull re specimens of snake's eggs.

New Members.—Mr. W. Clark Chambers, Miss D. Baalman, Miss A. Breyley, and Mr. F. R. Ball were unanimously elected members of the Society.

Nomination of Members.—Mr. A. J. Martin, 24 Marmion Street, Camperdown. Nominated by Mr. S. Ashley, seconded by Miss D. Dobbin.

Announcements.—Mr. Stead announced, on behalf of Miss T. Y. Harris, the second annual meeting of the Illawarra and Bankstown Federation of Junior Tree Lovers, which was to be held in the Assembly Hall on June 22. Mr. Ross Thomas was to preside and Mr. Roy Kinghorn to address the meeting on "Life in the Trees".

It was also announced that Mr. Seward, of Melbourne, was asking for spines of sea-urchins for micro-slides. (Mr. Wiburd offered to try to collect some.)

Exhibition of Specimens.—Mr. J. W. Hawley: Collection of fossil shells from Broughton village, near Berry, New South Wales.

Mr. S. Ashley.—Specimens of plant from the western district of New South Wales suitable for fodder. Mrs. A. E. Watson described the exhibit.

Members' Night.—Mr. E. H. Zeck, of the Department of Agriculture, delivered a lecturette, illustrated with coloured lantern slides, entitled, "Half an Hour with the Aphididae or Plant-lice".

Mr. Luke Gallard read a paper on "Biological Control of Insect Pests", illustrated with slides and apparatus, and explained the methods of development.

## JULY, 1937.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, July 6, 1937, at 8 p.m.

The President (Mr. David G. Stead), in the chair, with about 50 members and visitors present.

Announcements.—The President announced that the Junior Tree Wardens' annual meeting would be held on August 24, and referred to their publication, "The Junior Tree Warden". Reference was also made to a letter received from Mr. Linton, Mangrove Mountain, and the proposed floral clock in the Botanic Gardens. A letter from the North Sydney Council was read. This concerned the planting of an avenue of trees at Ball's Head Reserve in memory of the late Mr. W. W. Froggatt. The President also spoke about the City Council's proposed removal of the wattle trees from Hyde Park, and read a letter forwarded by the Secretary to the Council. He stated, further, that a deputation to the Lord Mayor may be arranged at a later date. The President announced that the Trustees of the "Walter and Eliza Hall" Trust had made a grant of £5 to the Society's funds. It was moved by the chairman that a resolution be sent to thank the Trust for the donation to the Society. This was seconded by Mr. L. Gallard.

New Members.—Mr. A. J. Martin was unanimously elected a member of the Society.

Nomination of Members.—Master Peter Korsman, "Crows Nest", Myall Lakes, via Tea Gardens, N.S.W. Nominated by Miss D. Dobbin, seconded by Miss Nash.

Exhibition of Specimens.—Mr. A. E. Watson: Carnation "Sports" showing peculiar growth.

Mr. S. Ashley.—Specimen of a *Cryptophasa* moth. Specimen of a "flute mouth" or "pipe fish" and whale bone from the humped back whale.

Mr. M. S. Barnett.—Portion of a collection of botanical specimens, mounted and named, ready to be placed into a loose-leaf cover.

Lecture.—Miss Elsie Bramell, M.A., Dip.Ed. (Anthropologist to the Australian Museum), delivered an extremely interesting and informative lecture, entitled, "Community Life in New Guinea", illustrated with numerous lantern slides. The lecturer was accorded a hearty vote of thanks.

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#### AUGUST, 1937.

The annual meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, August 3, 1937, at 8 p.m.

Mr. E. H. F. Swain, Commissioner for Forests, in the chair. The President (Mr. David G. Stead), with about 76 members and visitors present.

Alteration of Rules.—Moved by the President, and seconded by Mr. J. W. Hawley, that Rule 8 be altered in accordance with notice given at the previous ordinary meeting.

Rule 8 shall now read: "The Council shall consist of a President, 3 Vice-Presidents, Hon. Treasurer, Hon. Assist. Treasurer, Hon. Secretary, Hon. Assist. Secretary, Hon. Editor, Hon. Lanternist, Hon. Assist. Lanternist, Hon. Librarian, and 10 other members as hereinafter provided".

The motion was carried unanimously.

Election of office-bearers for year 1937-1938:—

President: Mr. David G. Stead.

Vice-presidents: Messrs. A. E. Watson, Luke Gallard, M. S. Barnett.

Hon. Treasurer: Mr. John Powell.

Hon. Assistant Treasurer: Miss L. Kaylock.

Hon. Secretary: Miss Dolce Dobbin.

Hon. Assistant Secretary: Miss L. Halloran.

Hon. Editor: Mr. E. H. Zeck.

Hon. Librarian: Mr. A. Booth.

Hon. Lanternist: Mr. G. White.

Hon. Assistant Lanternist: Mr. E. P. Bailey.

Other Members of Council: Mrs. A. E. Watson, Miss H. McAnene, Miss D. Ross, Messrs. C. S. Ashley, A. E. Hamilton, J. W. Hawley, F. J. Ludowici, N. L. Roberts, A. E. Tebbutt, and J. C. Wiburd.

Apologies for non-attendance were received from Mr. Ross-Thomas, Mr. M. B. Welch, and Miss T. Y. Harris.

The President moved that a vote of sympathy be sent to Mr. E. J. Bryce in his illness. This was seconded by Mr. John Powell.

New Members.—Master Peter Korsman was unanimously elected a member of the Society.

Nomination of Members.—Master Paul J. Zeck, 268 Blaxland Road, Ryde. Proposed by Mr. E. H. Zeck, seconded by Miss D. Dobbin. Miss E. Mahony, Gordon. Nominated by Miss D. Dobbin, seconded by Miss N. Luckie. Miss Gwen McGregor, 84 Highgate Street, Bexley. Nominated by Miss J. Logan, seconded by Miss E. Howieson. Dr. Clarke Webster. Nominated by Mrs. A. J. Pace, seconded by Mr. Luke Gallard.

Annual Report.—The Hon. Secretary (Miss Dolce Dobbin) submitted the annual report upon the activities of the Society during the past year.

Treasurer's Statement.—The Hon. Treasurer (Mr. John Powell), submitted his financial statement for the year ended July 31, 1937, as given elsewhere in this issue.

Presidential Address.—The President delivered his presidential address, entitled, "The Naturalist in Australia", which was illustrated with lantern slides.

Exhibition of Specimens.—Miss E. Rosling: Collection of 52 varieties of native plants.

Mr. S. Ashley.—Large collection of minerals and shells.

Mr. M. S. Barnett.—Collection of wild flowers, blooming in the Sydney district at the present time.

Mr. A. E. Hamilton.—A hybrid Cymbidium.

Entomological Branch, Department of Agriculture.—Collection of butterflies, timber moths and flower beetles.

Miss N. F. Cromnelin.—Exhibited a number of pictures in connection with "Animals' Week".

Mr. John Hawley.—Specimen of grey ironbark.

Mr. J. W. Hawley.—Specimens of fossils from Broughton village, near Berry, N.S.W.

Mr. L. Gallard.—Specimen of a trap-door spider, a worm, and a collection of various insects.

Miss Jean Buckingham.—Collection of insects and various species of wild flowers.

Mr. J. C. Wiburd.—Specimens of flower pots made with shells and cement, and pen drawings.

Miss Jean Garling.—Hand-made mat.

Miss D. Dobbin.—A collection of butterflies forwarded by Mr. G. W. Lupson from New Guinea.

Mr. M. E. Gray.—A series of coloured photographs of natural history specimens.

Mrs. A. J. Pace.—Specimens of white *Wahlenbergia*, Edelweiss from the Alps, aboriginal axe-head, etc.

#### SEPTEMBER, 1937.

The ordinary monthly meeting of the Society was held in the Royal Zoological Society's room, Bull's Chambers, Martin Place, on Tuesday, September 7, 1937, at 8 p.m.

The President (Mr. David G. Stead), in the chair, with about 50 members and visitors present.

New Members.—Master P. J. Zeck, Miss E. Mahony, Miss Gwen McGregor and Dr. Clarke Webster were unanimously elected members of the Society.

Nomination of Members.—Miss McDonald, Y.M.C.A., 325 Pitt Street, Sydney. Nominated by Dr. Clarke Webster, seconded by Mrs. A. J. Pace. Mrs. J. P. Wingrove, Whitby Flats, Evans Road, Elizabeth Bay. Nominated by Miss C. Williams, seconded by Miss D. Dobbin. Miss D. Martyn, 12 Terry Road, West Ryde. Nominated by Miss Wright, seconded by Miss Coxhead. Lieut.-Colonel C. V. Morisset, "Haldon Lodge", 4 Sinclair Street, Crows Nest. Nominated by Mr. M. S. Barnett, seconded by Miss D. Dobbin. Miss N. F. Cromnelin, 12 Mosman Street, Mosman's Bay. Nominated by Miss D. Dobbin, seconded by Mr. D. G. Stead. Miss Gamble, 61 Shirley Road, Wollstonecraft. Nominated by Mrs. A. J. Pace, seconded by Dr. Clarke Webster.

Announcements.—Mr. Stead called members' attention to the occurrence of a large number of frost fish in the vicinity of Watson's Bay during the previous month.

Exhibition of Specimens.—Mr. John Powell: A cone and winged seeds of the Silver tree of South Africa.

Miss Jean Garling.—Specimen of a honeycomb found in the ceiling of a house in Macleay Street, Sydney.

Mr. L. Gallard.—Exhibited a piece of prickly pear plant, shown previously at the August meeting of last year. It had since commenced to grow.

Mr. A. E. Hamilton.—Spoke of the interesting collection of West Australian wild flowers collected and exhibited by Dr. Clarke Webster.

Miss Jean Colditz.—Described a collection of wild flowers which had been forwarded by Miss G. Hull from Mangrove Mountain. Regarding the species of *Tetratheca*, which was in the collection, Mrs. Messmer said she understood that it was an undescribed species and was named, provisionally, *T. shiressi*.

Lecture.—Mr. E. C. Andrews (formerly Government Geologist), delivered an extremely interesting and informative lecture, entitled, "Volcanoes and Glaciers". The lecture was illustrated with numerous and beautifully coloured lantern slides, taking members from Sydney to the Arctic Circle and back again. The lecturer was accorded a very hearty vote of thanks.

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# The Australian Naturalist

Vol. X.

MARCH, 1938.

Part 3.

## THE NATURALIST IN AUSTRALIA.

By DAVID G. STEAD.

(Continued from Page 63.)

(f) RODENTIA.—In dealing with the Marsupials I referred (on page 58) to the so-called Pouched "Mice" or Marsupial Rats. These, being true Marsupials, are not related to the true rats and mice, which belong to the important order of Rodentia or rodent animals which we now consider. Apart altogether from recent introductions of animals belonging to this section, Australia possesses quite a large representation of such, indigenous to the country; but all belong to the rat family. We have no species of indigenous rodent allied to the true Squirrels, Marmots, Beavers, Rabbits, or Porcupines of the Old World, or to the great Carpincho or Capivara (*Hydrochaerus*) of eastern South America. Any Australian animals with similar names to some of these have been given such because of some surface resemblance only.

Including the New Guinea region with Australia and Tasmania, probably 100 species of true rodents are to be found. Among these are a considerable number which are included in genera not found elsewhere in the world. The great Water-Rats, *Hydromys*, are particularly noteworthy. These attain a length of at least twenty to twenty-two inches in some parts of the Darling and Murray River systems of eastern Australia. One or other of the species is found in all parts of Australia, where there is permanent fresh water. On the shores of many salt water bays and estuaries this great rodent is found—even existing sparingly on the shores of Port Jackson.

There are many species of *Rattus* and an allied genus, *Pseudomys*, allied to the European field mice. Of several genera peculiar to the Australian region, some have the hinder limbs more developed in the kangaroo fashion,

while representatives of two genera progress to some extent like the kangaroos or jerboas. A large kind is the Giant Rat of northern Queensland, *Uromys macropus*, while still larger is the Papuan Giant Rat, *Mallomys hercules*, growing to 19 inches in length, without the tail.

These Australian rodents are variously terrestrial, arboreal, and aquatic; the latter subsisting largely upon Mollusca and Crustacea.

A remarkable little species is the Nest-building Jerboa Rat, *Leporillus*, of the Nullarbor Plain, and associated regions. This constructs an enormous conical nest of woven sticks.

No account of Australian rodents would be complete without at least some passing reference to the most tragic pest ever introduced into Australia. In the European Rabbit, *Lepus (Oryctolagus) cuniculus*, we have an animal pest which has exercised a most profound influence over the development of the land, and has added a vast burden to agriculture and live stock production, besides being responsible both directly and indirectly for a great destruction of the flora of the country, and even of the fauna. Notwithstanding the immense annual killings of the pest—probably up to two hundred millions per year in the State of New South Wales alone—it still persists, costing the landholder, not only large sums for prevention and destruction, but still greater amounts in decreased land production.

The European Hare is also very abundant in parts and occasionally rises here and there to pest proportions. Usually, however, it is kept well under control without great difficulty.

(g) CHIROPTERA.—Many species of Bats, both insectivorous and frugivorous, are found in Australia. The small insectivorous species are found in every part, but are particularly abundant in the warmer parts of the north. Fruit Bats or Flying Foxes, as they are termed, occur at times in vast hordes and are very destructive to soft fruit crops. In a state of nature, these animals live mostly upon the fruits of the figs, *Ficus*, of the dense rain-forest country or "scrubs". The most widely known and perhaps the most destructive species are the Greater Flying Fox, *Pteropus poliocephalus*, of eastern Australia, and the Little Flying Fox, *Syconycteris*, which, in addition to its north Australian habitat, is found in the Malayan region. Four Australian species of the Leaf-nosed Bats, *Rhinolophidae*, are known.



One of the smallest of the insectivorous bats—a tiny species of less than forty millimeters in length—is *Eptesicus pumilus*, which is widely distributed in Australia and Tasmania. Among others is a blood-sucking bat, *Macroderma*, in Queensland, and a genus, *Nyctophilus*, containing several species peculiar to the Australian region.

(h) OTHER MAMMALS.—Among the large mammals, it is worthy of mention that the Water Buffalo, *Bubalus buffelus*, has established itself successfully in north Australia, where it lives in considerable numbers. The Domestic Pig also lives in the wild state in many parts of north and north-eastern Australia; especially in swampy parts. The Dromedary Camel is also running wild in parts of inland Australia.

## II.—BIRDS.

Australia possesses a wonderful bird fauna, rich in variety of form and habit and containing some of the most remarkable avian types (according to the view of the great ornithologists) in the world. Birds of marvellous plumage and of glorious song, mocking birds of surprising power of imitation, birds that build wondrous playgrounds and one bird that can run and fly at birth, are only a small part of the make-up of a region of surpassing interest to the bird-lover and ornithologist. According to the latest lists, about seven hundred species are known from Australia. This includes eleven families quite peculiar to the region, out of about one hundred families represented. Well over six hundred species are recorded as actually breeding in Australia, and forty-eight as regular visitors from outside regions—not for nidification. Eighteen of these are sea birds which breed farther south, while thirty are from the frozen north of Siberia. Outside these species there is very little in the way of migration, except for local movements—including movements sometimes over a wide area in drought times.

One of the most interesting and typical, and certainly among the most picturesque of our birds, is the Emu, *Dromaius novae-hollandiae*, which is found practically all over the continent. Though a child of the plains and finding its greatest development there, it occurs naturally in quite rugged places in open forests. In the open country, especially on the plains, large flocks are found. Notwithstanding the very great destruction that has taken place from time to time, both by human and natural agencies, there is no danger of the extinction of the species as is feared by many. By some the Emu is considered to be the

most primitive of birds. Allied to this species is the Australian Cassowary, *Casuaricus australis*, with a helmet-like casque on the head. It is found in the northern or north-eastern parts of the continent. Another primitive bird is the Mallee Fowl, *Leipoa*, which builds a mound of leaves and decaying bush matter from two to four feet in height and from thirty to forty feet in circumference. In this mound the relatively large eggs are placed, to be incubated by the heat of fermentation. When the young one hatches out it is immediately able to run about and to fly to the branches of the low Eucalypts (Mallee) among which the mound is found. Other mound builders are the Brush Turkey, or Wattled Tallegalla, *Alectura*, and the Scrub Fowl or Megapode, *Megapodius*. Though the last-mentioned is the smallest, it actually builds the largest mound—frequently the work of several birds and over successive seasons—up to nine or ten feet in height and as much as seventy feet in circumference.

Many kinds of wild Pigeons and Doves of extraordinary beauty are found in various parts, more especially in the eastern and moister parts of the tropical regions. These range in size from the tiny Diamond Dove, *Geopelia*, of eight inches in length, to the large and gorgeous Topknot Pigeon, *Lopholaimus*, measuring seventeen inches from tip of beak to end of tail.

Wading birds are numerous and of great variety in Australia. They include Plovers and Dottrels, Stilts, Whimbrels, Godwits, Sandpipers, Snipe and their allies. The Australian Snipe, *Gallinago hardwicki*, breeds in Japan and makes the great journey to Australia and even to New Zealand—across more than a thousand miles of ocean—each year. The Southern Stone Curlew, *Burhinus*, is a large, stilted plover-like bird, about twenty inches in length. It is widely distributed in Australia and Tasmania. Allied to this is the great Australian Bustard or Plain Turkey, *Eupodotis*, a splendid bird of the plains and open, grassy country, which at one time was extremely common, but has been almost completely destroyed over the greater portion of its natural habitat. Among the Cranes is to be noted the large Native Companion or Brolga, *Antigone*, which is not uncommon along the banks of the inland rivers of eastern Australia. Ibises, including the Sacred Ibis and the Straw-neck, *Threskiornis spinicollis*, are very abundant and widely distributed. They are of great use to the farmer in their destruction of noxious insects. The Jabiru or Black-necked Stork, is a very handsome large bird, to be

found in good seasons in considerable numbers in inland lagoons. The length is about sixty inches.

Beautiful Plumed Egrets, *Egretta*, ornament the trees lining inland watercourses and many coastal lakes and estuaries; while among the other heron-kind may be noted the White-Fronted Heron, commonly called the Blue Crane, *Notophox*, which is found everywhere in Australia wherever there is fresh water of any permanence, as well as on the sea coast.

The Black Swan is one of the most famous of Australian birds, and is common throughout Australia and Tasmania. Even in closely settled places it still persists, and, with the awakening conscience of the people as regards bird and general wild life preservation, it appears likely that the bird will remain permanently as a part of the fauna. This species, known as *Chenopsis atrata*, is a very handsome and elegant bird. The neck is very long, the plumage is black, with white on the wings, and the beak a bright red. Many kinds of wild duck and some geese are found on inland rivers and lakes and along some parts of the coastline; their numbers varying according to the season and abundance of water. In drougthy times it would appear that the ducks had gone for ever, and then comes a succession of good seasons, when they breed up and appear in countless myriads.

One of the most striking of the geese is the Cape Barren Goose, *Cereopsis*, which occurs on islands and along the coasts to the south. This is a large bird of a brownish-grey colour and having a round lemon-yellow bill. The Magpie Goose, *Anseranas*, has almost disappeared from the settled parts of the continent, but still occurs in good seasons on inland lagoons. The nearest species to the wild duck of Europe is the Black Duck, *Anas superciliosa*. An interesting form is the Wood Duck or Maned Goose, *Chenonetta jubata*, a small goose-like duck which is very widespread and is common inland on rivers and lagoons.

Cormorants of five species are abundant in various places. The most widely known is the common Black Shag, *Phalacrocorax carbo*, abounding both on the coasts and inland on rivers, lakes and billabongs. It is found also in Europe and elsewhere. A near ally is the *Plotus* or Australian Darter, also known as the Snake Bird or Snake-neck Darter—in reference to the long snaky neck which is generally the only part of the bird showing above water. Pelicans, *Pelecanus*, are abundant on inland lakes and on many coastal bays and estuaries. Occasionally they are still to be found in the waters of Sydney Harbour.

Birds of Prey of many types are found throughout Australia, from the tiny Nankeen Kestrel, *Cerchneis*, of eleven-and-a-half inches in length up to the majestic Wedge-tailed Eagle, *Uroaetus*, with a wing-spread of as much as eight feet, six inches, and so powerful as to be able to lift at times, and carry off, a full-grown sheep. There are also ten kinds of Owl, including the great Powerful Owl, *Ninox*, with its bellowing cry, and the abundant Boobook Owl, Morepork or Mopoke, which abounds everywhere in forest country.

Australia is peculiarly the home of the Parrot order, *Psittaciformes*, which includes Parrakeets, Lories, Parrots and Cockatoos of marvellous variety. Some of them, like the Brush-tongued Lorikeets, are purely Australian. On the great inland plains are to be found vast numbers of the tiny Budgerigar or Shell Parrakeet ("Love Birds"), *Melopsittacus*, and the lovely Roseate Cockatoo or Galah, *Cacatua roseicapilla*, while in the forests are innumerable small parrots, as well as the great White, or Sulphur-crested Cockatoo, *Cacatua galerita*, and the handsome Black Cockatos, *Calyptrohynchus*. The last-mentioned are often known as the "forest guardians", because of their habit of destroying the great timber-boring insect larvae.

In the desert or semi-desert parts are to be found large numbers of the lovely Pink Cockatoo or "Major Mitchell", *Cacatua leadbeateri*, feeding largely upon the gall-insects of the small Acacias and desert Eucalypts.

Kingfishers of several kinds, *Alcedinidae*, include in their number the most popular and best loved bird of Australia. This is the Laughing Jackass, or Kookaburra, *Dacelo*, which is a land-hunting "kingfisher", subsisting upon insects, reptiles, and young birds. Occasionally, the bird will revert to the ichthyophagous habits of its forbears. The Bee-eater, *Merops*, is an avian gem, which migrates to the Malayan region at the end of the Australian summer. Two species of Swift, *Cypselidae*, and several kinds of Cuckoo, *Cuculidae*, including the great Channel-bill or Storm Bird, *Scythrops*, with its blood-curdling screeching cry, may be noted.

The wonderful Lyre-birds, *Menura*, which are amongst the most striking of all Australian birds, are found in the moist gullies of south-eastern Australia and Tasmania. These birds have the most marvellous power of mimicry; almost every bush call and sound, as well as the barking of dogs, the chop of axes and the sound of human voices, being imitated perfectly. Probably no mocking bird in any part of the world can rival the Lyre Bird.

The Fly-catchers, *Muscicapidae*, are represented in Australia by more than three hundred and fifty species, nearly all of which are peculiar to this region! The quaint Coachwhip-Bird, *Psophodes*, whose call is like the crack of a whip, occurs in the forest country of eastern Australia. The true thrush family, *Turdidae*, has a number of species in Australia, but the so-called Australian Thrush, or Grey Shrike-Thrush is a member of another family, called *Prionopidae*.

Upwards of eighty species of Warblers, *Sylviidae*, include in their numbers the familiar Blue Wren or Cocktail, *Malurus*, and the Emu Wren, *Stipiturus*, a tiny bird with five skeleton-like feathers standing vertically in the tail. Several Wood-Swallows, *Artamus*, are distributed over the whole land, and are often to be seen "hawking" for insects in summer. These birds are of great aid to the farmer because of their destruction of large numbers of grasshoppers, which at times make their appearance in vast swarms.

Probably one of the most striking and characteristic of all birds in the world is the Australian Magpie-Lark or Peewee, *Grallina*, a beautiful black and white bird with a manner of flight quite unlike that of any other kind. It builds a large cup-shaped mud nest.

The melodious Magpies, *Gymnorhina*, are among the most widespread and popular of Australian birds. Three species are known. Nearly allied to these are the curious Bell-Magpies, *Strepera*, one of which (also called Black Magpie) is known by a great variety of names founded on the strange and quaint call. Currawong. Tollawong, and "To-morrow Bird" are among its familiar titles. The Butcher-birds, *Cracticus*, are also related to the Magpies.

Gullies in all our forest country ring with the musical calls of the merry Whistlers, *Pachycephala*, while Bell-birds of two unrelated genera tinkle their sweet tunes. There are no true Wood-peckers in Australia, but a number of species are known familiarly by such a name. These are the Tree-Creepers, *Climacteris*.

The *Meliphagidae* or Honey-eaters are very characteristic of the Australian region, with a large number of species. Many of these possess great beauty and range in size from a length of about four-and-a-half inches up to sixteen inches. The largest is the well-known Gill-bird, or Wattled Honey-eater, *Anthochaera*, a very striking bird, both as regards appearance and song, and one of the first birds to attract the attention of the early Australian colonists.

Finches of the family, *Ploceidae*, and of several species, are found in immense numbers in many parts; but some

species have been greatly reduced in numbers in recent times. A notable instance of this is that of the gorgeous Painted, or Gouldian, Finches, *Poephila*, which once occurred in prodigious abundance in the vicinity of Darwin and in many parts of Queensland.

The beautiful Rifle-birds, *Ptiloris*, are the Australian Birds of Paradise, occurring in the northern portion of the eastern coastal scrubs; while the allied family of Bower Birds, *Ptilonorhynchus*, build their wonderful playgrounds or bowers in eastern and southern parts. The Satin-bird or Satin Bower-bird lives in the coastal scrubs, even within a few miles of Sydney, while the Spotted Bower-bird, or "Weeta", is a permanent resident of the dry inland areas.

The Australian Raven or "Crow", *Corvus coronoides*, is very abundant all over Australia; subsisting upon carrion, insects, and occasionally lambs and chickens. In the Northern Territory it performs a good office for man by consuming large numbers of cattle ticks. A quaint bird is the White-winged Chough, *Corcorax*, of eastern Australia. This is one of three very distinct species known in various parts under the one name of "Twelve Apostles", because of their habit of consorting in self-contained little flocks of ten or a dozen, meanwhile volubly chattering, apparently to each other. More properly this name applies to the Babbler, *Pomatostomus*. The Chough is one of the very few mud-nest builders.

To enumerate but a few of the great variety in sea birds would occupy quite a large space. Petrels of more than twenty kinds, the great Albatrosses, many Terns and Gulls, roam the vast expanse of Australia's coastline. The common Silver Gull also penetrates far inland at times. In Bass Strait and on the immense extent of the Great Barrier Reef, which runs for about twelve hundred miles off the coast of Queensland, are to be found tremendous aggregations of sea-bird life—largely Petrels—like the Mutton-bird, *Puffinus tenuirostris*—and Terns. The great Frigate-bird, *Fregata*, is also found at times in various places. This bird has an enormous wing expanse and apparently is able to soar for days on end, when conditions of air are suitable, without fatigue. The Diving Gannets, called by the fishermen, "Mackere!-divers", are found in great abundance, and nest in large numbers on southern islands. Penguins of a small size are found in our southern waters. One species known as the Fairy Penguin, *Eudyptula*, breeds in considerable numbers in some southern parts, and in its adult stage is found in waters as far north as Port Jackson. Other

Penguins stray northwards from the Antarctic regions occasionally.

### III.—REPTILES.

Australia is the home of large numbers of reptiles of various diverse groups. Snakes, Lizards, Crocodiles, as well as Turtles and Freshwater Tortoises abound. Many species of Sea Snakes are found round the tropical shores, and some species extend down into the more southern waters of each side of the continent.

Of the larger snakes which constrict their prey, of a more or less tropical origin, the greatest is the Queensland Python, *Python amethistinus*, reaching a length of about twenty-one feet. A near relative, of smaller size and of wider distribution in eastern Australia is the Carpet Snake, *Python spilotes*. Both feed on marsupials and birds.

Very many venomous kinds are known; but some are of such small size as to be harmless to man. An abundant kind is the common Black Snake, *Pseudechis*, which is chiefly found in swampy areas. An abundant kind in our inland areas is the Mulga Snake, found always in more or less arid country. The Tiger Snake, *Notechis*, is one of the most deadly species known, while another deadly kind, the short thick Death Adder, *Acanthophis*, is found particularly along the coastal fringe.

Of the seas snakes, that kind most commonly seen is the Yellow-bellied Sea-Snake, *Pelamis platyurus*, which abounds also in the Malayan region. A number of kinds are found in rivers; especially in the warmer parts.

Crocodiles, *Crocodylus*, of two kinds, are found along the tropical coastal waters. The principal one is the well-known and widely-distributed *Crocodylus porosus*, which is so abundant in the Malayan and Indian regions.

Sea Turtles of all the well-known kinds are found over the greater part of the Australian coastal regions. On the Great Barrier Reef, the Green, or Edible, Turtle, *Chelonia mydas*, and the Hawk'sbill, *Chelonia imbricata*, are the most abundant. In the river systems, especially the Murray River and its feeders, are to be found several kinds of River Tortoises—locally termed Turtles—of the family *Chelididae*. These range from the small Long-necked Tortoise of a few inches in length, up to the Snake-neck, which has a body length of about eighteen inches.

Monitor Lizards, *Varanus*, of large size, are found throughout Australia. They are known generally as Goannas. It is specially worthy of mention that the name Goanna, as used, is a corruption of the South American

term Iguana, applied to a specific lizard in the South American region. In an attempt to be accurate (as is thought) the name Iguana is often mis-applied to the very different Goanna of Australia. The latter name should be used, however. One Goanna reaches a length of more than seven feet. Many of the smaller kinds of lizards show the greatest diversity in form; including the legless types, the extraordinary Thorny Devil, or Horned Dragon, *Moloch horridus*, of the desert regions of central and Western Australia, the Frilled Lizard, *Chlamydosaurus*, of Queensland, and many kinds of Geckoes, *Geckonidae*. Altogether about two hundred species of lizards are known from the Australian region.

#### IV.—AMPHIBIANS.

About sixty species of amphibians have been recorded from Australia. They are all referable to the Frogs and Toads; there being none of the salamander type of tailed amphibians as found elsewhere in the world. None of our frogs or toads attain to that large size to be seen among some of the American and Asiatic forms. A small form known as *Limnodynastes* is found throughout the whole of the eastern region. A large kind is the well-known Green Tree Frog, *Hyla cerulea*. A tiny toad of great interest is a *Pseudophryne*, found commonly under stones in damp places. This is quite abundant in the Sydney district.

Many of the Australian frogs show the most extraordinary vitality under the most exacting conditions of climate and rainfall; carrying themselves safely through the most severe droughts, sometimes lasting years and quickly reviving on the appearance of the rains.

#### V.—FISHES.

Upwards of two thousand species of fishes are already known from Australian waters. In view of the large amount of detailed exploration waiting to be done, it is probable that this total will be greatly exceeded as time goes on—not necessarily with species new to science—but largely with kinds already known in the Indo-Malayan region. With its northern shores close to the equator and the southern washed by the cold waters of the Southern Ocean, there is naturally extreme variation in the types. As in the land fauna, though not to the same extent, the fish-fauna is somewhat archaic. Port Jackson Sharks, *Heterodontus* and *Gyropleurodus*, the anguilliform Frill-Gilled Shark, *Chlamydoselachus*, the strange Queensland Lung-Fish, *Epiceratodus*, one of the ancient "rough-backed" her-



rings, *Potamalosa*, known as the Freshwater Herring or River Sprat of eastern rivers, and some berycoid fishes (such as the Nannygai), help to emphasise this archaic character.

On the whole this fish fauna shows great affinity with that of Malaysia and South Asia, but many southern types have been intruded. To a small extent, also, there has been some impression made by the abyssal oceanic forms.

Among the *Elasmobranchii* (the sharks and rays) the *Selachii* include a large number of both large and small sharks. The largest of these is the great White Pointer or Great White Shark, which attains to at least forty feet in length in Australian waters. The *Batoidei* or rays comprise many of the largest species known; including the great *Manta* or "Devil Fish", which reaches up to twenty feet in width, and a great variety of smaller or larger Stingrays and Skates. The order of *Holocephali* includes the quaint *Chimaera* or Ghost Shark and the Elephant Fish of our southern waters.

A considerable number of freshwater fishes are found—mainly in the eastern half of the continent—ranging from the great percoid fish, the Murray Cod, *Oligorus*, to a tiny perchlet known as *Riverina*, of only about one-and-a-quarter inch in length.

#### VI.—MOLLUSCA.

According to the late Charles Hedley, something under five thousand species of mollusks have been recorded from Australia. But many additional kinds are likely to be recorded as investigation proceeds in the future. Included in the vast variety of form and size is the largest of all molluscan animals—or at least the largest of all those provided with a shelly covering—the Giant Clam, *Tridacna*. This often reaches a length of shell of as much as fifty-four inches and a width of thirty inches. Like many other tropical kinds this giant is very widespread, but finds its greatest development in the waters of the Great Barrier Reef, which is a conchologist's paradise.

As in other parts of the world, so in Australian waters the gastropod mollusks or univalves are in the greatest numbers, though many kinds of bivalves are extremely abundant. The latter include Oysters, *Ostrea*, of great present and future economic value, as well as Mussels, of a number of kinds. The largest gastropod shell known in the world, *Megalatractus*, which grows to two feet in length, is found along the northern half of the Australian coastline.

Many kinds of Cephalopods—including a number of species of Octopus and Squids, ranging from tiny localised

species to the great Calamaries or Cuttle-Fish on which the Sperm Whales feed—are also found.

One of the most interesting of our shell-fish is the archaic *Trigonia*, which is not uncommon in the deeper waters of Sydney Harbour and in other places in Australia. Pearl Shells, *Pinctada*, abound in many of our tropical waters and are much sought for commercial purposes.

#### VII.—CRUSTACEA.

Not only are the Australian Crustacea of each order strongly represented in Australian waters, but many kinds are of great economic value. Among the Decapoda (as the Crabs, Lobsters and Prawns are known), is a large variety of the greater crustaceans. Among the *Macrura* or long-tailed forms, are several large “spiny lobsters” or Crayfish (often known as Murrumbidgee Crayfish or Murray Lobster), *Astacopsis*. Prawns of the genus *Penaeus*, including several of very large size (such as the Tiger Prawn and King Prawn) are abundant in many estuarine waters, providing a very lucrative fishery, and employing a considerable number of fishermen. One kind of freshwater Crayfish known as the “Yabbie”, *Parachaeraps*, is found in very great abundance in most inland waters—even those which dry up for very long periods. These have the power of aestivating in the dry beds of water-courses, billabongs, dams, etc. Many are able to put up with at least two years of this “suspended animation”, while awaiting the advent of the rains.

In the *Brachyura* or Crabs are many highly interesting forms of crustacean life in large variety. These range from the tiniest species up to the Giant Crab of south-eastern Australia, *Pseudocarcinus*, of which the “hand” portion of the nipper arm alone may measure as much as twenty-three inches. Though not covering the widest expanse this crab is in its mass, probably the largest of all crabs in the world. The large Mangrove Crab, *Scylla serrata*, which is so abundant throughout the Indo-Malayan region, is also more or less abundant over a length of several thousands of miles of the Australian coastline; principally in its northern portions.

The *Anomura* or Hermit Crabs, which stand practically half way between the lobster-like animals and the crabs, are well represented. Though mostly of small size, some are quite large. They possess themselves of the shells of various species of gastropod mollusks, including some of large size in tropical waters and off the coast of New South Wales.

In the *Amphipoda* there are many kinds of Sandhoppers living along the shoreline. There are also a few in fresh water and some that live as commensals in the bodies of sea-squirts (Ascidians), etc., and one species at least which lives among damp leaves in the coastal forest lands. The latter is known as *Talitrus sylvaticus*.

The *Isopoda* are represented by many marine species—one of which bores its galleries into soft rock along the shoreline in Port Jackson and other places. Another makes short tunnels into submerged timber. There are also a number of terrestrial or dry land kinds—including the common Blue Slater of our backyards. Several are very well known also as fish parasites—commonly known to fishermen as “doctors”. One highly aberrant form, *Phreatoicus*, is found in certain mountain regions of south-eastern Australia and Tasmania.

Among the *Entomostraca*, the *Daphnia* type of *Ostracoda*, known rather loosely as “water-fleas”, is probably most abundant in fresh water; but prodigious numbers of these, of the groups known as *Cladocera* and *Copepoda*, occur regularly as one of the main component parts of the stream of surface ocean life, known generally as plankton, in the vicinity of the Australian coastline. There is a splendid field for marine biological research in studying these groups. In many inland areas which are subject to periodical drying up, vast numbers of an entomostracan crustacean known as *Lepidurus* (often thought by the observer to be a kind of insect) make their appearance immediately after heavy rains have replenished the water-courses or temporary pools.

#### VIII.—OTHER AQUATIC INVERTEBRATES.

In a summary such as this it is not possible even to mention the outstanding features of a marine or other aquatic fauna of such surpassing richness as that which is found in a region of such vastness and so varied as that of Australia. Here, for instance, is by far the largest coral (*Actinozoa*) area in the whole world. The Great Barrier Reef alone is actually of larger extent than any aggregation of coral areas in any other region of the earth. This coralliferous environment also makes for an immense corresponding development of other forms of *Coelenterata*, Echinoderms or Sea Urchins, Star-fishes, Sea Anemones, Ascidians, Gorgonias or Sea Fans, Sponges, Holothurians or Sea Cucumbers, Worms, and other lowly groups of animal life. Yet, altogether apart from any coral environment, there are vast numbers of all these groups of animal life

to be found in the non-coralliferous southern areas of the Australian waters.

The Great Sea Anemone of the Barrier Reef, is of immense size for such a type of organism, reaching a width of as much as two feet in diameter. Many species of *Radiolaria*, *Foraminifera*, and other forms of *Protozoa* are already known from Australia, but a comparatively unworked field remains for the investigator.

#### IX.—INSECTS.

According to Dr. Tillyard, more than thirty-seven thousand species of the class *Insecta* are native to Australia and Tasmania. As might be suspected, in view of their great preponderance in the world's insects, the largest group, in numbers, is that of the *Coleoptera*, or Beetles, which possesses upwards of seventeen thousand species. Then follow the *Lepidoptera* (Butterflies and Moths), the *Hymenoptera* (Wasps, Ants, Bees, etc.), and *Diptera* (Flies, Mosquitoes, etc.). The least number of species is contained in the order *Embiaria*, which comprises the archaic "web-spinners", somewhat resembling the termites or white ants, but more closely related to the Stone Flies, *Perlaria*.

The only orders of world insects not represented in the Australian region are the *Protura* and the *Zoraptera*—rare insects brought to light by Dr. Silvestri.

Dragon Flies are very numerous in Australia, although not in New Zealand—there being only thirteen known species in New Zealand against two hundred in Australia, with probably several more to be described. The reason, no doubt, lies in the fact that the freshwaters of Australia are, in the main, more lagoon-like and consequently more sluggish in their movements.

Among the *Orthoptera* are great Stick Insects up to eighteen inches in length, while many species of Grasshoppers—including plague locusts (not to be confused with the Singing Locusts or Cicadas)—are distributed over the continent.

The Termites, *Isoptera*, are exceedingly numerous in their colonies over the greater part of Australia. Some build their Termitaria of great size. The Meridional White Ant of northern Australia, builds a wall-like "magnetic" nest, always pointing north and south.

The *Mallophaga*, including some very interesting forms of Biting Lice, found on native animals, are well represented in Australia. Native Thrips, *Thysanoptera*, occur also.

Among the *Hemiptera* are many species of Cicadas or Singing Locust, which are highly characteristic of the whole region. There are also many aquatic bugs, one of which grows to a length of three inches. The *Coleoptera* or Beetles, include many wood-borers; the larvae of some being the principal food of the aborigines. The beautiful Jewel Beetles, *Buprestidae*, have many representatives in Australia—being particularly abundant in the Sydney district.

In the *Hymenoptera* are numerous Ants (including some which are quite minute and others of an inch in length), Wasps of great variety and of many different sizes, and a small native Honey Bee.

The *Diptera* count among their number many blood-suckers and biting flies. Others are fruit pests, while the Bot Flies, *Oestridae*, are, during their larval stages, parasitic in horses, kangaroos, etc.

Among the eight thousand kinds of moths and butterflies, there are at once some of the largest and the smallest kinds in the world. Very many of these are of the greatest beauty in coloration.

#### X.—SPIDERS AND TICKS.

More than two thousand species of Spiders, *Araneida*, are known from Australia. Among the more interesting are the Trapdoor Spiders, *Aviculariidae*, some of which grow to a large size and have a very poisonous bite. One of the Wolf Spiders, *Lycosidae*, living in the desert country, also constructs a trap door. A venomous Red-back Spider, *Latrodectus*, is very common and widespread throughout the continent—even in the most arid parts. An Argiopid constructs a yellow silk web of such strength as to entangle small birds. A large wall spider, commonly known as the "Triantelope" (or *Tarantula*) is very common everywhere. It is quite harmless, although often feared and confused with other species.

Among the Ticks, *Acarina*, are numerous kinds infesting both native and introduced animal life. An *Ixodes*, a kind of blue bush tick, has caused fatal illness in humans and many dogs.

Several Scorpions, *Scorpionida*, are known and are abundant in rocky forest country. They are chiefly of small size; the larger kinds living in the tropical parts.

## XI.—CENTIPEDES AND MILLIPEDES.

A large number of Centipedes, *Chilopoda*, and Millipedes, *Diplopoda*, exist in various parts of the country. In the tropical parts the centipedes grow to a large size—many being as long as eight to nine inches. A species of *Scolopendra* is very abundant in most parts of Australia. The Millipedes, according to Rainbow, total about sixty kinds. They are found largely in rocky country. A species of *Spirobellus* is very abundant in eastern Australia, while a much larger kind, *Dinematocricus*, which is found in the north, grows to four inches in length.

THE 18-SPOTTED LADYBIRD BEETLE, *LEIS CONFORMIS*.

By E. H. ZECK.

As some members of this Society are under the impression that the 18-spotted ladybird beetle, *Leis conformis*, is an introduced English insect, the following notes may be of interest.

This ladybird was described from Australia, in 1835, by Boisduval, in *Faune Entomologique de l'Océan Pacifique*, p. 604.—*Voyage de l'Astrolabe*, and was, at that time, placed in the genus *Coccinella*.

Froggatt, in his article on Australian ladybirds (*Agricultural Gazette*, N.S.W., Vol. 13, p. 902, 1902), states that *Leis conformis* is "one of the largest and commonest species in our orchards and gardens". "This beetle has a wide range all over Australia from Queensland to Swan River, and is also plentiful in Tasmania".

"On several occasions this species has been sent to America, but I can find no record of it having become established in that country." "During the year this beetle has been introduced into England, where Theobald hopes to use it against the hop louse."

In Bulletin 30, of the United States Department of Agriculture, Division of Entomology, 1893, "Beneficial insects imported from Australia and New Zealand" (section), Coquillett records that Koebele (whose mission to Australia was for the purpose of collecting beneficial insects) forwarded *Leis conformis* to America as far back as 1891. Coquillett reports in full upon his experiments with the beneficial insects forwarded to him, and on page 11 states "The next consignment of insects reached me on 28 November, 1891, and the boxes, with the exception of one from Sydney, Australia, were marked as having been filled at

Parramatta, Australia, between the 23 and 30 of October, 1891". It may be of interest, here, to note, that in addition to *Leis conformis*, this consignment contained also, the following ladybirds, *Orcus chalybeus* and *Orcus australasiae* (two steely-blue ladybirds), and a species of *Scymnus*.

*Leis conformis* and various other ladybird beetles were forwarded on a number of occasions. The eighth and last consignment was forwarded by Koebele from Sydney and arrived in California on the 14th of May, 1892, and included in this were 170 specimens of *Leis conformis*.

Fuller, in the Agricultural Gazette of New South Wales, Vol. 7, p. 94, 1896, records "The Governments of New Zealand and Cape Colony are both desirous of introducing this ladybird, amongst others, to their orchards, and a consignment recently sent to New Zealand by this Department has met with some success, but one sent to South Africa early in the spring has not been so encouraging, the long sea-journey being the present difficulty".

Theobald, the well-known English entomologist, in his "Second Report on Economic Zoology" (British Museum, Natural History), p. 162, 1904, gives the following: "The Board may be interested to learn that the Tasmanian ladybirds—*Leis conformis*—have now passed two winters in this country, specimens having been seen during the present month (April) in fruit gardens near Wye".

In a footnote he states "None were seen after and I fear it has died out. They can withstand the winter, however, and will flourish here. Not enough were turned out in each locality to start a strong colony, hence the failure in this case".

The following notes have been taken from abstracts of the original articles, which have appeared in the "Review of Applied Entomology", a publication issued by the Imperial Institute of Entomology, London, as I have been unable to consult the original publications. The title of the original paper is given in each instance, together with the reference to the Review abstract.

In the Agricultural Circular, Department of Agriculture, Fiji, Vol. No. 1, pp. 68-69, 1924 [R.A.E., 1924, p. 567], it is stated that *Leis conformis* was introduced into Fiji from Australia.

*Leis conformis* is mentioned [together with *Coccinella transversalis* and *Orcus australasiae*], as being introduced from Australia, and being propagated for colonisation in the citrus groves in California, in the Report of the Californian Agricultural Experiment Station, 1927-28, pp. 32-35 and 70-77 [R.A.E., 1929, p. 718].

*Leis conformis* was established in California and was introduced into Florida to control aphids on citrus trees. In the Annual Report of the Florida Agricultural Experiment Station, 1931, pp. 69-91 [R.A.E., 1933, p. 411]. The Review abstract states "*Leis conformis*, introduced for the control of *Aphis spiraecola* Patch, in 1925-26, was recovered in two groves, and in the one where the Coccinellid was very abundant, the aphid infestation was lower than the average".

The abstract from the "Florida State Horticultural Society", 1932 [R.A.E., 1933, p. 289], reads "From numerous colonies of *Leis conformis* which were introduced from California against *Aphis spiraecola* Patch (green citrus aphid) and reared and liberated in many parts of the State in 1925, only one appears to be established. Its survival is considered to be due to the succession of aphids on tangerines of various ages, some of which are apparently succulent throughout the year.

The abstract from the Florida Entomologist, 1933, No. 2, pp. 27-29 [R.A.E., 1933, p. 586], records that "In the locality in Florida where *Leis conformis* has become established, it is now more abundant than any native Coccinellid, and it is believed to be an important factor in the control of *Aphis spiraecola* on citrus".

From the above records there can be but little doubt that this much sought after ladybird is a native Australian insect.

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### THE "BRONZE WHALER."

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#### An Undescribed Australian Shark.

By DAVID G. STEAD.

For some years past, while pursuing my studies of Australian Sharks and their habits, I have observed an occasional example of an unusual species, of medium size—not generally exceeding 8 to 9 feet in length—taken in the open sea, not far from the coastline, in the vicinity of Sydney. At first sight this shark would be confused with the Whaler, *Eulamia brachyurus*, to which it is closely allied; and, were it not for the fact that the coloration (as seen by me and some reliable Watson's Bay fishermen) is quite different from that of the common Whaler, and is constantly so, its identification in the field would be somewhat difficult. When I say this it must be remembered that the average shark is a large object; and, as it lies in



the bottom of a boat, or on a wharf, is not easy to "take in at a glance", unless it is possessed of outstandingly different features, as compared with some other species.

Here, it might be of value, as well as of interest, to give point to these opening remarks, by mentioning the outstanding points—as may be seen by any average observer—to help us to the identification of some well-known Australian sharks. If a large shark captured possesses a broad flattened head, with a semi-circular snout, a peculiar hole or spiracle just behind each eye and vertical shadowy stripes along each side, then we have a pretty good idea that we have landed a Tiger, *Galeocerdo arcticus* (Faber). If we examine the very distinctive teeth, with the deep notch cut out of one side, leaving a pointed cusp at the summit, then we are certain it is a Tiger. If we find the shark has a softish pointed snout, the two dorsal fins about equal in size, and long pointed awl-shaped teeth, with a minute cusp at each side, then that is a Grey Nurse, *Carcharias arenarius* Ogilby. If it has a beautiful bluish or blue-green spindle-shaped body, with a firm pointed round snout and a mackerel-like tail, then we are on to a Blue Pointer (or Mako), *Isurus glaucus* (Muller and Henle). If the body is still somewhat spindle-shaped, of a grey colour, mackerel tail, and with great separate triangular teeth, then we have a White Shark or White (or Grey) Pointer—the so-called White Death—*Carcharodon carcharias* (Linnaeus). If it has such an outstanding feature as a hammer-shaped head, then it is one or other of the true Hammerheads, *Sphyrna*. Perhaps it has an extraordinarily long upper fluke to the tail, almost as long as the body; if so, it is a Thresher, *Alopias vulpinus* (Bonnetterre).

There are other sharks again which are just as easy to determine quite satisfactorily by only a few features; but when we come to those of the genus *Eulamia* (see *Carcharias* in most of our past literature) we are up against a different problem. For this genus is particularly variable, and has many known species. I feel more inclined to say, as some say of the genus *Eucalyptus*, that it has either many species or only a few exceedingly variable ones. My own personal experience of *Eulamia* in many parts, does lead to the thought that many recognised species of to-day will, later, only be recognised as geographical varieties. But, even so, there are some very well marked types of this form of shark. A most distinguished student of these sharks, my friend, Dr. Henry W. Fowler, considers that

there are upwards of sixty species of *Eulamia*.\* Yet, Dr. Fowler himself, I feel sure, would be one of the first to concede that ichthyological literature is teeming with a most confused synonymy where descriptions and identifications of sharks of this group have been aimed at.

The most abundant and outstanding of the Australian kinds of *Eulamia* is the common Whaler Shark of the east coast, found more or less right round the Australian coast-line. It is the great shark—and the only species—which penetrates far up into our estuarine and river waters, even journeying at times right into the freshwater portions of such. Its habits are similar to those of the *Eulamia* of the Ganges and of the Middle East, and, as I may personally testify to, it is closely similar in appearance and form, and may be specifically quite identical. If so, some more synonyms will be cast out, and we must change its technical name once more—probably to *Eulamia gangeticus* (Muller and Henle). In our fish literature here we have at least two nominal species of sharks allied to the Whaler. One is the *E. (Carcharias) macrurus* described by Ramsay and Ogilby from Port Jackson in 1887. If these authors had examined their single specimen closely they would have found that it was a mere baby, and that should have made them very wary of adding to the confused nomenclature even then existent. Some writers since (with the unfortunate craze which often exists for the literal translation of technical specific names) have called this the "Long-tailed Whaler"; but their long-tail Whaler was only a baby Whaler after all.

Then there is another, *E. (Carcharias) stevensi* of Ogilby (1911), which again seems to be identical with the Whaler; and still another of Ogilby's, *E. (Carcharias) spenceri*, described from the Brisbane River in 1911, which I consider to be quite identical with *Eulamia brachyurus*, our omnipresent Whaler, first named by the great old ichthyologist, Gunther, in 1870. Tenison-Woods' "Sea Shark", by the way, was also a Whaler, although he tacked the popular name on to *Eulamia gangeticus*. This was an unfortunate connection, inasmuch as the *Eulamia* of the Ganges is, par excellence, like our Whaler, a fish of the estuary, bay and river—though extremely abundant, as I have found, in great semi-estuarine waters like the Straits of Malacca, between Sumatra and the Malay Peninsula. Sea Shark was probably only a longshoreman's name for

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\*Fowler: Marine Fishes of West Africa, Bull. Amer. Mus. Nat. Hist. 1936.

any old shark, just as I have often found, when making inquiries here and there along our coasts. I put this in as a warning to both the systematist and the field naturalist: there are "sea" sharks, "pointers", "bluenoses", "shovel-noses", "grey nurses", and—if they should look ferocious enough—"tigers", on every stretch of Australian coastline; but, as a rule, such names are quite valueless as a guide to the species observed.

There is one species of *Eulamia*, the Black-tip Whaler, *E. melanopterus* (Quoy and Gaimard), which is quite easy for the field observer to identify. It always has the fins broadly tipped in black. It is rather heavily built, too.

Now, having given this short outline of the Australian *Eulamia* sharks, we may revert to the principal subject of this paper, which I am unable to fit in with any known species so far described in technical literature, and which I propose to give the tentative name of *Eulamia ahenea*—the specific name from *aenea* or *ahenea*, bronze-like, because of the prevailing colour of the body of the shark. I confess that I do this with considerable diffidence, and only after much thought and several years' experience of this interesting shark. And even in promoting a new species of shark of such a variable genus as *Eulamia*, I am quite prepared for the possibility that it may someday be shown to be a variety of some previously described species—more particularly one of the Pacific Ocean sorts.\* Incidentally, I have never known the Bronze Whaler to be taken inside the harbours or bays, as we so commonly take its congener the Common Whaler.

A general monograph of the genus *Eulamia*, based as far as possible on entirely new material from every area inhabited by one or other of the species, or supposed species, is very badly needed. This may only be done by some student such as Fowler, of the Academy of Natural Sciences, of Philadelphia, who, by his experience, and through the affiliations of himself and his associated institutions, might be in a position to take on a work of such magnitude.

In the immediate study of the Bronze Whaler I have closely examined and have taken measurements from three examples: The *first* was taken by Robert Wild, of Watson's Bay, Port Jackson, at a spot 4 miles east of North Head, P.J., during 1935. It measured overall 105 inches,

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\*In this connection, I suggest as a preliminary study for comparison a close examination of a series of *Eulamia* (*Carcharias*) *nesiotes*, described by Snyder from French Frigate Shoals, and often observed by me at Honolulu.—D.G.S.

with a girth of 51 inches. The *second* was taken by Zane Grey, off Sydney Heads, 9/4/1936; it measured overall 98 inches. The *third* was taken by Errol E. Bullen, of Vaucluse, Sydney, in 23 fathoms, off South Head of Port Jackson, 20/11/1937. It measured 100½ inches and weighed 205 lb. All three were males, but females of similar size have been seen by me and by Dick Palmer, well-known boatman and shark fisherman of Watson's Bay.

In the following short description any dimensions given are taken from the third specimen above-mentioned. For present purposes of identification, however, and for future comparison by systematists with other varieties or species of the genus, I prefer to rely upon the detailed relative measurements shown in the table given below. In passing, I might say that in many descriptions given by various authors in the past, emphasis has quite frequently been laid upon characters which were generic rather than specific. The table of relative measurements will enable anyone to work out quite a large number of dimensions not specifically given. Another matter worthy of mention is that depths of body and widths taken by themselves are often not of great use where one is dealing with allied kinds. Sharks vary a great deal in their depth, width and girth, and consequent weight. For instance, the great Tiger Shark caught by Zane Grey by rod and line, which was weighed by me, scaling 1,036 lb., would have weighed at least 1,300 lb. if it had been in good physical condition. Such a thing is commonly observed. Yet authors have frequently stressed such dimensions as of importance.

All three Bronze Whalers mentioned here were taken by rod and line under Sea Game Fishing Rules, with light tackle. Each angler who has so caught the fish pronounces it to be a most active and strong fighter—remarkably so for its size. The bright polished bronze colour is always in evidence, and even after the fish has been dead for some hours it still retains a light bronze tint on the upper parts.

*Eulamia ahenea*, Stead.

Body somewhat compressed. Head broader than high, somewhat flattened anteriorly; tapers from gills. Snout moderate, rather moderately rounded, narrow, shovel-shaped, not acute, length about 1/6th greater than mouth depth. Eye small, diameter about 1/5th mouth depth, front orbital edge just behind front edge of mouth. Mouth large, crescentic, labial fold at angle, short. Teeth almost erect in lower jaw, well inclined towards angle in upper jaw, 32

rows above, 32 rows below; bases broad in both jaws; cusps very narrow in lower jaw; much broader in upper jaw, but considerably narrower than in *Eulamia brachyurus*; deeply notched on posterior edge; upper teeth finely serrate on bases and on cusps; median upper teeth fairly large; median lower teeth small. Nostrils smaller than eye, 2/3rds distance from snout end to orbit. Gill openings fairly large; last one slightly posterior to the position of the base of the pectoral fin. First dorsal origin above end of posterior pectoral margin. Second dorsal small; basal length equal to 1/3rd distance to caudal pit. Anal a little larger than second dorsal, almost directly below, base longer, posterior edge deeply notched with 2 sharp angles. Caudal nearly 4 in total length; lower lobe produced, pointed. Pectorals subfalciform; outer angles rather sharp, inner blunt rounded; reaches almost to end of first dorsal base. Ventral small, situated about 3/5ths of distance between dorsal bases. Deep pit above caudal peduncle. General form rather elegant; body rather more rounded below than in *Eulamia brachyurus*; snout also rather more flattened both above and below.

Colour: When fresh a bronze-brass colour "like a new penny", almost pale golden at times; grey or cream strip along sides from eyes; creamy white below.

Length of largest observed, about 9 feet.

#### MEASUREMENTS OF *EULAMIA AHENEA* STEAD.

	1.	2.	3.		1.	2.	3.
LENGTH OVERALL (In Inches) . . . .	105	98	100½				
LENGTH TO CAUDAL PIT (In Inches)	74	72	73				
	Hundredths of Total Length.				Hundredths of Length To Caudal Pit.		
	1.	2.	3.		1.	2.	3.
1. LENGTH FROM POINT OF SNOOT:							
To Nostrils . . . . .	—	3.7	4.6		—	5.0	6.0
To Point of Gape of Mouth . . . . .	—	5.9	—		—	8.0	—
To Anterior Border of Eye (Length of Snout) . . . . .	5.7	6.6	6.8		8.1	9.5	9.2
To Angle of Mouth . . . . .	—	11.1	—		—	15.1	—
To First Gill Slit (Length of Head) . . . . .	—	16.6	17.7		—	22.6	24.3
To Fifth Gill Slit . . . . .	—	—	20.1		—	—	30.5

To Anterior Edge of Insertion of Pectoral Fin . . . . .	—	19.9	18.9	—	27.1	26.0
To Posterior Edge of Insertion of Pectoral Fin . . . . .	—	—	25.4	—	—	34.9
To Beginning of Base of First Dorsal Fin . .	31.4	33.2	30.8	44.6	45.1	42.5
To End of Base of First Dorsal Fin . . . .	40.5	41.8	39.3	57.4	56.9	54.1
To Beginning of Base of Ventral Fin . . . .	—	51.0	49.3	—	68.5	67.8
To End of Base of Ventral Fin . . . . .	—	—	49.8	—	—	68.5
To Beginning of Base of Second Dorsal Fin .	—	66.7	62.9	—	90.6	86.6
To End of Base of Second Dorsal Fin . . .	—	69.9	65.7	—	95.1	90.4
To Beginning of Base of Anal Fin . . . . .	—	64.8	62.2	—	88.2	85.3
To End of Base of Anal Fin . . . . .	—	68.5	65.7	—	93.4	90.4
To Centre of Caudal Pit	70.5	73.5	72.6	—	—	—
To Bottom of Cleft of Tail . . . . .	77.8	—	78.1	—	—	—
2. WIDTH OF EYE . . . . .	—	1.1	1.0	—	1.5	1.4
HEIGHT OF EYE . . . . .	—	1.0	—	—	1.4	—
3. DEPTH OF GAPE OF MOUTH . . . . .	—	—	4.5	—	—	6.2
WIDTH OF GAPE OF MOUTH . . . . .	9.0	8.2	9.0	12.8	11.1	12.3
4. LENGTH OF MANDIBULAR RAMUS . . . . .	—	—	6.3	—	—	8.5
5. DISTANCE FROM 1st to 5th GILL SLITS . .	—	4.7	—	—	6.4	—
6. HEIGHT OF GILL SLITS:						
First . . . . .	2.7	—	—	3.6	—	—
Second . . . . .	3.1	—	—	4.2	—	—
Third . . . . .	3.3	—	—	4.5	—	—
Fourth . . . . .	3.2	—	—	4.4	—	—
Fifth . . . . .	2.7	—	—	3.6	—	—
7. LENGTH OR HEIGHT OF FINS:						
Upper Fluke of Tail .	29.5	26.5	26.2	41.9	38.9	36.1
Lower Fluke of Tail	11.4	12.2	12.9	16.2	16.7	17.8
Pectoral Fin:						
Anteriorly . . . . .	18.6	—	18.4	26.4	—	25.3
Posteriorly . . . . .	—	—	4.7	—	—	6.5

Ventral Fin:						
First Dorsal Fin	—	11.6	9.0	12.2	15.8	12.3
Anteriorly . . . . .	—	6.1	5.0	—	8.3	6.8
Posteriorly . . . . .	—	3.3	4.4	—	4.5	6.0
Second Dorsal Fin:						
Anteriorly . . . . .	—	2.8	3.0	—	3.8	4.1
Posteriorly . . . . .	—	3.4	3.5	—	4.7	4.8
Anal Fin:						
Anteriorly . . . . .	—	3.1	3.5	—	4.2	4.8
Posteriorly . . . . .	—	5.6	5.1	—	7.6	7.0
8. LENGTH OR WIDTH OF BASE OF FINS:						
Pectoral . . . . .	—	7.1	6.0	—	9.7	8.2
Ventral . . . . .	—	6.6	4.9	—	9.0	6.5
First Dorsal . . . . .	9.0	8.7	8.5	12.8	11.8	11.6
Second Dorsal . . . . .	3.3	3.3	2.7	4.7	4.5	3.8
Anal . . . . .	—	3.6	3.6	—	5.2	4.6
9. LENGTH OF CLASPERS (Males)						
	—	10.2	12.4	—	14.6	17.1
10. WIDTH OF SHARK, AT:						
Nostrils . . . . .	—	7.7	7.8	—	10.4	9.8
Three Inches From Point of Snout . . . . .	—	—	7.0	—	—	9.6
Eye . . . . .	—	10.7	9.2	—	14.6	12.7
Angle of Mouth . . . . .	—	—	11.4	—	—	15.8
First Gill Slit . . . . .	—	14.3	13.4	—	19.4	18.5
Last Gill Slit . . . . .	—	—	13.9	—	—	19.2
First Dorsal Fin . . . . .	—	—	14.9	—	—	20.5
Ventral Fin . . . . .	—	—	9.0	—	—	12.3
Second Dorsal Fin . . . . .	—	—	6.0	—	—	8.2
Anal Fin . . . . .	—	—	7.0	—	—	9.6
11. DEPTH OF SHARK, AT:						
Point of Gape of Mouth . . . . .	—	4.6	—	—	6.3	—
Nostrils . . . . .	—	2.8	—	—	3.5	—
Eye . . . . .	—	5.4	7.0	—	7.3	9.6
Angle of Gape of Mouth . . . . .	—	8.2	8.0	—	11.3	11.0
First Gill Slit . . . . .	—	11.7	10.0	—	16.0	13.7
Pectoral Fin . . . . .	—	12.8	—	—	17.4	—
Ventral Fin . . . . .	—	—	9.8	—	—	13.4
First Dorsal Fin . . . . .	—	14.8	10.9	—	20.1	15.0
Second Dorsal Fin . . . . .	—	—	7.2	—	—	9.9
Anal Fin . . . . .	—	—	7.3	—	—	10.3
Caudal Pit . . . . .	4.0	—	3.9	5.7	—	5.3

## NOTICE TO MEMBERS.

Members are reminded of rule 4 of the Society which reads: "All subscriptions shall become due on the first day of August and shall be payable in advance".

## NATURALISTS' SOCIETY OF NEW SOUTH WALES.

*Proceedings.*

OCTOBER, 1937.

The ordinary monthly meeting of the Society was held in the Conference Room, Department of Agriculture, on Tuesday, October 5, 1937, at 8 p.m.

The President (Mr. D. G. Stead), in the chair, with about 45 members and visitors present.

Correspondence.—Peter Korsman, forwarding specimens for identification. Miss T. Y. Harris, advising that Mr. Edwin Ashby, "Wittunga", Blackwood, South Australia, had several varieties of wattles for sale.

Announcement.—The President announced that Messrs. Angus & Robertson, Ltd., were publishing a book of Australian plants, with illustrations of flowers and descriptions. The illustrations were part of a collection of works painted by the late Mr. Adam Forster. The President suggested that the publishers be notified of the appreciation of the Society on their new publication.

The President also advised members that at the previous Council meeting it was decided to elect Mrs. Froggatt to life membership of the Society, and asked for confirmation from the meeting. This was carried unanimously.

New Members.—Miss McDonald, Mrs. J. P. Wingrove, Miss D. Martyn, Lieut.-Colonel C. V. Morisset, Miss N. F. Cromnelin, and Miss Gamble were unanimously elected members of the Society.

Nomination of Members.—Miss Clarice Elphinstone, 14 Gower Street, Summer Hill. Nominated by Miss E. Wright, seconded by Miss B. Coxhead. Miss Jean Grace Buckingham, 54 Tryon Road, Lindfield (junior member). Nominated by Mr. M. S. Barnett, seconded by Miss Dolce Dobbin.

Exchange and Mart.—Collection of butterflies and moths were given by Mrs. Froggatt, for sale, the proceeds to go to the Society. Fifty copies of the book, "The Rabbit in Australia", were given by Mr. Stead, the proceeds to go to the Society.

The President brought forward the matter of the disruption of scientific work in China by the present hostilities, and asked for the adoption of a resolution to be forwarded to the "China Society of Science and Arts", "The Shanghai Branch of the Asiatic Society", and the Quest Society. After discussion on the wording of the resolution, the following was moved by Mr. Bailey and seconded by Dr. Clarke Webster, and passed, "That the Society desires to, and does



now, express its deepest sympathy with the above Societies in the tragic interruption of their work and influence in China, which has come to pass through the invasion of their territory, and the Society trusts and hopes that these Societies will soon be restored to their normal place, and influence in the life of Shanghai, and of the Chinese students of the sciences and arts”.

Exhibition of Specimens.—Mr. A. E. Watson: Specimens of Queensland nut, *Macadamia ternifolia*, in bloom and various other plants. Specimen of petrified or silicated wood.

Mr. C. S. Ashley.—Various botanical specimens, including specimens of *Melaleuca leucodendron*, *Eustrephus* and Dodder.

Mr. D. G. Stead.—Stated that the Sea Slug was spawning at present along the coast.

Mr. E. H. Zeck.—Exhibited lantern slides of beetles of the family *Colydiidae*, in which many new species were represented.

Mr. Luke Gallard.—Specimens found on the excursion to St. Ives, which included fly larvae, wasps, and caterpillars.

Mr. E. A. Hamilton told members of the colour sense of the Eastern Bower Bird, which took two and a half minutes to sort out twenty-five pieces of blue-wool from one hundred and ten pieces of different coloured wools.

Mr. M. S. Barnett.—Sent notes on the excursion to St. Ives.

Mr. D. G. Stead.—Exhibited lantern slides of sharks, fresh water fishes, etc.

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#### NOVEMBER, 1937.

The ordinary monthly meeting of the Society was held in the Conference Room, Department of Agriculture, on Tuesday, November 2, 1937, at 8 p.m.

The President (Mr. D. G. Stead), in the chair, with about 60 members and visitors, including members of the Orchid Society present.

Announcements.—The President announced that the Christmas party would be held, and asked for volunteers for the ladies' committee. Mr. Stead welcomed members of the Orchid Society present.

New Members.—Mrs. A. E. Froggatt was unanimously elected an honorary life member of the Society, and Miss Clarice Elphinstone and Miss Jean G. Buckingham were unanimously elected members of the Society.

Report.—Mr. A. E. Watson reported on the excursion to Oatley Park, held on the previous Saturday, when 35 members were present.

Exhibition of Specimens.—Mr. Luke Gallard: A collection of wasp parasites.

Mr. G. White.—A collection of ferns presented to the Society by Mrs. Oldfield (daughter of the late Mr. Abrahams).

Mr. David G. Stead.—Announced that during the month a large specimen of a seven-gill shark had been caught by a set-line in deep water off Port Jackson. It measured 76 inches in length.

Mr. A. E. Watson.—Piece of flint stone from south Engadine, where it is found.

Mrs. C. A. Messmer.—Mentioned that on looking through the book of pressed ferns presented to the Society, she noticed that several of the names required to be brought up to date, and offered to alter the names where necessary.

Lecture.—His Honour Judge H. F. Markell, B.A., LL.B., K.C. (President of the Orchid Society of New South Wales), delivered an extremely informative and interesting lecture, entitled, "Experiences among Native and Exotic Orchids". The lecture was illustrated with beautiful living specimens, and all present learnt a great deal regarding the culture of of thanks.

these plants. The lecturer was accorded a very hearty vote

#### DECEMBER, 1937.

The ordinary monthly meeting of the Society was held in the Conference Room, Department of Agriculture, on Monday, December 6, 1937, at 8 p.m.

The President (Mr. D. G. Stead), in the chair, with about 70 members and visitors present.

Announcements.—The President made a statement in regard to the change of night for the December meeting, and apologised for the absence of members. He also welcomed visitors, many of whom were from various Government Departments.

Exhibition of Specimens.—Mr. S. Ashley: Specimens of insects, including ant lions, larva of a fly, and section of tree tunnelled by beetle larvae.

Mr. J. C. Wiburd.—Specimen of a species of *Hoya*, which was described by Mr. A. E. Watson.

Mr. M. E. Gray.—Specimens of larvae or caterpillars of the moth, *Danima banksiae*.

Miss Jean Garling.—Specimens of marble.

Mr. Luke Gallard.—Specimens of caterpillars, aphids, and a “sea-pen”.

Mr. D. G. Stead.—A large specimen of the venomous spined “Fortescue” or “Forty”, and described the functions of the spines. Specimen of the upper right ramus and left lower ramus of the “Bronze Whaler” shark, *Eulamia*, sp. Mr. Stead also described Mr. Gallard’s specimen of a “sea-pen”, which is commonly found on the coast to a depth of 60 fathoms.

Lecture.—Mr. E. S. Clayton (Director of the Soil Conservation Service, Department of Mines), delivered an extremely informative and interesting lecture, entitled, “Soil Erosion and the Naturalist”. The lecture was illustrated with numerous lantern slides, and at its conclusion the lecturer was accorded a very hearty vote of thanks.

#### FEBRUARY, 1938.

The ordinary monthly meeting of the Society was held in the Conference Hall, Department of Agriculture, on Tuesday, February 1, 1938, at 8 p.m.

The President (Mr. D. G. Stead), in the chair, with about 56 members and visitors present.

Announcements.—The President announced that the Society had been invited to co-operate with the Royal Zoological Society of New South Wales, and other Societies, in organising a Fauna and Flora Exhibition in connection with the 150th Anniversary celebrations, and that a committee had been formed, consisting of members of the Council and with the assistance of Mr. E. Gostelow to deal with exhibits, etc. It was decided to circularise members regarding exhibits, etc.

The President also announced that Mr. A. E. Tebbutt was seriously ill, and the Secretary was instructed to forward a letter of friendship and sympathy from members.

Nomination of Members.—Miss Ballantyne, 140a Louisa Road, Long Nose Point, Birchgrove. Nominated by Miss M. Davidson, seconded by Miss D. Dobbin. Miss Dorothea Booth, “Cloverdale”, Excelsior Road, Castle Hill. Nominated by Miss L. Halloran, seconded by Miss D. Dobbin. Mr. P. Whitley, 255 Byng Street, Orange. Nominated by Miss D. Dobbin, seconded by Mr. M. S. Barnett. The President welcomed Mr. McDonald, a country member from Armidale.

Exhibition of Specimens.—Mr. M. E. Gray: A Flat-tailed lizard or rock gecko, *Gymnodactylus platyurus*, which was erroneously thought by many people to be ferocious. It is neither dangerous nor poisonous.

Mr. Luke Gallard.—Specimens of insects obtained at Epping, on the Saturday excursion.

Mr. E. P. Bailey.—Fibre of a palm and section and bark of a "tea-tree".

Mr. S. Ashley.—Specimens of various woods, including Walnut, Tasmanian Fiddle-back, Silky Oak, and Blackwood.

Mr. A. E. Watson.—Specimens of the Queensland Fruit Fly, *Chaetodacus tryoni*.

Miss L. Kaylock.—Eggs of a wall Lizard taken from a staghorn fern.

Mr. D. G. Stead.—The young of the "Hammer Head" shark taken from a shark captured the previous Saturday. Mr. Stead also described how easily plant seeds may come into this country in spite of quarantine regulations. Recently, he received a parcel containing a snake bite cure, from India. It was packed in grass. The dried seeds he had sent to the Department of Agriculture; they readily germinated and were grasses entirely new to the Department.

Lecture.—Mr. W. B. Gurney, B.Sc., F.R.E.S. (Government Entomologist, Department of Agriculture), delivered an extremely interesting and informative lecture, entitled, "Plague Grasshoppers in New South Wales". The lecturer was accorded a very hearty vote of thanks.

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#### MARCH, 1938.

The ordinary monthly meeting of the Society was held in the Conference Hall, Department of Agriculture, on Tuesday, March 1, 1938, at 8 p.m.

The President (Mr. D. G. Stead), in the chair, with about 56 members and visitors present.

Announcements.—The Secretary announced that Mr. A. E. Tebbutt had died and members stood as a mark of respect. The President advised that Miss C. M. Le Plastrier had also died, and members again stood in silence.

[Since the above meeting, the Society has lost, through death, Miss E. Saunders and Mr. Luke Gallard.—Ed.]

The Secretary advised that she had received a message from Mrs. Messmer, apologising for her absence from the meeting, and sending a message of good wishes and farewell to members on the eve of leaving for a visit abroad. The Secretary was instructed to forward to Mrs. Messmer the good wishes of the meeting for her journey.

New Members.—Miss Ballantyne, Miss D. Booth, and Mr. P. Whitley were unanimously elected members of the Society.

Nomination of Members.—Mr. Eldred Best, c/o Central District Ambulance, Railway Square, Sydney. Nominated by Mr. J. C. Wiburd, seconded by Mr. S. Ashley.

Russian Arctic Expedition.—The President drew attention to the successful termination to the operations of the heroic Russian Arctic Expedition, when, a few days since, both men and records were safely transferred from their icy home to the great ice-breaker ships which had been fighting their way toward the expedition off the coast of Greenland for some time.

Mr. Stead said that every naturalist would rejoice at the happy outcome of an epoch-making expedition whose hopes of ultimate rescue were thought, right from the beginning, to be somewhat slender. Mr. Papanin and his associates had written an indelible page in the history of man's struggle for knowledge, as well as in the story of geographical exploration. The whole operation also was a splendid tribute to the directing genius of Professor Otto Schmidt. Almost everything seemed to have worked out, so to speak, to schedule. After 258 days spent on the ice on which they had first landed from planes, in the vicinity of the North Pole, and after floating for many hundreds of miles towards the Greenland Coast—often in danger of the most terrible of deaths and with the fear of the loss of their priceless scientific records constantly before them—this unparalleled scientific expedition was now returning to civilisation with a vast fund of information upon many aspects of study of the polar seas and polar ice, of the polar atmosphere, and a continuous story of day to day investigation and observation which would form a new chapter in meteorology and the physical sciences. Even oceanographical work at varying depths from the surface (immediately below their ice-flow home) to the constantly changing Arctic Ocean floor, had been regularly carried out from day to day, and, by the aid of radio, an immense amount of data had been forwarded throughout the whole period of the miserable and incredibly dreary sojourn of these "castaways of science", from their floating ice home—from the poor shelter of tents and extemporised ice or snow huts, and, latterly, often with the terrible crashing and roaring going on of the rapidly dwindling ice floes beneath and around them.

Mr. Stead then moved, from the chair, that a letter of congratulation on the successful conclusion to their great enterprise be written to Professor Schmidt and Mr. Papanin. This was seconded by Mr. E. P. Bailey and carried unanimously.

It was also mentioned at the meeting that the scientists, throughout their drift, had been in communication by radio with Moscow, and that some of these talks had been heard on short-wave sets in Australia.

Exhibition of Specimens.—Mr. Luke Gallard: Specimen of a hawk moth, *Coequosia australasiae*, brought to the meeting by Mr. J. C. Ludowici.

Miss Howieson.—Specimen of "Box fish" found on Garie Beach.

Mr. D. G. Stead.—Specimens of butterflies forwarded by Dr. Middleton, of Murrurundi. The butterflies wings had been pressed into a gummed surface and the wing scales partly adhered, giving "prints" of the wings. The bodies and antennae were added with water colours.

Lecture.—Mr. Keith A. Hindwood (Hon. Ornithologist, Australian Museum), delivered an exceedingly interesting and informative lecture, entitled, "In Search of Birds". The lecture, which was illustrated by many beautiful lantern slides, was enjoyed by all, and the lecturer was accorded a hearty vote of thanks.

#### *CIMEX LECTULARIUS* (COMMON HOUSE BUG).

In a very old version of the Bible, published shortly after the Great Fire of London, 1666, there is a verse, Psalm XCI, Verse V, which reads:—

Thou shalt not be affrayed for any bugges by nighte:  
Nor for the arrow that flyeth by day.

This refers to the repulsive blood-thirsty creature which is a wingless species of the family *Cimicidae* within the order *Hemiptera*. It is reported that these insects were not known in England before the Great Fire, 1666, but were imported in timber used for rebuilding London.

—J. W. HAWLEY.

# The Australian Naturalist

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DECEMBER, 1938.

Part 4.

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## SOME PROBLEMS OF AUSTRALIAN FISHERIES AND THEIR SCIENTIFIC TREATMENT.

By DAVID G. STEAD.

Presidential Address to The Naturalists' Society of  
New South Wales.\*

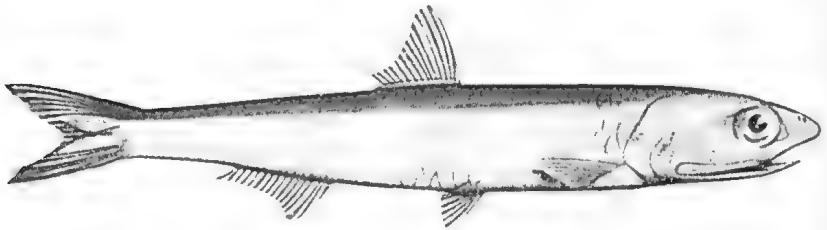
During the past twelve months or so there has been a quite considerable amount of public discussion of several items of interest and importance in economic fisheries development and in relation to what may be termed fisheries biology. Most of this discussion has been of a type which has been recurrent in Australian public circles for many years past—always reaching that dead end which has seemed to be the unfailling fate of most fisheries questions in this country where our people, in the main, appear incapable of appreciating the great national importance of fisheries development and the many concomitant potential industries associated therewith. The outstanding feature of these public discussions—even right up to the present day—is that they always reveal the almost hopeless state of ignorance which prevails, not only among the rank and file of the public, but also to a large extent in official circles in many places. That lack of official knowledge which is so often displayed is really not very surprising, as it is a kind of companion to, and a result of, the almost universal Australian indifference to advancement. Governments, also legislators (with a few bright exceptions here and there) have consistently closed their eyes to this field for scientific and commercial endeavour—the two combined, of course—which has lain at our doors for so long, only partly developed on relatively

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\*Given at the October, 1938, meeting of the Society.

small sections of our immense Australian coastline, while most of that coastline has remained practically untouched, in the fishery sense, since our advent to these lands 150 years ago.

Had our Governments alone recognised long ago the potentialities of these fishery fields, we could by now have possessed, not only immense industries associated with marine development, but we would have built up a large body of expert official advisers on every aspect of fisheries administration and development, around whom would have revolved greater and still greater advancement in this



AUSTRALIAN ANCHOVY (*Engraulis*).

This valuable foodfish is extremely abundant at many places on the eastern Australian coasts; at times shoaling in vast numbers. Great numbers are always to be found in the waters of Port Phillip, Victoria.

field which has made such immense strides in the past 30 years in almost every country but Australia. We are all familiar with the great and ever growing scientific background to the development of industry, that the administration, control and economic development of both sectional and general fisheries to-day, are all built upon the labours and the investigations of the fisheries economist and his scientific helpmates. Except for some very meagre, and almost grudging acceptance of the fact in some places, however, Australia has not yet learned this basic truth. And without learning it, our fisheries—which may be the lifeline of many parts—will remain otherwise barren and undeveloped.

In my 1929 presidential address "Marine Resources and the Naturalist", the substance of which was published in this Journal (Vol. 7, pt. 8, Sept. 1929), I dealt in a general way with parts of this same problem. The present address should be looked upon as a companion to the former one and should be read in conjunction therewith. At the same



time, I wish to quote a little from this earlier address to emphasise some present points. After repeating the late Dr. Jordan's dictum that all fisheries control must be based upon scientific investigation, and stressing the need for the application of the knowledge so gained for the immediate economic benefit of the community, subject to the necessary conservational safeguards, I said:—

Fisheries development may proceed in various ways, but, in any new fishery—and even in some of the older fisheries—experimental work should be carried out by the overhead authority, the State, with a view to ascertaining both the possibilities for commercial development and permanence of the industry. Such experimental work, to be of lasting value, should be in the hands of the fisheries economist, who will co-ordinate and correlate the information obtained.

And, further, regarding the concomitant oceanographical and marine biological studies:

Parallel with the regular fisheries investigation work—such as the testing of the various bottom and surface fishing grounds with all forms of fishing gear, the elucidation of seasonal, bathymetrical and geographical distribution, the rate of growth, food, etc., of economically valuable fishes and their food organisms—should be investigations relating to sea currents and temperatures, nature of bottom deposits, chemical constituents of the sea water, nature and volume of the plankton and other associated marine life, as well as a number of other related subjects of inquiry which properly appertain to a wide application of marine biology.

#### SEA FISHERIES DEVELOPMENT.

As regards sea fisheries development I have here shortly sketched, in their rational order of sequence, the various types of investigation which are needed and which should be followed by the various States of Australia and by the Commonwealth authorities in both separate and concerted efforts. As regards State investigations, the position remains about the same as when I wrote those lines nine years ago. Very little individual State work has been done, and practically nothing of a co-ordinated nature, as between the various States. Individual naturalists have been able to do a little in certain restricted sections of marine biological study and in static oceanography, but, taken by and large, the general condition of backwardness of the State authorities remains unaltered, so fisheries development remains as before, "anybody's business", with private

fishing concerns carrying on (especially in open sea work) as best they can, without any assistance from the authorities, either by intelligent organised control or by co-ordination of the individual efforts and discoveries.

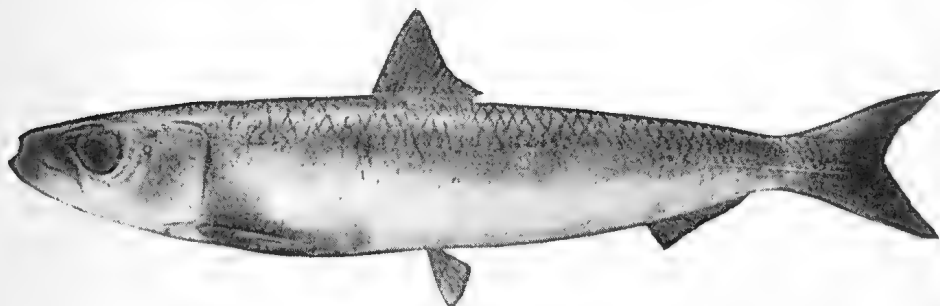
In the Commonwealth field, although much has been talked over during these nine years, nothing of importance has eventuated until the last few months, when a small ocean-going fishery investigation vessel, the "Warreen", has initiated pelagic fish enquiries off the south-eastern Australian coastline. This vessel is equipped chiefly with surface nets, such as the purse-seine, but has also been fitted out with scientific equipment for certain oceanographical and biological enquiries. It is understood that detailed investigations are now being made into the occurrence of well known pelagic fishes such as the Tunny and other mackerel kind, as well as other surface or near surface species. The operations of this vessel will be watched with great interest by all of those interested in the scientific and economic development of our marine fish fauna. Perhaps one may be permitted to express the hope that the vastness of the field—both geographically and in its faunal scope—will not tempt those responsible for the work to try to cover too great an amount of territory, at least in the early period of the work.

From the point of view of the experienced fisheries economist, the attempt to unravel the problems of even the pelagic fisheries of the vast 12,000-mile Australian coastline with only one small vessel of highly restricted scope and fishery equipment, is nothing short of ridiculous. The general scope of this developmental fishery field has been well known for many years past. The writer has himself repeatedly drawn attention to it during the last thirty-five years—more particularly in his paper, "The Future of Commercial Marine Fishing in New South Wales" (1911), wherein it was shown that while there were great prospects for the development of trawling and other forms of bottom fishing at sea (later to be realised to such a marked extent on the New South Wales coast), far and away the greatest potential fishery field of Australian seas was to be found in the pelagic fisheries—embracing mainly Sardines, Sprats, Pilchards, Herrings, Anchovies, Mackerel of several species, including great Tunny and Bonito, several large fishes of the Yellowtail family, Australian Salmon and other kinds.

#### NEED FOR SPECIALISED EQUIPMENT.

I spoke just now of the "restricted" equipment of the present Commonwealth vessel, but the use of this term does

not imply any adverse ideas. The equipment is necessarily restricted to adapt the vessel for particular types of fishery work. And this is as it should be. In this connection it is worthy of mention here, that the writer himself was only able to direct the attention of the Commonwealth Government to the necessity for obtaining or constructing such a specialised fishing craft—fitted primarily for the capture of surface-swimming fishes (or at least those which most frequently made their appearance at the ocean surface)—in the face of a flood of inexpert advice from a number of biologists and others, who had, as always, confused the need for concomitant biological research with the primary



AUSTRALIAN PILCHARD (*Sardinops*).

This pilchard or sardine is destined to be one of Australia's most important foodfishes. Very abundant at all times (often in moderately deep water) off the New South Wales coast, it moves at times—notably in September—in shoals of vast extent, up to many miles in length.

economic questions of the fisheries. Had the advice of such "experts" been followed we would have now been operating with a vessel which would have been "neither flesh nor fowl nor good red herring", and which could have only carried out some purely sectional research in aquatic biology and related subjects, but which might have added very little to our knowledge of fishery economics in many years of work. When the time arrives that we have several vessels working the coasts of Australia in the various departments of economic fishery research, then it will be most opportune to have a special vessel mainly for oceanographical and marine biological research, but the latter should not take precedence over the essential investigations with various forms of gear, and into the relation of such gear to the various fishery fields.

I feel that it is so important to stress this question of the order of investigation in primary fisheries development, that I may be excused for referring to several points which were brought before the Minister-in-Charge of Development, at Canberra, some time ago in a memorandum of advice as to the most suitable type of fishery research vessel needed (where only one vessel was intended to be commissioned), following upon various representations having been made to the Commonwealth Government, urging the construction and commissioning of a special vessel for general marine biological and associated work—representations which so clearly indicated the lack of fishery knowledge and of the fishery requirements of this country. I referred the Minister also to certain related recommendations of mine contained in my "Report Upon the Fisheries of British Malaya" (1932), where, in explaining my proposal for the appointment of a Superintendent of Fisheries Investigation I warned the administration against the appointment of one who might carry on purely marine biological work, while neglecting the all-important economic investigations with various forms of fishing equipment. It was stated there (p. 96) that while the research officer should be "well equipped with a knowledge of marine biology" and that "while the working biologist finds a very important place in the organisation of the Fisheries Department—wherever situated—it would be a great mistake to have in the position under discussion an officer who was solely a biologist".

Though I was aware that it would sound as a rank heresy in the ears of some, it was stated further:—

There is not wanting evidence that a mistake has been made in this way, in several places in the world, during the last twenty years. Unquestionably a great deal of the published work that has resulted therefrom, in some places, has been more "interesting" than immediately beneficial to the fisheries, or helpful to the administration, in either its control of the organisation, or for future guidance.

These remarks were read later by one of the greatest of all scientific fishery experts in the world—Dr. John N. Cobb, professor in the University of Washington, and Director of the famous College of Fisheries and Food Preservation there. Dr. Cobb had a long practical acquaintance with all the leading forms of fishery work in the world, while being also a most distinguished biologist. It is of value, therefore, and permissible, perhaps, for me to quote from Dr. Cobb's comments upon my published remarks.

Writing in 1924, he said, *inter alia*:—

For a number of years I have been observing the methods followed by various countries in their endeavour to develop their fishery resources, and while these have interested me from an ichthyological standpoint, yet they have done, in most cases, almost nothing looking to the development of commercial fisheries, which are of course the backbone of any real development. Once or twice I have raised my voice in protest against the methods followed, but these have been in use so many years that it is difficult to get people to change their ideas. I have one particular Asian province in mind—one with which this country is vitally involved. Here some fourteen years have been devoted to development, and practically nothing to show for it, simply because the old methods were followed instead of the more modern ones.

Early in my own career I, also, had to "raise my voice in protest" against the type of jack-of-all-trades vessel which was to be built—and which ultimately was built—for the Commonwealth authorities, to carry out trawling investigations on these coasts. Though nominally a trawler, intended for the use of the otter trawl, the "Endeavour" was extremely ill-designed for deep-sea trawling work, and at no time was she able to manipulate satisfactorily the full-sized commercial trawl net. Even the smaller nets which she did operate very often played "ducks-and-drakes" over the sea bottom, so that, after several years' operations, although she caught a large variety of fishes and other marine organisms, nothing profitable was demonstrated from the point of view of commercial development. Indeed, her "results" were—as contemporary press references and State reports will show—constantly used to indicate the paucity of the commercial bottom fisheries on the eastern coast of Australia, and the unsuitability and economic disadvantages of the trawl net for such purposes. As I have pointed out elsewhere (notably in the 1924 Australian Year Book): "Ichthyologically the 'Endeavour' produced results of great interest and value", but as an economic demonstration vessel her operations were quite disappointing. Actually, on many of the grounds which later proved to be our finest trawling areas, with modern trawlers, the 'Endeavour' only secured 'samples' or no fish at all".

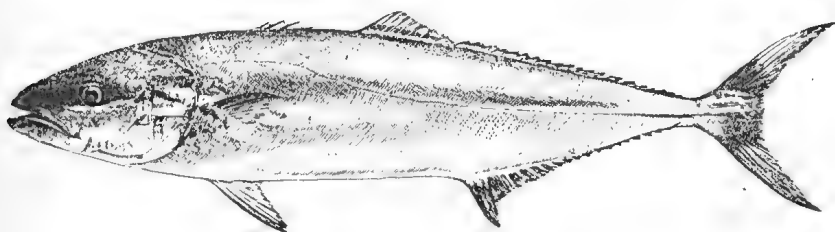
I have very good reason to remember the operations of this vessel, for, in the years 1912, 1913 and 1914, when I put forward suggestions to the Government of New South Wales for the proper testing of our ocean bottoms on economic

lines with three modern otter trawlers, I was constantly met with press, official, and Parliamentary opposition—the example of the Commonwealth vessel being unfailingly produced to show the futility of my proposals. Yet, when at last my three vessels materialised in 1915 (and others later), they showed the existence of commercially profitable grounds right from the outset—and, as a direct result, we have to-day, working out of Sydney, a large trawling fleet, adding annually great wealth and a large food supply to the State's resources.

This brief recital of former experiences will explain to my fellow naturalists, my anxiety when the Commonwealth Government again decided to enter the field of research and will indicate the reasons for my insistence on the proposed new vessel being correctly designed primarily for one specific section of economic fishery development, such as the purse-seine type of vessel for surface or near surface work. The particular need for the latter type of vessel was specially stressed in view of the bottom fisheries having been already initiated (though requiring much additional elucidation) and the outstanding fact that so many types of pelagic commercial fishes were known to inhabit our waters, and were lying undeveloped, with economic possibilities almost impossible to exaggerate. Here the Minister was given the lesson of the "Endeavour", was shown how her operations had actually retarded instead of encouraging development, and was strongly impressed with the necessity for setting aside all considerations other than those of economic advancement in the coming vessel's design for certain fishing equipment. It was further pointed out that this would still enable a great deal of accompanying oceanographic and marine biological work to be carried out.

I propose now to pass on to the discussion of several kinds of fishery problems of to-day, related to some specific fishes, etc., but just before leaving this general discussion may I say that I hope that any governmental authority—Commonwealth or State—in Australia, which intends to take practical steps toward encouraging particular fishery industries, will weigh well the type of argument which I have brought forward here, and will see to it that their vessel or vessels are correctly designed and equipped by fisheries specialists, and will weigh very carefully, before accepting, the recommendations of the restricted marine biologist or sectional marine naturalist—however great may be the latter's academic knowledge. It will always be

found that the experienced fisheries economist will not discard the ideas of the biologist, but will place them in their proper perspective, incorporating them as far as is essential in the general scheme. In addressing this appeal to Governments I have in mind the urgency of each State conducting with at least one specialised sea-going fishery vessel, at the earliest possible moment, the elucidation of sea fishery problems which will directly lead to development as did the efforts of the New South Wales Government from 1915 and onwards. Each of the other States, as well as the Commonwealth itself (off Northern Territory coasts) might have now been possessed of at least these



#### KINGFISH (Victoria "Yellowtail").

Grows to about six feet long. Fine foodfish, occurring in large shoals at sea. To be taken by line and surface nets.

partially developed open sea fisheries to-day, if they had taken such steps about the same time. Obviously, the longer such initiatory work is postponed, the longer shall we wait for full development.

#### CONSERVING INSHORE FISHERIES.

In this section, and in my concluding remarks, I shall deal very shortly with a number of apparently unrelated fisheries matters, selected almost at random, to indicate the constant need for basing all efforts at conservation, increase of supply and development on the work of the qualified fisheries investigator, rather than upon advice and opinions of inexpert people—however concerned such people may be in the furtherance of the fisheries. Taking inshore—i.e., bay, sea, lake and estuarine—fisheries as our first example. Latterly I have been watching with great interest the uprising of one of the periodical waves of public concern regarding these and their future. As usual, it was

accompanied by much well-meant enthusiasm in several directions, while wrong premises were being supported in press, in angling circles, in Parliament and elsewhere by faultiest of arguments. Strong editorials and other contributed press articles which appeared were faulty in nearly every line and were based upon the most complete misunderstanding of the general and local distribution of our edible and other commercial fishes and of their breeding and other habits.

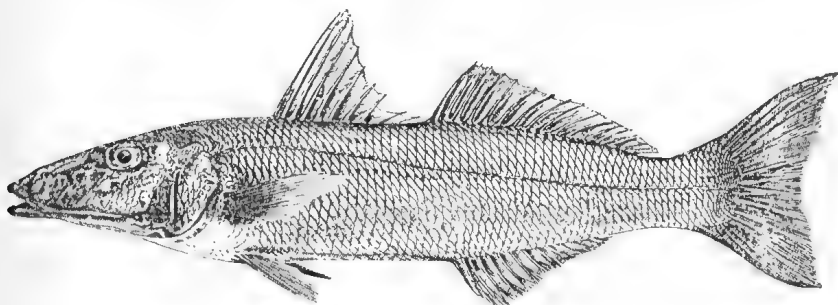
The fact is that every inshore water must be treated, from the point of view of fisheries regulation, almost entirely by itself. There is hardly one in which the conditions are precisely similar to another, although there are several somewhat similar in certain characteristics. Port Jackson stands peculiarly alone, for nearly all the nursery grounds of edible fishes living there have been covered up by reclamations. These are not, and never were, however, spawning grounds, as so many amateurs would have. It is not true, as so often stated by various correspondents and deputations, that "the deep sea fish come into these harbours to spawn". Indeed, there is only one of our important edible fishes which penetrate even a little at that time—that is the Sea Garfish. Quite on the contrary, all of the important estuary fishes make for the entrances or go right outside during the spawning period. Likewise—and contrary to popular ideas still prevailing—no trawling operations in the ocean have any effect whatever upon the supply of inshore fishes, as the species taken are quite distinct, and no young of estuary kinds are taken. It is idle, therefore, to follow the popular demand, and make inshore closures "to protect the spawning grounds" as it is so often put. Yet this still goes on without adequate investigation by competent fisheries men.

Many other misconceptions are continually recurring—relating mainly to distribution of species, age and size at spawning, breeding periods, rate of growth, suitability of lawful sizes, and so on. I found exactly the same state of affairs in the Malay Peninsula and other British-controlled areas, Sumatra and associated areas. In every case what is the apparent thing to the ordinary interested observer, proves, upon expert examination, to be entirely wrong or faulty. In fixing regulations relating to fisheries, it is impossible to consider only one set of conditions or circumstances, as very great harm may so result both to the fisheries and the community as well.



## THE PELAGIC FISHERIES.

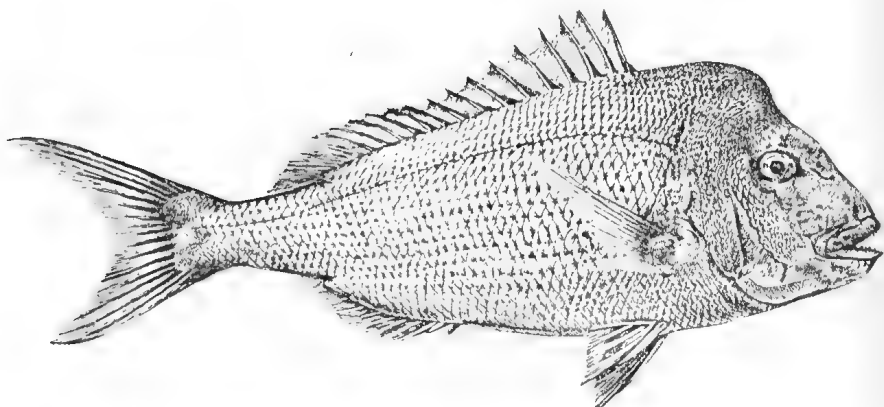
During the past two or three years the public have been hearing more than usual of our surface-swimming ocean fishes—chiefly the larger ones, such as the Tunny, Albacore, Bonito and Spanish Mackerel. But little has been mentioned of the perennial swarms of the various species of herring kind, such as Pilchards, Sprats, Anchovies, etc., which potentially are of still greater value than the more impressive looking larger fishes. We shall all hope that the new Commonwealth vessel will achieve useful results in not only demonstrating the presence of these great shoals,

SAND WHITING (*Sillago*).

This estuarine foodfish spawns in the ocean at or near the bay or harbour entrances. The egg is pelagic, yet, on many occasions, inshore areas have been closed to netting "to prevent interference with the spawning grounds". A good example of the necessity for scientific investigation before the making of regulations.

but will also illustrate their capture on commercial lines, for only by the latter may we expect proper development to be taken up by the people. Most of these pelagic kinds will be taken by nets, but some, like the large Yellow Fin or Southern Tunny (Tuna) will most probably be taken principally with the aid of the jig—a stout sea rod, to which is attached a short length of line and a barbless hook. Several of these jigs may be worked simultaneously from the one vessel as she moves along—after sprinkling the surrounding waters liberally with small fishes like Pilchard, used as chum or berley to attract the Tunny and to make them bite recklessly.

Very often fishes of the Tunny type are swimming far below the surface, but may be attracted to the surface it-

SNAPPER (*Pagrosomus*).

This handsome fish, abundant on reefy grounds at sea on many parts of the Australian coast, is often found in estuarine waters, where the young occur in large numbers. As in the case of the Whiting and Mullet, areas far inshore have often been closed to fishing, "to protect the spawning grounds" as was (and still is) often said. The fish spawns in the open ocean; the egg being pelagic or floating.

self when their presence is known. The Yellow Fin Tunny is enormously abundant along the eastern coast of Australia, particularly on the southern half. Large numbers have been taken at times in hauling nets at the entrances of Port Jackson, Port Hacking, Botany Bay, Port Stephens and elsewhere, while for many years sea anglers have made liberal hauls of them with handlines, either drifting or trolled.

In connection with this species a number of bizarre "observations" of its occurrence have been given to us by an officer of the Council for Scientific and Industrial Research, who is alleged to have recognised their shoals from an airplane. Such observations may be discounted, however, except as records of "fish", unless taken in close conjunction with an observing ocean-going investigation vessel, and the C.S.I.R. would be well advised not to waste effort and public money in such spectacular but relatively useless observation work. No one is likely to accept such a loose method of identification of shoal fishes (1) unless the observer is a trained and experienced ichthyologist, used to

observing the various species at close quarters in their natural environment, (2) unless actual catches are being made in the vicinity, and the sea surface observations are correlated with those from the air. This Tunny reaches a weight of more than 250 lb. Very large numbers are taken averaging 20-30 lb. There is evidence to show that this species (like the small Pilchards, Sprats, Sardines and Anchovies) is always with us—that is, that it does not migrate (within the proper meaning of that word), except for local seasonal movements when spawning or while in pursuit of small shoal fishes. In this connection all naturalists should be on their guard against the statements of sea anglers who often speak about “the season” for such-and-such a fish. Very few of such, fish in the open sea during the winter months (though seafishing conditions are often very suitable then), so the season of most anglers is somewhere between the months of September and April.

#### THE ROLE OF THE SHAG.

Far removed from the usual type of fishery investigation is that which attempts to assess the role of certain fish-eating birds in their impact on the fish fauna, and particularly in relation to fish conservation and increase of supplies. In the case of sea birds, many of which take a prodigious toll of fish even daily it has been extremely difficult to prove that the birds were a serious menace to the shoals. In restricted inland waters there are notorious birds such as the various species of Shags or Cormorants which prey upon fish and crustaceans. The poor Shag is a veritable Ishmael, for every man's hand is against him—or almost every man's. Most people cannot even understand that there might be something to be said in the Shag's favour. “Everyone knows” that its presence is a constant menace to all fish in inland rivers and that unless the Shags are removed ultimately no fish will remain. Yet, calm investigation does not reveal such a pessimistic view nor does it justify the universal feeling against the bird—or birds, as there are several species. All Shags are, more or less, fish-eaters in our rivers and lagoons and on our coasts, but not all species have exactly similar habits. The great Black Shag or Cormorant of our harbours, for instance, almost invariably dives to the bottom, where it obtains actually bottom-dwelling fishes like Catfish, Frog Fish (*Batrachus*), Dragonets (*Callionymus*) and various crabs. On the coast again the Little Black-and-White Shag skims over the surface of submerged rocks and catches mainly crabs and shrimps. Inland, in circumscribed waters, the

smaller species and the larger alike live upon fish almost entirely, under certain circumstances. For instance, in rapidly drying billabongs and lagoons, left after a river rise, there will be thousands upon thousands of young fish of some larger species and many of the full-grown small kinds, as well as large quantities of little Crayfish, and all of these will be cleaned out, usually just before the water dries up. Under such conditions the birds may not be regarded as a menace, of course, as the fish would die anyway.

In upland rivers where, in dry times, a watercourse becomes reduced to a chain of waterholes, the Shags can also do enormous execution, killing all and sundry of the fish population. But, in streams of good flow, the Shag is largely reduced to small fishes like the *Galaxias* (Minnow), which shoal and so are more readily taken. Now all of these small fishes are—within their predatory powers and capacity—great destroyers of tiny fry, and some of ova of the larger kinds, and it appears most likely to me, as a student of long standing, that the little fishes in their unspectacular way, actually do much more harm than the highly spectacular and nonchalant Shags. In a word, then, notwithstanding great known destruction of fish—even the solitary Trout—at times, it has never yet been demonstrated that the Shag was an unmixed evil, and this is clearly the subject for a far-reaching fishery investigation by informed and reliable observers, before any wholesale destruction of the birds is allowed or condoned. Certainly, the “tales the fishers tell” of the vast capacity of these Shags for Trout, are chiefly without serious foundation. As far as Trout occurrence is concerned, I may say at once that, in this country of such uncertain stream flow, the main trouble is—not Shags, but totally inadequate plantings of fry and fingerlings.

#### TROUT AND SELF HELP.

Remarks under this heading will apply primarily to the State of New South Wales. One of the recognised activities of Government in fisheries here is that of Trout cultivation, for the purpose of stocking certain upland streams. In the last few years there has been great dissatisfaction in many quarters because of the declining stock of these splendid introduced fish. There are two species, the California Rainbow and the European Brown. We have not space here to go into any relative merits of the the reduction of stock in recent years, the outstanding

two species, but for the purpose of this discussion may regard them as one—Trout.

Though many reasons have been given, to account for fact to the knowing student is that the yearly plantings or introductions of new stock have been totally inadequate. Compared with the native haunts of Trout or with any of those regions in which they have been successfully acclimatised, the Australian environment is the most uncertain as regards stream flow—in reliability and periodic volume—and also shows the greatest range in temperatures; including, from the Trout culturist's point of view, extreme "highs". That being so—and even without the ordinary incidence of the host of natural agencies which may be regarded as inimical to the Trout in greater or lesser measure—it would seem that our annual plantings should be much greater than in countries more suited to these peculiarly cold water and "live" water fish. But the fact is that we have always planted inconsequential numbers of young fry and fingerlings, compared even with actual native areas, say of California, where one might expect the fish to hold its own perhaps against a great onslaught. I have not space now to give the necessary figures to demonstrate this, but so it is.

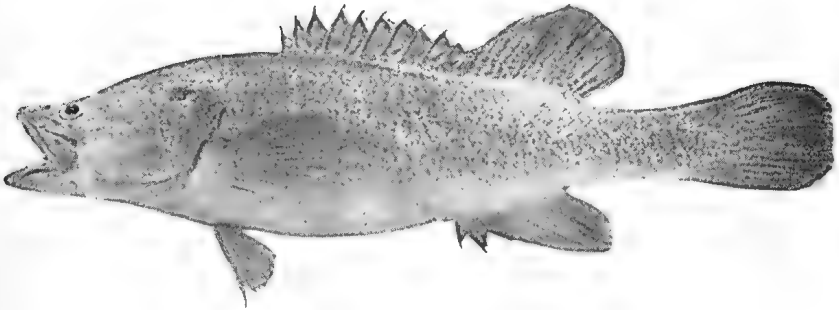
For many years—apart from some small gatherings from "tame" fish and, years ago, strippings from wild fish gathered through my agency—reliance has been placed entirely upon imported Trout eggs, chiefly from New Zealand. This only had one great advantage from the official standpoint—it was easy, and required almost no expert supervision to get a fair modicum of hatchings and resultant fry. Thus reliance has been built upon others, while a great biological fact was completely overstepped. In a rapidly adaptable fish like Trout, which breeds out almost a variety for every stream, it was clear that a surer plan for safe and full acclimatisation would be by careful production from our own wild fish, which had already fought the battle of life successfully in our own streams. The way for this was actually pioneered by myself in New South Wales twenty-five years ago, when it was shown that eggs could be obtained and safely transported (even while "green") under difficult circumstances to a hatchery which itself was most unsuitably placed. Recently the most extraordinary official (Ministerial) excuses have been made for inability to capture and propagate our own fish—at least this does mean an official acceptance of the principle. But the work, in proper hands, is both simple and sure, and

might be permanently productive of great benefit to our upland streams—and not only from the angler's point of view. Yet one Minister recently deplored the fact that "fruitless enquiries had been made in various countries to obtain ova", or words to that effect. Here is surely a case for a little self help with the aid of a little scientific endeavour.

#### THE CASE OF THE MURRAY COD.

I must content myself with just one more instance: With the regular onslaught made by anglers and commercial fishermen, with the rapid silting up of some thousands of miles of river and creek beds, through widespread erosion, with the removal of a vast amount of cover by snagging operations here and there, the Murray Cod (*Oligorus*), intrinsically one of the best food-fishes of Australia, has diminished most seriously in abundance in recent years. Various other factors have contributed, but those set out shortly here have been the main ones. What is more natural, then, than that many citizens—residents of the cities, as well as those of the parts most affected—should show great anxiety as to the future of this fine fish; some even fearing that it might vanish altogether from its native haunts. It may be said at once that there is not the slightest fear of the latter taking place.

Various means for increasing stocks have been suggested by anglers, and by some naturalists, unfamiliar in the main with the natural conditions under which this species originated and developed and has its being. Some consider that this may be achieved by wholesale closures against certain forms of fishing; others, closures against all fishing for a long period and others again for the extending of the spawning time closure which operates during part of the spring and early summer months. In the main, however, the more thoughtful (though inexperienced) people naturally think that the cure is to be found in the establishment of Murray Cod hatcheries and rearing establishments. In making such suggestions they have mainly in mind the success which has attended Trout cultivation in certain waters of this country. But actually there is no sort of similarity in the problems at all. Even under the most satisfactory conditions of Trout culture, as applied to the hatching and rearing of the Murray Cod, the expenditure for propagation work would be really prodigious, and economically quite impracticable, except in some relatively small circumscribed areas of permanent water, such as the



MURRAY COD (*Maccullochella macquariensis*).

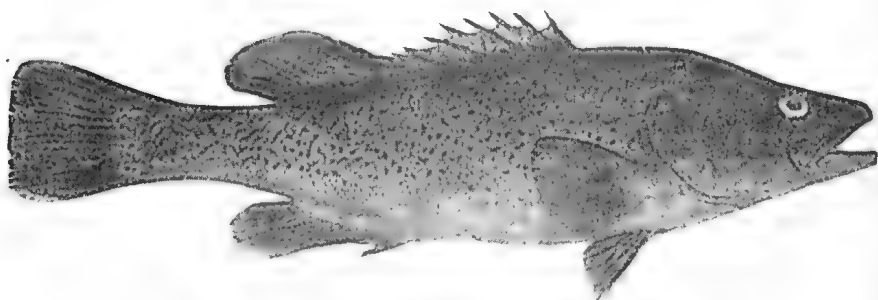
The greatest and finest of Australian freshwater foodfishes. Spawns in late spring and summer months, chiefly in temporary backwaters and lagoons. The ripe egg is about one-tenth of an inch in diameter, and hatches in about 8 days.

various irrigation dams. Yet, even in their case we have a means at hand which would cost relatively little.

In the case of the Trout we have first readily trapped brood fish, a large separate egg, easily stripped, handled and transported, to be spread out like so many peas on suitable hatching trays or troughs; then, following incubation, most readily handled fry, fingerlings, yearlings, and so on. Then when we come to stream stocking, even on a liberal scale—such as we have never had in our streams—we have but a relatively small stream area of permanent or near-permanent water to concern ourselves with. In the case of the Murray Cod we have a small egg, adhesive and attached, of the jar-hatch or pond culture type—to be collected from brood fish only with great effort and cost—young fry which mass together and suffocate unless spread over a wide area (impracticable on a large scale), need for relatively vast rearing ponds, even without the high cost of rearing to a reasonable size, when one considers the great array of “natural” enemies awaiting them, as compared with the Trout. Bear in mind also that the area to be dealt with is so enormous compared with the Trout area that hatching and rearing stations would have to be either of unheard-of capacity or sprinkled freely over the habitat of the Murray Cod. To one acquainted with the distribution, natural occurrence, habits and spawning of this great fish, any suggestion of artificial propagation as a

practicable aid to re-establishment or increase of stock, is quite unreasonable—even impossible!

Fortunately, however, we have no reason to be downhearted about the prospects. Every year, particularly after a river rise, countless millions of the fry of Murray Cod and Golden Perch (second only to the other in importance) are left by receding waters in billabong, lagoon, and riverbank embayment, over a great area of the Darling, Murrumbidgee, Murray watershed—affecting, in a length aggregate, many thousands of miles of water. In these areas a prodigious death roll of these and other edible fishes, as well as of the foodstocks of such, perish, either directly by the waters drying up, or by being “gobbled up” in their myriads by various fish-eating birds. Most of these young fish are from spawn deposited in the late spring and early summer, and by Christmas time, or the end of January are of a suitable size for net capture—the water areas being then so reduced in volume. My own surveys of such areas show



TROUT COD (*Maccullochella mitchelli*).

This is generally confused by naturalists (not by anglers or professional fishermen) with the great Murray Cod, its congener. It attains to a comparatively small size, reaches sexual maturity at a little over half a pound weight. The ripe egg is about half the size of that of the Murray Cod. More abundant in the lower reaches of the Murray River system.

that some of the most productive of these lagoons may only be netted when very low, because of natural obstructions.

This process of regeneration of our inland fish supplies I have termed in special official reports (particularly in 1910, after a three years' survey), “utilisation of Nature's waste”, for such it truly is. Because of the extraordinarily hard conditions of aquatic life in our inland waters, natural



selection has brought about an enormous profligacy of almost all of the organisms affected. In the main it is a kind of hit-and-miss arrangement, which just about ensures carrying on of the species under normal conditions. Were the waters permanently running, this great fecundity would be unnecessary. All that remains, then, for us, is to take full advantage of it—take the millions of fry, and sometimes yearlings or larger, and transport them by tank-truck, or train to the open river areas desired to be stocked. This process has been productive of the best results, even in the Mississippi Basin and other inland waters of the United States, where conditions are not nearly so hard as in our own back country, of course. There it is called fish rescue work or salvage. All States, as well as the U.S. Federal authorities, co-operate in the work—resulting in an annual planting of approximately 80,000,000 young or well-grown fish, representing literally the hatchings of thousands of millions of small fry—an entirely impossible job practically and economically by any hatchery, or other propagating, methods known. Here, then, is our way out of an urgent problem, which cannot be met satisfactorily in any other way.

I hope that with these few examples I have made out a fair case for scientific treatment of all our fisheries problems.

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### HARDENBERGIA.

By GINA BALLANTYNE.

A king has lost his purple cloak,  
 That, blown and tattered by a breeze,  
 Bold with the youngest breath of spring,  
 Is caught in shreds upon the trees.

A king has lost his purple cloak—  
 Or whence could come such royal spread?  
 The dewy violets are pale,  
 And iris petals drooped and dead.

A king has lost his purple cloak—  
 And left a deeper dream of skies,  
 A bluer ocean, in a flight  
 Of tiny purple butterflies.

To deeply merge on distant hills,  
 The blue and mauve, that it would seem  
 The tatters of the royal cloak  
 Had wrapt them in a purple dream.

## ADDITIONS TO THE FLORA OF AUSTRALIA.

By W. F. BLAKELY,  
National Herbarium, Sydney.

## LEGUMINOSAE.—

*Mirbelia Jeanae*, Blakely, sp. nov., "Jean's *Mirbelia*".— Suffrutex parvus, procumbens; ramuli ferrugineo-pubescentes, 4-18 uncias (10-46 cm.) longi. Folia longe alterna, patula, sessilia, plana vel leniter curvata, subscabra (in sicco supra canaliculata), lineari-lanceolata, pungentia, 8-13 mm. longa, 1 mm. lata. Flores aurantiaci et purpureo-brunnei, solitarii, axillares, raro geminati, cum pedicellis brevibus; calyx 4-5 mm. longus, lobi superiores emarginati, lobi inferiores acuminati, ciliolati, vexillum 10 mm. longum, alae 8 mm., carina 5 mm., stylus pilosus, ovarium glabrum atro-purpureum, ovula 1-2.

A small procumbent undershrub, with densely rusty-pubescent branches 4-18 inches long. Leaves distantly alternate, spreading, rarely opposite or in threes, linear lanceolate, tapering into very fine pungent points, thick and flat, the margins closely revolute, slightly channelled and somewhat scabrous above, the midrib broad and pale coloured beneath, quite glabrous, 8-13 long, 1 mm. broad. Flowers mostly solitary, axillary, on short, hairy, bracteate pedicels. Calyx bell-shaped, usually dark-coloured, lightly covered with minute golden hairs, 5 mm. long, the 2 upper lobes emarginate, longer than the 3 lower acuminate, ciliolate ones and slightly shorter than the tube. Bracts and bracteoles very small and narrow, densely ferruginous-pubescent. Standard with a narrow wedge-shaped claw as long as the calyx tube, the lamina 5-6 mm. long, 7-8 mm. broad, dark purple-brown in the centre, with radiating purple veins, surrounded by a rich reddish-orange border; wings narrow, 8 mm. long, the same colour as the standard; keel blunt, greenish at base, tipped with purple-brown. The flowers are usually darker on the lower surface than on the upper, and are almost the same colour as those of *M. grandiflora*. Style hooked, silky-hairy a short distance below the capitate stigma; ovary glabrous, dark purple, channelled; ovules 1-2? Pod ovate, glabrous, faintly reticulate, 6 x 5 mm.

It seems to be confined to the Southern Tableland of New South Wales, and its range at present extends from Penrose southwards to Mongarlowe. Named in honour of

Miss Jean Buckingham, junior member of the Australian Naturalists' Society of New South Wales, who discovered this very pretty species on a rocky sandstone plateau in Gold Gully, 2 miles south-east of Penrose railway station, October 2nd, 1938. It has since been found close to Penrose and 2 miles north and north-west of Penrose by the author in company with Miss Jean and W. J. Buckingham, October 15th, 1938. It is represented in the National Herbarium, Sydney, from the following localities:—Nowra, J. A. Fletcher, August, 1912; Dr. F. A. Rodway, in 1922; both specimens were determined as *Dillwynia* species, which it strongly resembles in colour and structure of the flowers. Badgery's Crossing to Nowra, W. Forsyth and A. A. Hamilton, September, 1899; Mongarlowe, W. Baeuerlen, October, 1898.

Its position is near *M. pungens*, A. Cunn., from which it differs in its strictly prostrate habit, distantly alternate, subscabrous glabrous leaves which are very rarely opposite or in threes, larger and mostly solitary, orange and dark purple-brown flowers, larger calyx; rusty tomentum of the young parts, and glabrous ovary. The flowers of *M. pungens* are bluish-purple, and usually in dense subsessile clusters, while the tomentum is hoary-pubescent. It is a very showy little plant with striking flowers and a long slender tap-root, and should be useful for certain rock-gardens. It flowers during September and October, or a little later than the beautiful *M. grandiflora* with which it is associated.

#### PROTEACEAE.—

*Strangea Steedmani*, Blakely, sp. nov., "Steedman's *Strangea*".—Frutex glaber, atro-viridis, 3-4 pedes altus, ramis pelliculosis lenticularibus. Folia distantia, alterna, spathulata, obtusa vel mucronata, crassa, in petiolos breves compressos angustata, 7-14 cm. longa, 1-1.5 cm. lata, 1-3-nervia. Flores in umbellis pedunculatis axillaribus dispositi, pedunculi bracteati, graciles, plerumque deflexi, 1.5-2 cm. longi, 4 flores gerentes, bracteae parvae mox deciduae. Perianthii segmenta 4, apice spathulata, basi lata plana; antherae acute cordatae, sessiles; stylus glaber; stigma circulare vel subpeltatum; ovarium glabrum, stipitatum. Folliculi pedicellis deflexis, compresso-spathulati, apiculati, sublignei, secundum suturam superiorem late dehiscentes, 5-7 cm. longi, 1.5 cm. lati, monospermi; semina pendula in endocarpo membranaceo naviculari inclusa, libera, plana, alata, 3-5 x 1.5 cm.

A glabrous dark green shrub 3-4 feet high, the branchlets reddish-brown, covered with a deciduous silvery pellicle.

Leaves distant, alternate, spathulate, obtuse or mucronate, thick, tapering from about the centre into compressed petioles, 7-14 x 1-1.5 cm; 1-3 nerved, light green and brittle when dry, the lateral veins conspicuous, usually 2 or 3 on each side of the midrib. Flowers pedicellate in pedunculate axillary umbels; peduncles bracteate, slender, spreading or deflexed, with a terminal conical or pyramidal point, enlarging as the fruit develops, and a thin circular bract-like expansion under the flowers, 1.5-2 cm. long shaded pink, bearing 4 pedicellate greenish-brown flowers. Bracts linear, acute, subfoliaceous, usually on the lower half of the peduncle, deciduous, 2-5 mm. long. Buds curved, globose at the top, terete in the centre, quadrangular at the base; perianth segments 4, spathulate or spoon-shaped at the top, the broad basal portion almost flat, slightly tomentose inside, 12 mm. long; anthers acutely cordate, sessile, the broad connective dark-coloured; pollen creamy-white, copious; style glabrous; stigma circular or peltate, subrugose, with a small projecting central point; ovary glabrous, stipitate; nectar abundant. Follicles on deflexed pedicels, white, changing to brown with age, compressed-spathulate, apiculate, thin, coriaceous or subligneous, wrinkled, opening widely along the upper suture, 5-7 x 1.5 cm. Seeds pendulous, enclosed in a dark membranous boat-shaped endocarp, free, flat, rather thin, light brown, more prominently winged at each end than at the sides, 3-5 x 1.5 cm. W.A. Nornalup district. "The plant grows in dense clumps, generally 3-4 feet high and seems to have a sucker-like system of growth".—H. Steedman, January, 1931-1938.

It is specifically distinct in all its botanical characters from *S. cyanchicarpa* (Meissn.), F. Muell., (the only species recorded for Western Australia), and appears to be nearer *S. linearis* Meissn., a N.S.W., and Queensland species, from which it differs in the broader leaves, different inflorescence, and in the larger and less woody fruits.

Named in honour of the discoverer, H. Steedman, late Curator, King's Park, Perth, and a capable collector of native seeds and plants.

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## FIELD OBSERVATIONS ON A DRAGON FLY.

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By T. Y. HARRIS.

The following field notes, on observations made on bright, cloudless days, have been extracted from my notebook.

Peel River, Dungowan, January 11, 1938.—Fertilisation; the prenuptial flight was brief. The male dragonfly caught the female, on wing, by the back of the head and carried it to a sheltered branch of a *Casuarina* overhanging the river, and to this, clung with its mandibles. The female dragonfly was held in the terminal appendages of the male, with its body swinging below that of the male. The female then swung its body upward until it made contact with the copulatory apparatus of the male, situated on the ventral surface of the second segment of the male's abdomen.

Egg-laying.—Later, on the same morning, about 11 a.m., and very hot, egg-laying was observed. The male held the female by the back of the head and kept it in an upward position so that eggs could be deposited, singly, on leaves, or parts of aquatic plants, etc., either floating or stationary in the shallow water. As each egg was deposited the female swung its body round to bring the ovipositor to another suitable place just below the water. When no more eggs were being deposited the male rose and carried the female to another object, suitable for holding the eggs.

Namoi River, January 14, 1938.—The perfect insect usually emerges from the nymphal case early in the morning, but one was observed on a hot day at 11 a.m. The whole process, from the first appearance of a slit on the dorsal surface to the final flight, occupied 20 minutes. The nymph was observed crawling out of the water and was removed to a log in the shade, some distance from the river bank. A slit occurred down the back, and through this the head, legs and wings were pushed by jerky movements. By additional jerks the body was brought out. The wings were miraculously unfolded and the body elongated to about three times the length of the nymph. The end of the body was used to push the drying wings apart with a gentle upward movement. As the wings dried, the insect commenced to flutter them, and to move the body slowly up and down, elongating it still more. The first flight was at least 200 yards without a stop, but after a short rest the dragonfly took wing again and disappeared. The lateness of the hour and the unusual position may have caused more rapid emergence than usual and possibly, also, accounted for the absence of trial flights.

AN INTRODUCED SNAIL (*HELIX PISANA*).*First Record for New South Wales*

By M. S. BARNETT, A.A.C.I.

Recently the writer's attention was drawn to the presence of a snail of unusual type occurring in large numbers in a garden at Mount Colah, about 17 miles north of Sydney.

Specimens submitted to the Australian Museum were identified as *Helix pisana* Müller, and—although already reported from elsewhere in Australia (see later)—this is the first record of the appearance of this snail in New South Wales. A few facts regarding it should therefore be of interest to our readers.

In his Monograph on the Land and Fresh-water Mollusca of the British Isles, J. W. Taylor states that *H. pisana* was first recorded from specimens collected as far back as 1711, near Pisa, in Italy (whence, obviously, the specific name). It was not, however, binomially distinguished till 1774, by O. F. Müller. Since then it has been reported from various countries in Europe, more particularly in the coastal areas of the southern and south-western parts of the Continent. Specifically, Taylor (1911) gives its geographical range as: practically all round the shores of the Mediterranean and the islands therein; throughout the whole of the Spanish Peninsula; the western coast of France, south-west corners of England and Wales, and in parts of Ireland—to which, of course, has now to be added Australia.

To the ordinary observer, *H. pisana* is a typical snail outwardly, with a somewhat fragile shell of rather flattened form, perhaps a little over five-eighths inch wide and nearly half an inch high, when fully grown. The shell is creamy grey in colour (the greyishness being due more to the body of the animal showing in places through the semi-transparent shell), and it possesses a number of transverse (spiral) lines of dull reddish-brown colour, varying in width and distance apart, and often discontinuous.

One peculiarity of the species seems to be its extreme variability. Taylor says it "has been happily described as diffusely polymorphic", and he lists no fewer than 23 varieties, which are further split up into 64 sub-varieties. He also figures 40 types in colour in his monograph, and, while these show no great variation in shape, they possess

an extraordinary range of colouration—from self-coloured grey and light pink (without any lines) to very dark brown, the intermediate types having lines of all shades from light to dark brown, with much variety in arrangement. The Australian introduction may thus vary in time.

One character, in common with the main European type, is its habit of collecting in masses on the leaves or stems of various plants. In the locality herein mentioned, one can sometimes run the two hands up the sides of a leaf (say a large bulb leaf) and collect the best part of a handful.

Taylor states that *H. pisana* is "most plentiful in dry and arid regions, especially within the influence of the sea; it lives and prospers under a variety of conditions, on dry sandy plains, in gardens and fields, by roadsides, in hedges and on hill slopes, usually adhering in great profusion to thistles and other plants, the trunks and stems of trees and bushes, and on walls, usually in places fully exposed to the sun, the animal having a wonderful capacity for enduring solar heat".

As regards food plants, Taylor adds that, "though showing local preferences, these snails seem to be quite omnivorous, as where they are found they often exist in such multitudes that, after rain especially, they swarm over everything, and much latitude in choice of food seems quite impossible". In a few minutes, in the garden in question, the writer found the snails congregating on over thirty different species of plants, and the owner stated that he had seen them on many others, and that they were becoming a rather serious nuisance through feeding freely on some plants, particularly young zinnias, fringed petunias, larkspur, African marigolds, etc. He said he had first noticed the snail about three years ago, and since then it had vastly increased in numbers. It "slows down" very considerably in the winter, but does not altogether disappear. It becomes very prevalent again in the spring, and continues with little abatement until the autumn. After a shower or heavy dew in the evening, or when the lawn has been hosed, the snails make their appearance after dark on the wet grass in great numbers, "resembling hail".

*H. pisana* has a certain food value in Europe, for those with such gastronomic tendencies, and is regularly brought to market in France, Italy and Algeria.

As to its Australian distribution, information supplied by Mr. T. Iredale, Conchologist of the Australian Museum,

shows that—apart from the present instance—it has already been reported from West Australia (certain coastal localities from Geraldton to Eucla), South Australia and Victoria (also in coastal parts).

Although referring to its omnivorous habits, Taylor does not seem to suggest that this snail is regarded in any way as a pest in agriculture; but, in view of the foregoing, it can hardly yet be said that—in horticulture, at least—it will not become a nuisance in this country. Reports, therefore, of its occurrence in any locality would be valuable to have, and it is hoped these notes may enable some of our readers to identify it should it appear in their neighbourhood. Possibly it has come more than once to Australia, but the time and place of its introduction are not known.

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#### ENTOMOLOGICAL NOTES.

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By H. S. NICHOLAS.

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##### A CUP MOTH.

*Doratifera oxleyi* Newm. Family *Limacodidae*.

The eggs are deposited upon the leaves of *Eucalyptus* trees during May and June, in masses, and are covered with a dark brown woolly covering.

The larvae which hatch are slug-like, with vestigial prolegs, and possess groups of stinging, yellow hairs. They feed, throughout the winter and early spring, upon the foliage.

Pupation takes place during October, when they form cup-like cocoons upon twigs, sticks, etc., the male cup being much smaller than the female.

The adults commence to emerge in the following April, May and June, removing the lid from the cup-like cocoon.

Actually, after the cup is formed, the main portion of the dormant period is spent in the prepupal stage, and herein lies one of the most interesting features of this insect.

Not all the prepupal insects change to pupae after the first summer, for a small number, always (in our tests less than five per cent.) remain as dormant prepupae, for eighteen months, and then finally change to pupae, and emerge after a life-cycle of two years, instead of the usual yearly cycle.



The moths that emerge after the two-year life cycle, mate, and lay eggs which hatch normally.

The female moth is much larger than the male, is very sluggish and often taken in the open. The males are smaller and swift on the wing and seldom seen in the open. The males can be readily trapped in the open by using females as decoys.

The larvae of these moths completely defoliated many trees in the Scone district during 1934. Predaceous Reduviid bugs destroyed a few of the larvae; when a food shortage was imminent, the bulk of the larvae died from a disease, later identified as *Streptococcus*.

The main parasite is a species of *Eurytoma* of the Chalcid wasp group, a large number of which emerge from each pupal cup. Large numbers of Eulophid wasps have emerged from some cups and there is also an Ichneumon wasp parasite.

The emergence and parasitism figures for this cup moth, during 1933, are as follows:—

- 95 moths emerged = 38.7 per cent. emergence.
- 1 Eulophid wasp parasite.
- 2 Ichneumon wasp parasites.
- 10 *Eurytoma* sp. = 5.3 per cent. total parasitism.
- 7 Larvae carried over to 1935 = 2.8 per cent. total pre-pupal larvae remaining.

#### A GRASS TREE MOTH.

*Heteromicta latro* Zell. Family *Galleriidae*.

The dark brown larvae of this moth were found feeding upon the flower and seed spikes of the grass tree, *Xanthorrhoea* sp.

They are of gregarious habits and form rough channels of web under cover of which they feed. Colonies of larvae, of all sizes, were found in August, again in November and December, and during March and April, in the dry seed spikes. These larvae are capable of destroying the whole of the spike of flowers and seeds.

The larvae usually keep their tunnels clear of frass, which they deposit at the entrance, and when ready to pupate travel individually in any direction, sometimes long distances before pupating. They pupate finally within a flimsy cocoon amongst debris and rubbish, but on and well above soil surface.

Pupae were collected during August and September, and again in December and January. Adults were obtained in October and again in the autumn.

The actual life-cycle is not known, but it is apparent that there is an amount of overlapping during generations, and that this insect does overwinter, as large larvae, in dry seed spikes.

#### A GUM TREE MOTH.

*Epipaschia nauplialis* Walk. Family *Pyralidae*.

The dark brown larvae of this moth feed upon dead *Eucalyptus* leaves, constructing web-tunnels and living singly therein. The larvae which grow to an inch in length have brown heads and fine golden hairs on their bodies. They pupate inside the web-tunnel, spinning together any material, to form a rough but light cocoon.

The adults commenced to emerge in October and emergence continued at intervals until late autumn. They deposit their cream-coloured eggs loosely, amongst dead leaves.

Pupae collected in the field have produced many parasites, including *Brachymeria ruskini* and *Brachymeria* sp., *Stomatoceras melitaræ*, and a large series of a species of *Stomatoceras* not yet described (Chalcid wasps). The other parasites included Ichneumons and Eulophids. Many Tachinid flies emerged from the pupae.

Here it will be of interest to state, that in some known cases, a species of *Tetrastichus* was a hyperparasite of the Tachinid fly parasite.

Under laboratory conditions both *Stomatoceras fasci-tipennis* and *S. melitaræ* were bred from pupae of this moth.

From 129 cocoons collected in the field early in October, 1933, the following results were obtained:—

60 moths emerged.

21 parasites emerged.

4 dead parasites were removed from pupae.

44 pupae died, cause not known.

#### THE KURRAJONG LEAF ROLLER.

*Sylepta clytalis* Walk. Family *Pyraustidae*.

The gregarious green larvae of this moth feed upon the foliage of the Kurrajong trees, *Sterculia diversifolia*.

The eggs are deposited between two overlapping green leaves which are then sealed together. Upon hatching, the larvae live inside these leaves, which they web together,

and to these they continually add further leaves upon which they feed. The colonies are known to leave their shelter of leaves, which have died, and to commence webbing leaves together upon another portion of the tree. The larvae are known to overwinter inside cocoons in a pre-pupal condition. The pupae are to be found inside the bunches of dead leaves upon the tree.

From 376 cocoons collected January to April, 1934, the following results were obtained:—

Moth emergence 246 = 65.4 per cent.

Parasite emergence 62 = 16.4 per cent.

The following wasps emerged: *Chelonus* sp. (22), Family *Ichneumonidae*; *Brachymeria* sp. (37), Family *Chalcididae*; *Eurytoma* sp. (3), Family *Eurytomidae*.

Other species of parasites bred during other years include Tachinid flies, other Ichneumons and Chalcids of the genus *Stomatoceras*. The *Brachymeria* bred out in 1934 included three species.

The larvae of this moth, at times, completely defoliate small Kurrajong trees. A small tomtit has been observed destroying many of the larvae by removing them from inside the webbed leaves.

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#### FIRST RECORD FOR NEW SOUTH WALES OF THE GREAT RHINODON OR WHALE SHARK.

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The President (Mr. David G. Stead) stated at the monthly meeting of the Society, held on June 7, 1938, that during the past month he had been able to record the first known occurrence of the great *Rhinodon* Shark (generally known as the Whale Shark, because of its enormous bulk), in the waters off the New South Wales coastline. Identification had been possible because of the information furnished by Mr. Harold Christiansen of Huskisson, Jervis Bay, N.S.W., of the great shark seen by himself and party while fishing off Jervis Bay on April 23rd. Mr. Stead stated that the latitude in which the observation was made was a very great extension to the south of the known range of this great sea beast. The only other known record in Australian waters was off the south-east coast of Papua in (?) 1885. As this shark is peculiarly a warm-water fish, its occurrence so far south is of great interest. The specimen was most probably a stray which had drifted down on the warm notonectian current which washes the New South Wales coast, and which appears to have been somewhat stronger

this year than usual. In reply to Mr. Stead's detailed enquiries the observer, Mr. Christiansen, had furnished the following information:—

"The shark was seen on April 23, about 2 p.m. The breeze was light N.E., and the sea calm. The shark was under the lee of Crocodile Head, where there was no wind whatever and no sea, and a nice clear day. When first seen, the shark was lying right at the surface of the water with the dorsal fin and upper fluke of tail above water, and within ten yards of the cliffs. As we came close, the shark just submerged and swam away slowly along the cliffs just under water, and in the opposite direction to the way we were steering. As soon as he scented our baits, however (we were trolling with whole Salmon for Marlin), he turned and came after us, but dived before he came to the launch. We stopped the engine and drifted for perhaps fifteen minutes with the baits down about 50 feet, and on winding up the first bait this monster followed the bait right up. Until then we had no idea of the gigantic proportions. The estimate of 25 feet from dorsal fin to tail (previously reported) was made absolutely on top of the water. Now, however, he was motionless 10 feet from the launch, and about 3 feet under water. His head was at our stern and he was lying parallel to the boat with his tail toward our bow. I got up on the cabin top to have a good look at him and he was certainly longer than the launch. The second time he rose he was at right angles to the launch, so we could closely observe the tremendous width of head and body, and the third time he rose about midway between the two other positions. On each occasion he stayed motionless for 3 or 4 minutes, at about the same depth with his head about 10 feet away. The head was very square. The spots were round, about the size of a billiard ball, and, as near as one could see through 3 feet of water, were about 9 inches apart. They appeared to be a dirty-white colour. The fish had the appearance of being mottled like the little Toad Fish we see in shallow water and that is just the impression it gave me—as like a gigantic Toad Fish, only for the shape of its head."

Mr. Christiansen considered that his estimates of length and width were "on the fine side" as the fish was so vast; but he did not want to exaggerate. In his first letter recording the occurrence the spots had been mentioned. The further information regarding them, mentioned above, was given in response to Mr. Stead's questions.

Mr. Stead stated that this vast shark grows to at least 60 feet in length.

## A VISIT TO LAKE CONNEWARE.

By ALBERT BOOTH.

On March 6 I visited the Lake with the Leach Memorial Club of Melbourne, and there met Mr. Edgar Churches, who is a very keen naturalist. He very kindly conducted us through his property to all the best vantage points for viewing the vast amount of bird life on the Lake. Members estimated that there were more than six thousand swans, *Chenopsis atrata* on the lake, which is situated some six miles out of Geelong, Victoria.

We saw numbers of mountain duck, *Casarca tador-noides*, but, as their favourite portion of the lake dried up, they gradually departed, and by the end of April there was none left. Other birds noted were plover, *Squatarola squatarola*, bittern, *Botaurus poiciloptilus*, pelican, *Pelecanus conspicillatus*, cormorant, *Phalacrocorax carbo*, tern, *Sterna* sp.; egrets, *Egretta alba*, spoonbills, *Platalea* sp.

Since my visit Mr. Churches has sent me the following notes:—

"In May, the black water coot, *Fulica atra*, started to migrate to Conneware, until there were about six thousand present on the lake. These birds feed mostly by diving all day. About four o'clock in the afternoon they swim from their feeding grounds at the northern end of the Lake to the sand flats on the southern end, and on these flats they stand very closely together throughout the night. These birds when attacked by a hawk form into a mass formation so that it is impossible to pick out any one bird separately.

In June there were some two thousand teal, *Querquedula* sp., and countless blue wings on the sand flats of the Lake, and here and there were a few hardheads, *Nyroca australis*. They used to be present in countless thousands, but, although they have never been shot or disturbed in any way, they no longer visit the Lake in large numbers."

This great fresh water lake is one of the most interesting areas for bird lovers around Melbourne, and Mr. Churches, who has lived there for over fifty years, has promised to send further notes of the birds frequenting this area.

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**THE TAWNY FROG MOUTH.**

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These notes were kindly contributed by Mr. E. Churches, of Lake Conneware, Victoria, and relate to a pair of mopokes, or tawny frog mouths *Podargus strigoides*, which he personally watched on his own property for thirteen years.

These birds built a very crude nest on the fork of a pine tree in the same position each year. Their nest consisted of a few sticks, and was unlined. They laid two eggs each year about the 16th September, and the mother bird stayed on the nest for nine weeks. It is thought she hatched the eggs by holding them under her wings. The male bird was observed feeding her during this period. When the young birds were able to fly, the parents took them to another tree, always the same silky oak, and there they sat, very close together, the young ones between the parents. They were very inquisitive of passers-by, but never flew away with fright. When they were fully-feathered, the old birds took them away, and no more was seen of them for a month. At the end of that time, the old birds returned, but the young ones never visited the scene of their birth again.

In 1937 the female bird was found lying on the ground fifty yards from their tree, and was believed to have been killed by a hawk. At that time the young ones were just about fully-feathered. The male bird finished rearing them and took them away a little later, remaining away about a month as usual. It returned alone, and sat by itself in the same tree for six weeks. One morning we noticed it had a new mate, a very shy, young female bird. When the nesting season came the male bird introduced it to the same nest where the previous female had laid its eggs for thirteen years. There they hatched two young ones, but unfortunately they lost them both before they were fully-fledged, and this year (1938) the usual monthly migration was not undertaken. We are still interestedly watching our pair of mopokes.—ALBERT BOOTH.

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**NOTICE TO MEMBERS.**

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Members are reminded of rule 4 of the Society which reads: "All subscriptions shall become due on the first day of August and shall be payable in advance."

## OBITUARY.

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MARY ELLEN FULLER (MRS. E. G. KIPPS).

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1907-1938.

Mrs. E. G. Kipps, better-known to members of the Society as Mary Fuller, died on September 25, 1938.

Mary Fuller was elected a member of the Society in October, 1919, although of recent years she had not taken an active interest in the work of the Society, having been stationed at Canberra. A number of articles, from her pen, appeared in early issues of the "Australian Naturalist".

She obtained her B.Sc. degree at Sydney University in 1929, and for a number of years carried out important research work on the bionomics, life-histories, and ecology of various types of flies, including Australian Sheep-blowflies, March flies, etc. The results of this work have appeared in the *Bulletins and Journals of the Council for Scientific and Industrial Research*, Canberra, the *Proceedings of the Linnean Society, N.S.W.*, etc.

The world has lost a careful and painstaking investigator in the realms of entomology, and her death will be deeply regretted by her many friends.

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LUKE GALLARD.

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1864-1938.

The Society lost a keen and enthusiastic field naturalist when Mr. Luke Gallard died on March 15, 1938. He was a great worker in the interests of the Society, and was always ready to assist anyone seeking information with regard to insects. He was taken ill whilst waiting for a 'bus to convey him towards the city, with additional specimens for his display, which he had arranged for the Naturalists' Society's exhibit at the Flora and Fauna Exhibition, in connection with the Sesqui-centenary Celebrations.

Gallard was particularly interested in entomology, and his large collection contained mounted specimens, numbers of which he had bred out, and an extensive series of specimens of various larvae and pupae, included amongst which were many of the lesser known forms of timber-boring moth caterpillars, which feed within the trunks and limbs of various forest trees.

He was also a great collector of the Moth-Lacewings, and the Silky-Lacewings, one of which, a small and delicate species, *Psychopsella gallardi*, was named in honour of him.

At the monthly meetings of the Society he was a regular attendant, exhibited various specimens, and read notes of interest to members. On a number of occasions he was a leader of various field excursions, at which he always described the habits and named the specimens collected by the newer members present.

His work on the life-histories of various insects, in many instances with forms not readily seen or found by the ordinary observer, always exhibited a vast amount of patience and perseverance to overcome the various difficulties which arose in the course of his observations. On a number of occasions he was associated with the late Dr. R. J. Tillyard on trips to obtain the obscure larvae of various moth-lacewings, of which he seemed to have the happy intuition of knowing where they were to be found.

Gallard was elected a member of the Council in 1919, and later was for many years a Vice-President of the Society.

Since 1914 he contributed to the "Australian Naturalist" notes on the life-histories of insects which he had developed.

Several years ago, Gallard was awarded the honour of the knighthood of St. John of Jerusalem, for his honorary services as a member of the St. John Ambulance Association.

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#### CONSTANCE MARY LE PLASTRIER.

Miss C. M. Le Plastrier, for many years a member of the Council, and during 1919-1920, President of the Society, died on February 7, 1938.

Although of recent years not a regular attendant at meetings of the Society, she acted as leader of an excursion to Pymble Forest Reserve quite recently, and in past excursions, of earlier days, she was always most generous in imparting her knowledge to anyone seeking information, and especially to young students in botany.

Arriving in Sydney, from Melbourne, where she was born, she joined the staff of "Redlands", North Shore, as a teacher, of English, Latin and Botany. On her retirement she toured England and the Continent, and later devoted her studies to literary pursuits, and published several novels and a book on botany.

She was beloved by the numerous students who came under her care.

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**EVA FLORENCE SAUNDERS.**

Eva Saunders, a great and well-known educationalist, who will be remembered by most of the earlier members of the Society, died on March 3, 1938. Although of recent years she did not participate actively in the work of the Society, she was for many years a member, and was on the Council during 1920-1921.

Miss Saunders entered the Women's College and obtained her degree in Arts, with honours, at the age of seventeen. She then taught at Rockhampton and Brisbane Girls' Grammar Schools, returned to Sydney, and obtained, with honours, her diploma of Education.

On becoming Principal of Ailanthus' School, she combined it with Shirley School, Edgecliffe, and in 1936, when she retired, arranged a merger of Shirley School with Kambala, Rose Bay.

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**ALFRED EDWARD TEBBUTT.**

1865-1938.

Mr. Tebbutt, well liked by all members, and a regular attendant at meetings and field excursions, died at his home at Haberfield, on February 24, 1938. He will be missed by all.

He was a member of a family, well-known in the pioneering days of Quirindi and Liverpool Plains districts, and for many years was in business with his elder brother at Quirindi.

Mr. Tebbutt was elected a member of the Society in April, 1931, and a member of the Council in August, 1932.

One of his brothers, Mr. E. H. Tebbutt, a well-known Sydney solicitor, died on February 19, 1938.

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**PROFESSOR WILLIAM MORTON WHEELER.**

1865-1937.

One of the foremost world authorities on ants, a great scholar, and an outstanding personality in the biological world, died on April 21, 1937, at Cambridge, Massachusetts, U.S.A. Born in Milwaukee, Wisconsin, U.S.A., on March 19, 1865, he obtained his Ph.D. in 1892, and later held important professorial posts in various American Universities.

His early researches were in the field of general zoology—more particularly embryology and morphology, but later

he devoted his studies to the insect world, more especially in relation to ant life. He published some hundred and fifty works, and, although a great systematist, he was attracted to the living forms—the relationships of ants to other insects and the plant world, and to various aspects of their economy.

He visited Australia in 1914-15 and again in 1931.

Numbers of his works on Australian ants have been published in the Transactions of the Royal Society of South Australia and in the publications of various American Societies.

In December, 1915, Professor Wheeler attended a field excursion of the Naturalists' Society, held at Heathcote, some twenty miles south of Sydney, and the writer remembers the interest shown by members, in his methods of studying the ants in the field and their collection. He was elected an honorary member of the Society in 1915.

The world is poorer, having suffered the loss of this great scientist.—E. H. ZECK.

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#### THE PEARLY NAUTILUS.

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##### *Nautilus pompilius.*

This Nautilus is a member of the class *Cephalopoda*, but on account of the animal having four gills it has been placed in the order *Tetrabranchiata*; all the other members of the *Cephalopoda* having only one pair of respiratory organs.

The shell is large, spiral and flattened at the sides. The smaller whorls are enclosed in the final whorl.

The interior presents a curious structure. It is divided by thin partitions into chambers, a small tubular hole transversing the centre of the partitions.

The Nautilus is destitute of a funnel and ink bag, and its tentacles are numerous but short and without suckers. It has a fleshy foot with which it crawls at the bottom of the sea, head downwards and shell upward. The animal, which has its residence in the outer chamber, has no organs of hearing and its eyes are simple in structure. These characters make it a near approach to the class *Gastropoda* (Snails and Slugs).

The Nautilus shell exhibited was collected at Vacluse during May, 1938, and provides an additional exhibit to the tropical marine fauna within Port Jackson.

—J. W. HAWLEY.

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## NATURALISTS' SOCIETY OF NEW SOUTH WALES.

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*Proceedings.*

APRIL, 1938.

The ordinary monthly meeting of the Society was held in the Royal Zoological Society's room, Bull's Chambers, Martin Place, Sydney, on Tuesday, April 5, 1938, at 8 p.m.

The President (Mr. D. G. Stead), in the chair, with about 40 members and visitors present.

Announcements.—The President announced the death of Mr. Luke Gallard, and members stood as a mark of respect. The President showed a newspaper cutting referring to the Russian scientists' adventures on the ice floe (see *Proceedings* for March, 1938), and asked for the name of the member, who, at the previous meeting, had mentioned having heard the scientists, on a short-wave wireless set, speaking to Moscow from the ice floe.

New Members.—Mr. Eldred Best was unanimously elected a member of the Society.

Nomination of Members.—Miss Nuri Mass, of The Avenue, Ashfield. Nominated by Mr. D. G. Stead, seconded by Miss D. Dobbin.

Members' Night.—Mr. A. E. Watson: Specimen of a bone which showed wonderful preservation after having been embedded beneath asphalt for a long time; also specimen of *Pittosporum undulatum* forwarded by Peter Korsman, and specimens of plants from Gilgandra and Coonamble districts, forwarded by Mr. S. Ashley.

Mr. M. S. Barnett.—Specimens of a snail, *Helix pisana*, collected in a garden at Mount Colah. This is the first time this species has been recorded from New South Wales. The specimens were kindly identified by Mr. Tom Iredale, of the Australian Museum. Mr. Barnett also described specimens of a plant collected by Miss Jean Buckingham, at Wentworth Falls, during January, 1938. This species was originally collected by Fitzgerald, in a moist locality, at Katoomba, about 1880, and specimens were secured later, from time to time, by various collectors in the vicinity of, and at Wentworth Falls, but efforts made in 1918, and later failed to locate it, and it was regarded as extinct in that area. The specimens exhibited, therefore, were of particular interest.

Mr. D. G. Stead.—Referred to the Fauna and Flora Exhibition, and to the exhibits there. Mr. Stead also described

the "leafy sea-horse" forwarded by Mr. Ashley.

Mr. E. Gostelow.—Exhibited paintings of various species of birds, including Bower birds, Rifle birds and Cat birds. Mr. Gostelow also exhibited several paintings of birds forwarded by Miss F. Irby from Casino.

Mr. E. H. Zeck.—Exhibited a series of photographs (by means of the epidiascope), showing trees, insects, etc., taken during his stay in Mexico.

Miss Rosling.—Described various types of timbers and illustrated her talk with pictures projected by the epidiascope.

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MAY, 1938.

The ordinary monthly meeting of the Society was held in the Conference Hall, Department of Agriculture, on Tuesday, May 3, 1938, at 8 p.m.

In the absence of the President, Mr. A. E. Watson, Vice-President, in the chair, with about 55 members and visitors present.

New Member.—Miss Nuri Mass was unanimously elected a member of the Society.

Nomination of Members.—Mr. Alfred J. Border, 8 Redmyre Road, Strathfield. Nominated by Mr. A. E. Watson, seconded by Miss D. Dobbin. Mr. E. P. Jasper, 53 Frederick Street, Rockdale. Nominated by Mr. C. S. Ashley, seconded by Mr. J. C. Wiburd. Miss Lucy Weymouth, Wunulla Road, Double Bay. Nominated by Miss Jefferson, seconded by Miss D. Dobbin.

Exhibition of Specimens.—Mrs. A. Pace: Specimens of fossils from Burragorang Valley. These specimens, which were described by Mr. Doherty, consisted of plants and shells and belonged to the carboniferous period.

Mr. C. S. Ashley.—Seeds of the Tung oil tree, "Bearded Corn" and a white *Grevillea*.

Dr. Webster.—Specimens of walking sticks, made from Eucalyptus, Acacia, and a Trans-Australian railway sleeper, also specimens of minerals, shells and kino from *Angophora*.

Mr. M. S. Barnett.—Gave an account of the outing to Bardwell Creek reserve, and Mr. Ball's nursery, held on the previous Saturday.

Lecture.—Mr. Tom Iredale (Conchologist to the Australian Museum), delivered an extremely interesting and informative lecture, entitled, "Some Shells from the Sydney

Beaches", illustrated with numerous lantern slides, many of which were beautifully coloured. The lecturer was accorded a hearty vote of thanks.

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JUNE, 1938.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, June 7, 1938, at 8 p.m.

The President (Mr. D. G. Stead), in the chair, with about 85 members and visitors present.

New Members.—Mr. A. J. Border, Mr. E. P. Jasper and Miss L. Weymouth were unanimously elected members of the Society.

Nomination of Members.—Mr. H. Doherty, 9 Belgrave Street, Kogarah. Nominated by Mr. M. S. Barnett, seconded by Miss D. Dobbin. Mr. and Mrs. Gapp, 3 Ocean Street, Bondi. Nominated by Mrs. Pace, seconded by Miss D. Dobbin. Miss E. McNicol, 3 Ocean Street, Bondi. Nominated by Mrs. Pace, seconded by Miss D. Dobbin. Mr. J. R. Wills, 49 Ross Street, Parramatta. Nominated by Mr. D. G. Stead, seconded by Miss D. Dobbin. Mr. W. H. Brabant (at present) "Milton", 79 Ocean Street, Woollahra. Nominated by Mr. C. S. Ashley, seconded by Mr. E. P. Bailey. Miss Florence Nixon, 9 Belgrave Street, Kogarah. Nominated by Mr. M. S. Barnett, seconded by Dr. C. Webster.

Exhibition of Specimens.—Mr. E. P. Bailey exhibited specimens of plants obtained at North Head by Miss Ballantyne.

Mr. M. E. Gray.—Described Mr. Ashley's exhibit of a photograph taken at Rabaul during the recent volcanic eruption; also specimen of a large moth (*Chelepteryx collessi*) and its cocoon which was covered with stinging spines from the caterpillar's body.

Mr. E. Best.—Specimens of minerals.

Mr. David G. Stead.—Announced that the vast whale shark had been observed by Mr. Harold Christiansen, of Huskisson, Jervis Bay, on April 23, 1938, off Jervis Bay. This is the first record of its occurrence in waters off New South Wales.

Lecture.—Dr. David F. Martyn (Director of the Radio Research Bureau of the Council for Scientific and Industrial Research), delivered an extremely informative and interesting lecture, entitled, "Air and Sunlight", which was illustrated with many diagrams and charts. The lecturer was accorded a hearty vote of thanks.

JULY, 1938.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, July 5, 1938.

The President (Mr. D. G. Stead), in the chair, with about 70 members and visitors present.

New Members.—Mr. H. Doherty, Mr. and Mrs. Gapp, Miss E. McNicol, Mr. J. R. Wills, Mr. W. H. Brabant (Fiji), and Miss F. Nixon were unanimously elected members of the Society.

Nomination of Members.—Miss C. E. Griffith, 7 Kitchener Road, Artarmon. Nominated by Miss Stevenson, seconded by Miss Luckie. Mr. W. F. Blakeley, National Herbarium, Sydney. Nominated by Mr. J. C. Wiburd, seconded by Mr. C. S. Ashley.

Announcement.—The President referred to the destruction of trees in Hyde Park, and particularly to the fig tree in the central path. He moved a resolution, seconded by Dr. C. Webster, that the City Council be requested not to remove the trees mentioned in the "Sydney Morning Herald" of July 5, 1938. The Secretary was instructed to forward the resolution to the Council.

Exhibition of Specimens.—Mr. M. E. Gray: Exhibited, on behalf of Mrs. Pace, an aboriginal carved stone found in the Burratorang Valley.

Mr. C. S. Ashley.—Specimen of a tooth from a sperm whale; also specimens of Eucalypts from Mount Blaxland, near Lithgow.

Miss L. Kaylock.—A heart-shaped sea urchin from the north coast of Tasmania.

Mr. M. S. Barnett.—Specimens of ferns.

Mr. Hawley.—Fruit of the Plum Pine, *Podocarpus elata*; specimen of Pearly Nautilus and swimming bladder of the Porcupine fish.

Mr. M. S. Barnett spoke of the outing to Cooper Park, Bellevue Hill, held on Saturday, July 2, 1938, and moved a resolution that the Hon. Secretary write to Woollahra Council, thanking Mr. Walker for showing members over the park, and advising the Society's interest in the work being done there.

Mr. M. E. Gray stated that the sap from near the root of the bracken fern was an antidote for stings.

Mr. Armstrong, a visitor from New Zealand, who had been introduced to the Society by Miss Garling, exhibited a complete collection of New Zealand ferns. Mr. Armstrong

stated that the collection had been made by his mother, over 40 years ago, and that it contained several species which were now extinct.

Lecture.—Professor Eric Ashby (Professor of Botany at the University of Sydney), delivered an extremely informative and interesting address, entitled, "Botany and the Land". The lecturer was accorded a very hearty vote of thanks.

#### AUGUST, 1938.

The annual meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, August 2, 1938, at 8 p.m.

In the absence of the President (Mr. David G. Stead), Mr. A. E. Watson, Vice-President, occupied the chair. About 67 members and visitors were present.

Mr. Watson told members of the sad loss Mr. Stead had sustained in the death of a son, who had been killed in an accident that morning. Members stood in silence as a mark of respect, and the Hon. Secretary was instructed to pass to Mr. Stead the Society's resolution of sympathy.

Election of office-bearers for year 1938-1939:—

President: Mr. M. S. Barnett, A.A.C.I.

Vice-Presidents: Messrs. David G. Stead, A. E. Watson, E. H. Zeck.

Hon. Treasurer: Mr. John Powell.

Hon. Assistant Treasurer: Miss L. Kaylock.

Hon. Secretary: Miss Dolce Dobbin.

Hon. Assistant Secretary: Miss Lillian Halloran.

Hon. Editor: Mr. E. H. Zeck.

Hon. Librarian: Mr. A. Booth.

Hon. Lanternist: Mr. G. White.

Hon. Assistant Lanternist: Mr. E. P. Bailey.

Other Members of Council: Mrs. A. E. Watson, Miss D. Ross, Miss W. Rosling, Messrs. C. S. Ashley, D. R. Ball, A. E. Hamilton, J. W. Hawley, F. J. Ludowici, N. L. Roberts, and J. C. Wiburd.

Apologies for non-attendance were received from Mr. D. G. Stead and Mrs. Wrigley.

New Members.—Miss C. E. Griffith and Mr. W. F. Blakeley were unanimously elected members of the Society.

Nomination of Members.—Mr. W. Gilmour, Box 3156B, G.P.O., Sydney. Nominated by Mr. Blakeley, seconded by Miss D. Dobbin. Mr. L. G. Harrison, 85 Clarence Street, Sydney. Nominated by Mr. Watson, seconded by Miss D. Dobbin.

Annual Report.—The Hon. Secretary (Miss Dolce Dobbin), submitted the annual report upon the activities of the Society during the past year.

Treasurer's Statement.—The Hon. Treasurer (Mr. John Powell), submitted his financial statement for the year ended July 31, 1938.

Exhibition of Specimens.—Entomological Branch, Department of Agriculture. Collection of moths, beetles, cicadas and insects of economic importance.

Mr. F. J. Ludowici.—Specimens taken from coal seam at Westport, New Zealand.

Mr. M. E. Gray.—Specimens of insects and collection of photographs.

Miss W. Rosling.—Mounted specimens of local native flowers. Specimens of plywoods and veneers.

Mr. E. Gostelow.—Water colour paintings of Australian ducks.

Mr. A. E. Hamilton.—Specimen of a hybrid *Cymbidium*.

Mr. M. S. Barnett.—Named specimens of native flowers.

Miss Jean Buckingham.—Collection of pressed specimens of Australian flowers.

Mr. E. P. Bailey.—Seeds of native Queensland plants and wild fruits.

The floral decorations in the hall were collected by various members the previous day.

In place of the Presidential Address, Mr. E. H. Zeck gave a short address on scale insects (*Coccidae*), illustrated with lantern slides, and Mr. E. Gostelow exhibited his water colour paintings of Australian ducks, and also gave information about the different species which he had painted.

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#### EXTRACTS FROM ANNUAL REPORT OF THE HON. SECRETARY.

(Read at the Annual Meeting August 2, 1938.)

The Naturalists' Society has now completed its thirty-seventh year. The Society has continued its endeavours to stimulate interest in natural history, and has kept its members in touch with the various branches of natural science.

During the past year we have had some outstanding lectures, and we have to tender our thanks to the various lecturers for their valuable assistance. The lectures given to the Society have been recorded in the Proceedings of each particular monthly meeting, in this Journal.

The field excursions, both half and whole day, have



been well attended, and during the past year the following places were visited:—Quarantine Grounds, North Head; St. Ives; Oatley Park; Cronulla; Epping; Kurnell; Rofe Park, Turramurra; Bardwell Creek Reserve; Botanic Gardens; Cooper Park, Bellevue Hill; Turramurra; Mr. Ball's Nursery at North Bexley; Wattamolla and Garie Beaches; Engadine; Mount Riverview Lookout; Blaxland and Waterfall.

During the year two parts of the "Australian Naturalist" have been published, and our thanks are due to the Hon. Editor (Mr. E. H. Zeck) for his work in connection therewith.

Our Hon. Librarian (Mr. Albert Booth), has been working in an endeavour to get our library into some definite order, but a great deal of work still remains to be done before we can allow members the ready use of books.

The membership of the Society now totals 216.

The seventh annual planting of Australian trees and shrubs was carried out in co-operation with the North Sydney Council, at Ball's Head, on July 19, 1938, and on this occasion the North Sydney Council unveiled a very fine memorial to our old friend and former President, the late Mr. W. W. Froggatt. Trees were also planted in memory of the following late members: Mr. Luke Gallard and Mr. A. E. Tebbutt.

I would also like to express the Council's appreciation of the way in which the Hon. Lanternist (Mr. G. White) carries out his duties, and to call attention to the valuable assistance I have received from my assistant, Miss L. Halloran, during the past year.

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#### SEPTEMBER, 1938.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, September 6, 1938, at 8 p.m.

The President (Mr. M. S. Barnett), in the chair, with about 46 members and visitors present.

New Members.—Mr. W. Gilmour, and Mr. L. G. Harrison were unanimously elected members of the Society.

Nomination of Members.—Miss J. McGregor, 4 Lucknow Street, Willoughby. Nominated by Miss D. Dobbin, seconded by Miss F. Bewley.

Correspondence.—The President called members' attention to the following:—The Orchid Society's Annual Show, to be held in the Blaxland Galleries, at Farmer's, on September 8 and 9, 1938. Angus & Robertson's donation of a

book by Miss Nuri Mass, entitled, "Wildflower Fairies". Sydney University Science Association lectures and discussions on parasitism, to be held in the Biology School, on September 21, 1938.

Miss W. Rosling donated two copies of W. W. Froggatt's "Forest Insect and Timber Borers", to the Library, and Miss Dolce Dobbin donated "Bush Rambles", by A. G. Hamilton.

Mr. A. E. Watson.—Suggested that a questionnaire be enclosed with the next notice to members, regarding the activities of the Society, and asking for possible suggestions for improvement.

Lecture.—Assistant Professor W. R. Browne (Geology School, Sydney University), delivered a most informative and interesting lecture, entitled, "A Geological Ramble along the Coast". The lecture was illustrated with excellent lantern slides, and was greatly appreciated by the members. The lecturer was accorded a very hearty vote of thanks.

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OCTOBER, 1938.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, October 4, 1938, at 8 p.m.

The President (Mr. M. S. Barnett), in the chair, with about 35 members and visitors present.

New Members.—Miss J. McGregor was unanimously elected a member of the Society.

Nomination of Members.—Mr. C. M. Townsend, 10 Rydale Road, Ryde. Nominated by Miss F. Bewley, seconded by Miss D. Dobbin. Mr. L. Hasemer, 13 Eric Street, Leichhardt. Nominated by Mr. Wills, seconded by Mr. Border.

Announcement.—The President announced that the Workers' Education Society lecture, entitled, "The Flora and Fauna of Lord Howe Island", would be delivered by Mr. M. J. Campbell at the Club's rooms, Manning Building.

Exhibition of Specimens.—Mr. A. E. Watson: A weed popularly known as Bindy-eye, *Soliva sessilis*, which is a pest in lawns on account of the sharp spines it develops. Specimen of Queensland Nut, *Macadamia ternifolia*, and She oak, *Casuarina distyla*. Mr. Watson also described Mr. Wiburd's specimens, which included *Podocarpus*, *Helichrysum*, *Trachymene*, *Lasiopetalum* and *Acacia longifolia*.

Mr. Doherty.—Specimens of *Grevillea asplenifolia* from the Upper Woronora River.

# The Australian Naturalist

Vol. X.

MAY, 1939.

Part 5.

## A KEY TO THE NEW SOUTH WALES SPECIES OF *DILLWYNIA*.

By W. F. BLAKELY.

The species of *Dillwynia* are amongst the most attractive and admired plants of the Hawkesbury sandstone, and are generally known as "Eggs and Bacon", owing to the two colours of the flowers.

For a number of years many people have been puzzled over several distinct types or forms placed under one or two specific names, and hence a revision of the species confined to New South Wales was long overdue. Bentham in *Fl. Aust.*, ii., 146 (1864), records 10 species and 7 varieties of *Dillwynia* for the whole of Australia, allocating 5 species and 6 varieties to New South Wales; Moore and Betche, in *Handbook of the Fl.*, N.S.W. 140 (1893), record 7 species; Cheel in *Proc. Linn. Soc.*, N.S.W. (1914), 471, restored to specific rank 3 of Bentham's varieties; Maiden and Betche in *A Census of New South Wales Plants* (1916), 104, list 7 species and 8 varieties; Cheel in *Proc. Linn. Soc.*, N.S.W. (1923), 68, raises one of Maiden and Betche's varieties to specific rank, making a total of 8 species and 7 varieties for New South Wales. The present revision establishes 16 species and 14 varieties, while 2 species remain in doubt as to whether they are indigenous to this State.

### *Dillwynia* Sm.

After Lewis Weston Dillwyn, author of "British Con-fervae" (1809), and other botanical works.

Calyx turbinate or campanulate, 5-lobed, the 2 upper lobes broad, divergent and partially united in an upper lip; lower ones three-parted, acute or acuminate. Petals clawed; standard broader than long usually reniform; wings narrow-oblong; keel straight, obtuse, shorter than the wings; stamens 10, free, perigynous owing to their insertion on the summit of a thin disc lining the lower part of the calyx-tube; ovary shortly stipitate, 2-ovulate; style erect,

uncinate; pod brevi-stipitate, ovate, ventricose; seeds strophiolate. Heath-like shrubs. Leaves simple, alternate, narrow-linear or terete, generally subulate and channelled above, the margins rolled or revolute; stipules wanting or minute; bracts small, brown, deciduous; bracteoles small on the short pedicels slightly below the calyx; standard usually yellow and red or dark purple-brown, the wing yellow, rose-coloured or crimson.

*Key to the Species.*

SECTION DILLWYNIATRUM.—Petals deciduous. Standard with a long claw, the lamina above twice as broad as long; wings much shorter than the standard. Calyx funnel-shaped at the base costellate, the 2 upper lobes scarcely united. Flowers axillary or terminal.

*Sub-section 1.*—Terminales.

Flowers usually terminal or sub-terminal in corymbs or sub-spicate. Leaves erect or horizontal, often rolled or twisted when dry, smooth or scabrous with short bristles when young except *D. hispida*.

- A. Leaves usually twisted, rarely erect. Ovary hoary-hirsute. Seeds smooth or rough.
- i. Low divaricate shrubs. Leaves deflexed, spreading, scabrous or almost smooth, 3-5 mm. long.  
Flowers in sessile or shortly pedunculate heads.  
Seeds rough . . . . . 1. *D. parvifolia*.  
Flowers on long hair-like peduncles.  
. . . . . 2. *D. parvifolia* var. *trichopoda*.
  - ii. Moderately tall shrubs with minutely pubescent branches. Leaves deflexed or horizontal, scarcely scabrous, 6-10 mm. long.  
Flowers on peduncles 10-15 mm. long or longer.  
Calyx glabrous . . . . . 3. *D. peduncularis*.  
Flowers in irregular spike-like racemes.  
. . . . . 4. *D. peduncularis* var. *racemosa*.  
Flowers in almost sessile corymbs.  
. . . . . 5. *D. ericifolia*.  
Flowers in corymbs or short spikes. Leaves mostly deflexed. 6. *D. ericifolia* var. *deflexa*.
  - iii. Scabrous-pubescent shrubs. Leaves spreading, twisted, acute, 3-6 mm. long. Flowers in almost sessile corymbs.  
Calyx hairy . . . . . 7. *D. phyllicoides*.

Calyx glabrous .. 8. *D. phyllicoides* var. *leiocalyx*.

B. Leaves straight or nearly so, never twisted or deflexed, not pungent. Ovary ferruginous-hirsute or hoary-hirsute. Seeds smooth.

i. Small, hairy, pubescent, divaricate shrubs. Flowers few or several together in short corymbs or on elongated peduncles.

Peduncles and calyx hairy. Leaves hairy, 5-12 mm. long. Keel acuminate, obtuse in the other species .. . . . 9. *D. hispida*.  
Peduncles and calyx hairy. Leaves smooth, not hairy, 5-12 mm. long.

.. . . . 10. *D. hispida* var. *laevifolia*.  
Peduncles and calyx slightly hairy. Leaves almost glabrous, 5-7 mm. long. Calyx glabrous, except the ciliolate lobes .. 11. *D. hispida* var. *glabriflora*.

Peduncles glabrous, filiform. . . . .  
.. . . . 12. *D. hispida* var. *glabripes*.

ii. Tall glabrous shrubs. Leaves straight, subangular, 10-27 mm. long. Flowers rather large, few, in shortly pedunculate corymbs.

.. . . . . 13. *D. oreodoxa*.

iii. Small, virgate glabrous or pubescent shrubs. Leaves filiform, terete or nearly so, curved at the top, 10-15 mm.

Glabrous plants. Flowers numerous in almost sessile corymbs .. . . . 14. *D. glaberrima*.

Glabrous plants. Flowers few on long slender peduncles smaller than those of the preceding.  
.. . . . 15. *D. glaberrima* var. *longipes*.

Young leaves and branches pubescent.  
.. . . . 16. *D. glaberrima* var. *pubescens*.

iv. Prostrate shrubs, branches minutely pubescent. Leaves straight or curved, glabrous, 5-7 mm. long.

Flowers in small terminal abbreviated corymbs.  
.. . . . . 17. *D. prostrata*.

v. Frail virgate shrubs. Flowers solitary, terminal or axillary. Leaves filiform, clustered.

.. . . . . 18. *D. tenuifolia*.

vi. Wiry glabrous shrubs. Flowers axillary and terminal. Leaves not clustered.

- Branches spinescent . . . 19. *D. spinescens*.  
 Branches not spinescent.  
 . . . . . 20. *D. spinescens* var. *inermis*.

*Sub-section 2.—Axillares.*

Flowers axillary, solitary or in pairs, often crowded into leafy racemes. Leaves erect or oblique, straight or slightly curved, never markedly twisted, glabrous or hispid-tuberculate, hairy when young.

- i. Dwarf almost glabrous shrubs. Flowers crowded into terminal or infraterminal globular heads. Leaves straight smooth, somewhat triangular. Stipules evident. . . . . 21. *D. stipulifera*.
- ii. Usually tall shrubs; branches pilose or hirsute. Flowers usually in long leafy spikes, chiefly yellow. Calyx glabrous.  
 Leaves somewhat flat or scarcely terete, straight or curved, tuberculate and glabrous, 10-15 mm. long. . . . . 22. *D. floribunda*.  
 Leaves almost terete, glabrous, mucronate, tuberculate, 5-10 mm. long.  
 . . . . . 23. *D. floribunda* var. *brevifolia*.  
 Leaves terete, straight, slightly tuberculate, glabrous, 1-15 mm. long.  
 . . . . . 24. *D. floribunda* var. *teretifolia*.  
 Leaves filiform, terete, faintly tuberculate, 20-25 mm. long. Flowers rather large.  
 . . . . . 25. *D. floribunda* var. *longifolia*.
- iii. Usually stunted shrubs, the branches villous or silky hairy. Flowers usually in short spikes, chiefly dark red or purple-brown. Leaves terete. Branches robust. Tomentum villous. Bracts covering the young buds sub-hirsute, 3 x 2 mm. Leaves scabrous, 7-11 mm. long. Calyx glabrous. . . . . 26. *D. rudis*.  
 Leaves rigid, very tuberculate, usually hairy, 8-15 mm. long. . . 27. *D. rudis* var. *hispidula*.  
 Branches very slender. Tomentum silvery-hairy. Calyx silky-hairy. Leaves slender, terete, abruptly acute, scabrous, 7-12 mm. long. Bracts glabrous, 2 x 1 mm. . . 28. *D. sericea*.  
 Calyx glabrous. Leaves smooth or slightly scabrous, 5-7 mm. long.  
 . . . . . 29. *D. sericea* var. *glabriiflora*.

SECTION XEROPETALUM.—Petals persistent, standard with

a claw usually shorter than the calyx, the lamina entire, scarcely twice as broad as long; wings nearly as long as the standard, keel obtuse, shorter than the wings. Calyx turbinate to somewhat campanulate. Flowers terminal.

- i. Tomentum villous. Calyx villous, the lobes nearly equal. Leaves thick, almost triangular, scabrous, 5-8 mm. long.

Flowers in dense terminal heads.

..... 30. *D. brunioides*.

- ii. Tomentum close and velvety. Calyx pubescent, the lobes unequal, the 2 upper emarginate. Leaves spreading or somewhat erect, filiform, straight, with recurved points, 5-12 mm. long.

Flowers in loose terminal corymbs.

..... 31. *D. cinerascens*.

Leaves crowded, erect, terete, acute but not pungent, 12-15 mm. long. Flowers in very short terminal racemes, larger than those of *D. cinerascens*. . . . . 32. *D. acicularis*.

Leaves very slender, up to 30 mm. long.

..... 33. *D. acicularis* var. *leptophylla*.

Leaves straight, terminating in long pungent points. Flowers in small terminal clusters, smaller than in all the preceding species.

..... 34. *D. juniperina*.

Leaves obtuse, often recurved, 3-7 mm. long.

Flowers medium-sized. . . . . 35. *D. uncinata*.

*Section Dillwyniastrum*.—Flowers terminal. Petals deciduous. Calyx funnel-shaped at the base.

1. *D. parvifolia*, R.Br., Bot. Mag. t., 1527 (1810); Lodd. Bot. Cab., t., 559. "Small-leaved Dillwynia".

A rather dense, intricately branched shrub, 1-2 feet high, the slender branches almost glabrous or hairy-pubescent. Leaves crowded, somewhat decussate and spreading, 3-5 mm. long, often twisted, with straight or slightly recurved points, usually scabrous. Flowers rather small, few in sessile or shortly pedunculate clusters. Petals deciduous; calyx glabrous, turbinate, ciliolate, 5-7 ribbed, 3 mm. long, the 2 upper lobes deeply emarginate, longer than the 3 broad, acute lower ones. Standard yellow with a purple-brown centre, reniform, 3 x 6 mm., the claw rather broad, 2 mm. long; wings yellow, 4 mm. long; keel purple-brown, obtuse, ciliolate, 3 mm. long. Ovary hirsute, stipitate; style glabrous; stigma capitate. Pod elliptical, 4 x 3

small. Usually confined to ironstone gravel and hard shale. mm.; seed obliquely reniform, reticulate-rugose; caruncle Very plentiful on the Southern Tablelands from Hill Top to Tumut; common throughout Parramatta and Nepean districts. It was collected at the head of the Gwydir River by the late Dr. Leichhardt. Fl., Sept.-Nov.

Syn.:—*D. microphylla*. Sieb. Pl. Exs. N. 410, and 553, and Fl. Mixt., N. 586; *D. ericifolia* Sm., var. *parvifolia* Benth.

2. *D. parvifolia* var. *trichopoda*, var. nov. Variat pedunculis elongatis filiformibus et foliis longioribus.

A low divaricate shrub with slender branches. Leaves almost smooth, spreading and twisted, 4-5 mm. long. Flowers 1-4 on hair-like peduncles, 10-15 mm. long. Hill Top, J. H. Maiden, 9/1899; (Type): Bargo; Bowral; Mittagong; Sutton Forest; Conjola; Bent's Basin; Blue Mountains; Warrumbungle Ranges. Fl., Sept.-Dec.

3. *D. peduncularis*, Benth., Ann. Wien. Mus., ii., 78 (1838). "Common Dillwynia".

A wiry shrub, 3-8 feet high, with slightly pubescent branches. Leaves 6-10 mm. long, deflexed, horizontal and spirally twisted, acute and somewhat pungent when dry. Flowers in loose clusters of 2 or 3 on peduncles exceeding the leaves. Calyx funnel-shaped, 10 ribbed, 4 mm. long, the 2 upper lobes falcate, longer than the 3 acute lower ones. Petals deciduous; standard reniform, 5 x 7 mm. long; keel 3 mm. long, yellow or red. A more wiry shrub, with paler and smaller flowers than *D. ericifolia*. In some districts it is not associated with *D. ericifolia*. At Lindfield Park, the latter flowers fully a month earlier, and is in pod by the time *D. peduncularis* comes into flower. Common throughout the Hawkesbury sandstone from Victoria to Queensland, but apparently more plentiful north of Hawkesbury. Fls., Sept.-Nov.

Syn.:—*D. filifolia* Endl. Nov. Stirp., Dec. 13; *D. ericifolia* Sm. var. *peduncularis* Benth.

4. *D. peduncularis* var. *racemosa*, var. nov. Variat floribus in racemis tenuibus, 2-4 cm. longis.

Leaves 4-10 mm. long. Flowers in slender racemes, 2-4 cm. long. Lindfield Park, W. F. Blakely and W. J. Buckingham, 6.11, 1938. (Type): Toronto; Wallsend.

5. *D. ericifolia* Sm., Koen & Sims, Ann. Bot., i., 510 (1805); Lodd. Bot. Cab., t., 1277; Maiden & Campb., Fl. Pl. & Ferns, 6, 12. "Erica-like Dillwynia".

*D. peduncularis*  
(Wendl.)

Dunn, Rev. Soc. Sci. & Arts, Isles, 1907, p. 107



A divaricate shrub, 3-9 feet high, with virgate, pubescent branches. Leaves slender, mostly 5-12 mm. long, spreading or deflexed, often twisted with straight or slightly curved points. Flowers numerous, in sessile, terminal, leafy corymbs. Calyx glabrous, turbinate, 5 mm. long, ciliolate, 7-8 ribbed, the 2 upper lobes rounded and falcate, united to the middle. Petals deciduous; standard yellow with purple-brown radiating lines in the centre, deeply emarginate, 5 x 8-9 mm., the claw narrow, 5 mm. long; wings yellow, obovate, 6 mm. long; keel obtuse, purple-brown, 4 mm. long, sometimes minutely ciliolate. Ovary hairy, stipitate. Pod stipitate, ovate, almost glabrous, 6-7 x 5 mm. Seeds smooth, black, obliquely ovate. Recorded for all the States, except Western Australia. In New South Wales it is mainly confined to sandstone, and extends throughout the whole of the coastal area and to some parts of the Dividing Range. I have not seen specimens from South Australia nor Tasmania. It makes a very attractive garden shrub when in full bloom. Fl., Sept.-Nov.

Syn.:—*D. ericoides* Sieb., ex. Benth. Fl., Aust., ii., 148, 1864. (Sieb. Pl. Exs. N. 412, and Fl. Mixt. N. 585.).

*D. pinifolia* Sieb., ex. Benth., l.c. (Sieb. N. 424); *D. seriphioides* Endl. Nov. Stirp., Dec. 14; *Pultenaea retorta* Wendl. Hort. Herrenh., t., 9; *Aotus ericoides* Paxt. Mag. v., 51, with a fig.

6. *D. ericifolia* var. *deflexa*, var. nov. Variat foliis deflexis inflorescentia inconstante.

A robust shrub, 3-5 feet high; branches minutely pubescent. Leaves all or nearly all deflexed, straight and spirally twisted mainly to the left, 5-7 mm. long, terete, smooth or minutely scabrous. Flowers solitary and in short, dense, subsessile corymbs, sometimes forming spike-like racemes 2-5 cm. long. New South Wales, Como, J. H. Camfield, 8, 1897. (Type): J. L. Boorman, 9, 1916. A very marked variety. Fl., Aug.-Sept.

7. *D. phyllicoides*. A. Cunn., in Fields, N.S.W., 347 (1825). "Phyllica-like Dillwynia".

A dense, spreading shrub, 2-7 feet high; branches, foliage and calyces scabrous-pubescent with short rigid hairs. Leaves 3-6 mm. long spreading, twisted, with straight or slightly recurved points. Flowers in terminal clusters on short peduncles, but appearing axillary owing to the abbreviated branchlets. Calyx funnel-shaped, hirsute, strongly ribbed, 6 mm. long, the two upper lobes falcate, longer than

the 3 acuminate lower ones. Standard yellow and crimson, reniform, emarginate, 5 x 10 mm.; claw linear, 4 mm. long; wings obliquely-oblong, 5-6 mm. long, pale yellow and red; keel dark purple-brown shading into orange-red, 4 mm. long. Pod ovate, stipitate, sub-glabrous, 7 x 3 mm. Seeds smooth, obliquely ovate 2 x 1.5 mm.

This beautiful species is very common on the Southern Tablelands from Hill Top to Braidwood, extending westward to Ilford, and northward to the Warrumbungle Ranges and Queensland. It prefers granite, sandstone, and quartz porphyry. Fl., Aug.-Jan.

8. *D. phyllicoides* var. *leiocalyx*, var. nov. Variat foliis fere glabris et calyce omnino glabro.

A pubescent or nearly glabrous shrub, 4-6 feet high. Leaves very numerous, dense and spreading, almost smooth to very hispid, 6-14 mm. long, slightly twisted, obtuse or acute. Calyx glabrous, the lobes subulate, fringed with soft white hairs. Top of range near Backwater; W. F. Blakely, Rev. E. N. McKie, and T. Youman, 30/10/1929. (Type): Forked Mountain, Coonabarabran, near Tingha; Cherm-side, Queensland. A specimen from Ravine, via Tumut, has smaller leaves and smaller flowers. Fl., Sept.-Dec.

9. *D. hispida*, Lindl. in Mitch. Three. Exped., ii., 251 (1838). "Rough Dillwynia".

A divaricate shrub, 2-4 feet high, with slender, scabrous-pubescent or hirsute branches. Leaves erect or nearly so, 5-12 mm. long, straight, terete, channelled and scabrous, obtuse or scarcely pointed; stipules minute. Flowers rather large, of a deep orange mixed with purple-red, in clusters or short racemes, on terminal peduncles much longer than the leaves. Calyx turbinate, hirsute, 10-ribbed, 6 mm. long, the lobes acute, shorter than the tube. Petals deciduous; standard reniform 5 x 8 mm. or larger; claw oblong, 4 mm. long; wings obovate, 6 mm. long; keel acuminate, almost uncinatè, 6 mm. long. Ovary villous; stipes long.

Very rare in New South Wales and is represented in the Herbarium by a solitary specimen from Barellan; Dr. E. C. Chisholm, 10, 1937. It appears to be common in Victoria and South Australia. Fl., Sept.-Nov.

Syn.:—*D. scabra*, Schlecht., Linnaea., xx., 666.

10. *D. hispida*, var. *laevifolia*, var. nov. Variat foliis brevibus glabris et pedunculis glabris.

A dwarf, divaricate shrub, with rather short, glabrous

branches and leaves, hirsute buds, and glabrous peduncles. Leaves subterete, smooth, obtuse, channelled above 3-4 mm. long. New South Wales. "On conglomerate rocks near Griffith, W.F.B., and D. W. C. Shiress, 8/1928. (Type)." Fl., Aug.-Sept.

11. *D. hispida* var. *glabriflora*, var. nov. Variat pedunculis glabris et calyce glabro.

Leaves almost glabrous, subterete, arcuate, slightly scabrous, 5-7 mm. long. Flowers terminal on filiform peduncles, 10-15 mm. long. Calyx glabrous except the ciliolate lobes. Victoria, Lillimur, C. Walter, Oct., 1898. (Type): Linton, H. B. Williamson, October, 1914, mixed with the typical form. Fl., Oct.

12. *D. hispida* var. *glabripes*, var. nov. Variat pedunculis glabris flavidis, 10-20 mm. longis.

Peduncles filiform, glabrous, 10-20 mm. long, usually straw-coloured, Victoria, Skipton, Rev. W. T. Whan. (Type): South Australia, Port Lincoln. Fl., Nov.

13. *D. oreodoxa*, sp. nov.

Frutex glaber 3 m. altus, foliis minute scabris 10-27 mm. longis erectis aut obliquis, sub-angularibus vix teretibus, acutis vel acuminatis; corymbis terminalibus floribus paucis breviter pedunculatis, calyce hypocrateriforme 6 mm. longo, lobis latis acutis. petalis deciduis, vexillo reniforme 6 mm. lato, 11-12 mm. longo, aliis obovato-oblongis 7 mm. longis, carina rubra cucullata ciliolata 6 mm. longa, ovario ferrugineo-hirsuto.

A glabrous shrub, 12 feet high. Leaves minute scabrous, 10-27 mm. long, erect or oblique, straight or subflexuose, channelled above, slightly keeled beneath, subangular or scarcely terete, acute or with acuminate points, stipules minute, subulate. Flowers few, pedicellate, in terminal almost sessile corymbs. Bracts and bracteoles subulate, 1-1½ mm. long ciliate. Calyx funnel-shaped, costulate, 6 mm. long, the lobes broad and acute, ciliolate. Petals deciduous; standard yellow, with several reddish radiating veins around the centre, 6 x 11-12 mm. long; claw, linear, 4-5 mm. long; wings yellow, obovate oblong, 7 mm. long; keel cucullate, ciliolate, reddish, 6 mm. long; ovary stipitate, ferrugineous-hirsute.

Victoria:—"Shrub, 12 feet high, Grampians", C. Walter, 11.1900 (Type). The long, minutely scabrous subangular leaves, larger flowers, and broad calyx-lobes, readily separates it from its allies.

This species, although not found in this State is included here for botanical reasons, as it is possible if not probable that it will be found in New South Wales under conditions similar to those of the Grampians.

14. *D. glaberrima* Sm. in Kon. & Sims, Ann. Bot. i., 510 (1805); Lodd. Bot. Cab., t., 582; Labill., Nov. Holl., Pl. i., t., 139; Bot. Mag. t., 944. "Smooth Dillwynia".

A weak, spreading shrub, 2-3 feet high, with glabrous branches. Leaves numerous, 10-15 mm. long, filiform, erect or slightly spreading, smooth, ending in a soft recurved mucro; stipules microscopic. Flowers in dense, almost sessile, terminal corymbs, among the upper leaves. Bracteoles subulate, glabrous, 1½ mm. long; pedicels, 2 mm. long; peduncles shorter. Calyx turbinate, 10-ribbed, ciliate, glabrous, the 2 upper lobes broad, falcate, nearly as long as the 3 lanceolate lower ones. Petals deciduous, standard yellow, with 10 or more radiating purple-brown lines in the centre, reniform, the lamina 5 x 10-11 mm.; claw linear, 5 mm. long; wings narrow, 5-6 mm. long, yellow; keel narrow, acute, 4-5 mm. long. Ovary rufous-hirsute, stipitate; style glabrous, hooked, stigma small. In a specimen from Eaglehawk Neck, Tasmania, many of the flowers had two ovaries. Pod slightly hairy, stipitate, ovate, 4 x 3 mm. Seed obliquely ovate, 2 mm. long, mottled. Common in Tasmania and Victoria, less common in New South Wales, and represented in the Herbarium from Milton; Jervis Bay; Kogarah; Long Bay; Botany Swamp; King's Tableland; Mt. Wilson; Newcastle; Belmont. It prefers very moist sandy soil and is more fragile than *D. ericifolia*. Fl., Aug.-Dec.

Syn.:—*D. ericifolia* Sm., var. *glaberrima* Benth.

15. *D. glaberrima* var. *longipes*, var. nov. Variat pedunculis elongatis et floribus parvis.

Quite glabrous. Leaves filiform, subterete, straight or uncinuate, 5-10 mm. long. Flowers in loose clusters of 3-4 on long, slender, terminal peduncles, smaller than the Tasmanian specimens in the Herbarium, but with the same rufous-hirsute ovary. Pod ovate, hirsute, 5 x 3 mm. long; seed obliquely ovate, 2 mm. long, mottled. The long peduncles and smaller flowers distinguish it from the species. New South Wales:—La Perouse, J. H. Camfield, 10/1898. (Type): Centennial Park; Randwick Rifle Range; Kogarah; George's River. Fl., Sept.-Dec.

16. *D. glaberrima* var. *pubescens*, var. nov. Variat foliis juvenilibus et ramulis pubescentibus.

Slender shrub up to 18 inches high, young leaves and branches minutely pubescent. Leaves slender, straight or uncinatè, 10-17 mm. long. Mt. Imlay, near Eden; J. L. Boorman, 12/1916. (Type): Milton, R. H. Cambage, No. 1406, 4/12/1905.

17. *D. prostrata*, sp. nov.

Fruticulus prostratus, ramis minute pubescentibus; foliis 5-7 mm. longis confertis patentibus lineari-clavatis glabris; floribus in corymbis parvis terminalibus pedunculatis depositis, calyxe 5 mm. longo turbinato 10-costato glabro, lobis superioribus bifidis obtusis; petalis deciduis, vexillo rubro et flavo reniforme, carina rubra obtusa 4 mm. longa, aliis 5 mm. longis.

A prostrate shrub with very short, minutely hoary-pubescent branches. Leaves 5-7 mm. long, crowded, spreading, linear-clavate, straight or curved, firm, obtuse or abruptly acute, furrowed, mostly glabrous or the tips sometimes minutely scabrous. Flowers in small, pedunculate, terminal corymbs, the peduncles and pedicels glabrous, very short; bracts and bracteoles glabrous, concave, 1 mm. long. Calyx 5 mm. long turbinatè, 10-ribbed, ciliolate, glabrous, the 2 upper lobes bifid, broad, obtuse or shortly acute, much longer than the 3 lower acute ones. Petals deciduous, standard yellow and red, broadly reniform, the lamina 4-5 x 8 mm.; claw linear, 3 mm. long; wings obovate-oblong, 5 mm. long, yellow; keel broad, obtuse, dark red, 4 mm. long. Ovary elongate, stipitate, hairy; style slender, hooked, glabrous; stigma small. New South Wales:—"Quite prostrate; 4 miles west of Braidwood". R. H. Cambage, Nov. 1908. (Type): "Prostrate plant, flowers yellow. Banks of Kybean River". R. H. Cambage, 3/11/08. Tuross River. Distinguished from the other species by its prostrate habit, firm, terete, linear-subclavate leaves, and in the rounded and obtuse upper lobes of the calyx. Fl., Nov.-Jan.

18. *D. tenuifolia* Sieber, ex. DC., Prod., ii., 109 (1825).

"Slender Dillwynia".

A virgate shrub, 2-3 feet high, with slender, minutely pubescent branches. Leaves 4-10 mm. long, usually erect or slightly spreading, glabrous, straight, rarely twisted, with very short recurved points, channelled above, rounded beneath and very slender. Flowers terminal, single or in pairs, shortly pedicellate on the short, lateral, leafy branchlets. Calyx glabrous, turbinatè, thin, 4-5 mm. long, ciliolate, faintly costate. Petals deciduous; standard yellow, reniform, emarginate, 5 x 8 mm., the claw linear, 4 mm.

long; wings yellow 6 mm. long; keel purple-brown, obtuse, 5 mm. long. Ovary stipitate, silky-pubescent; style hooked, glabrous, stigma small.

Illustrative specimens in the Herbarium, from Grose River, and banks of the Nepean River, near its confluence with the Grose. Robert Brown collected here about May, 1803, and January, 1805. A specimen collected by him is in the Herbarium without locality. Hawkesbury Agricultural College, Richmond; Oakville, via Windsor; St. Mary's. It is the most distinctive of all the New South Wales species and is readily separated from *D. ericifolia* by its dwarf spreading habit, filiform branches, very fine straight leaves which are clustered at the ends of the branchlets, and in the large terminal and mostly solitary flowers. It invariably grows on shale formations. Fls., Aug.-Jan.

Syn.:—*D. ramosissima* Benth., Ann. Wien. Mus., ii. 79; *D. ericifolia* Sm. var. *tenuifolia* Benth. Fl., Aust., ii., 148, 1864.

19. *D. spinescens* (F. Muell. ex. Maiden & Betche), Cheel, Proc. Linn. Soc. N.S.W., xlviii. 682 (1923). "Spiny Dillwynia".

A slender shrub, 2-5 feet high; branches glabrous, very slender, the branchlets ending in short spines. Leaves glabrous, 3-5 mm. long, less than 1 mm. broad, straight, narrow oblong almost blunt, smooth, flat or terete, channelled above. Flowers numerous, solitary, terminal or in the upper axils, shortly pedicellate on a very short bract-eate peduncle; bracts 2 mm. long. Calyx glabrous, dark coloured, ciliolate, turbinate, faintly, 5-10 ribbed, the 2 upper lobes united nearly to the apex, longer than the 3 acute lower ones. Standard reniform, yellow with a dark centre, 5-6 x 7-8 mm.; claw narrow, 4 mm. long; wings obovate-oblong, 5 mm. long; keel obtuse, dark red, 4½ mm. long, ciliolate. Ovary hirsute stipitate; style hooked, glabrous; stigma small. Pod hairy, stipitate, obliquely ovate. The colour of the flowers resembles the highly coloured form of *D. ericifolia*, while the buds are almost glaucous. Very common on sandstone throughout the Southern Highlands, and also in parts of the Port Jackson district. Fl., Sept.-Nov.

Syn.:—*D. floribunda* Sm. var. *spinescens*. F. Muell. ex. Maiden & Betche, Cen. Pl., N.S.W., 104 (1916).

(TO BE CONCLUDED.)

## NATURALISTS' SOCIETY OF NEW SOUTH WALES.

*Proceedings.*

NOVEMBER, 1938.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, November 1, 1938, at 8 p.m.

The President (Mr. M. S. Barnett), in the chair, with about 48 members and visitors present.

New Members.—Mr. C. M. Townsend and Mr. L. Hasemer were unanimously elected members of the Society.

Nomination of Members.—Mr. R. A. Bembrick, c/o Book Supplies, 55 York Street, Sydney. Nominated by Mrs. A. E. Watson, seconded by Miss L. Halloran. Mr. D. Bevins, c/o County Treasurer's Branch, Sydney County Council, Queen Victoria Building, George Street, Sydney. Nominated by Miss D. Dobbin, seconded by Mrs. A. E. Watson.

The President announced the decision of the Council to hold a Froggatt Memorial Lecture night.

Mr. A. E. Watson.—Described the excursion to Heathcote, held on October 29, and showed a list of plant groups observed. Mr. Watson also exhibited types of metal flower pots, and explained how they could be readily made by members.

Mr. W. F. Blakely.—Exhibited specimens of *Mirbelia* and *Strangea*.

Lecture.—Dr. C. Anderson, M.A., C.M.Z.S. (Director of the Australian Museum), delivered an extremely interesting and informative address, entitled, "Extinct Animals". After first explaining what fossils were, and their various modes of occurrence, he covered briefly, but comprehensively, in the time available—the zoological history of the earth in past ages. The lecture was well illustrated with lantern slides. Dr. Anderson was accorded a very hearty vote of thanks.

DECEMBER, 1938.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, December 6, 1938, at 8 p.m.

The President (Mr. M. S. Barnett), in the chair, with about 40 members and visitors present.

New Members.—Mr. R. A. Bembrick and Mr. D. Bevins, were unanimously elected members of the Society.

Nomination of Members.—Mr. R. G. Stone, The Boulevard, Warrimoo, Blue Mountains, N.S.W. Nominated by Miss M. Davidson, seconded by Miss W. Rosling. Mr. A. J. Guy, Department of Public Health, Hunter Street, Newcastle. Nominated by Mr. E. H. Zeck, seconded by Mr. W. F. Blakely.

Correspondence.—Letter from the Secretary of the Marine Section of the Royal Zoological Society (Miss Golding), inviting members to attend an outing to Shark Island, under the leadership of Mr. Tom Iredale, Miss Joyce Allen, Mr. Gilbert P. Whitley and Miss Valerie May. Parks and Playgrounds Movement, inviting members to attend a rally in the Domain on 14th inst., to protest against the proposed encroachments on the Domain.

Outing.—The outing to Cowan on Saturday, March 3, when about 32 members attended, was described by Mr. Barnett.

Members' Night.—Mr. John Powell: Exhibited specimens of pebbles from English beaches. These he described, together with their composition and commercial uses.

Mr. C. S. Ashley.—Specimens of fossils, gum moths and corals.

Mr. E. G. Gostelow.—A series of his own paintings of Fairy wrens and Emu wrens which he described.

Miss Jean Buckingham.—A collection of preserved plants which Mr. Blakely described.

Mr. A. E. Watson.—A plant grown from seed brought from Lord Howe Island.

Mr. H. Doherty.—Lantern slides showing glacial folding, and fossils from the Maitland district.

Miss W. Rosling.—Lantern slides illustrating various types of hardwoods and softwoods.

Mr. E. H. Zeck.—Lantern slides illustrating various types of moths and their larvae.

Mr. W. F. Blakely read a paper on "A Key to the New South Wales species of *Dillwynia*, in which he re-established three old species and two old varieties, and described as new two species and thirteen varieties for New South Wales, and one species and two varieties for Victoria, in addition a description of all the New South Wales species and varieties. He also exhibited herbarium specimens from the National Herbarium of all the New South Wales species and varieties of *Dillwynia*.



FEBRUARY, 1939.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, February 7, 1939, at 8 p.m.

In the absence of the President (Mr. M. S. Barnett), Mr. A. E. Watson, Vice-President, occupied the chair. About 40 members and visitors were present.

Announcements.—Mr. Watson apologised for the absence of the President and welcomed members back, this being the first meeting of the year. Mr. Watson asked members to stand as a mark of sympathy to Mr. and Mrs. Zeck in the loss of Mrs. Zeck's mother (Mrs. Arthur Collingridge), and the Hon. Secretary was instructed to forward a letter of sympathy from the Society. Mr. Ludowici drew members' attention to the recent death of Mr. Albert Morris, of Broken Hill, and spoke of the great work he had done in the problem of regeneration of herbage and trees in that district. Mr. Ludowici said the work was now being carried on by Mrs. Morris. The Hon. Secretary was instructed to forward a letter of sympathy from the Society.

Correspondence.—The Consul-General for China in Sydney forwarded a letter of acknowledgement and thanks from the Department of Education, China, for the Society's letter of sympathy with various scientific societies in Shanghai. Apologies for non-attendance were received from Mr. M. S. Barnett, David G. Stead, E. H. Zeck, Mrs. Ludowici, J. Powell, Mr. and Mrs. Houlston, Miss L. Kaylock, Miss Rosling, and J. W. Hawley.

New Members.—Mr. R. G. Stone and Mr. A. J. Guy were unanimously elected members of the Society.

Nomination of Members.—Miss E. Browne, 4 Rosebank Avenue, Epping. Nominated by Mr. Wills, seconded by Miss D. Dobbin. Mr. Henry Preston, Graythwaite, North Sydney. Nominated by Miss Jean Garling, seconded by Miss D. Dobbin.

Members' Night.—Mr. E. C. Bailey: Specimen of South African plant and specimens of coconut borers.

Mrs. G. Pring.—Seed-pod of *Poinciana*, a gourd from New Caledonia, pod of the sacred bean from Nubia and seeds of *Cascara*.

Mrs. M. Jenkins.—Brooch made from "Stinkwood," which grows in the Nyassa district South Africa.

Miss G. Ballantyne.—Specimen of *Angophora* from East

Hills, which was described by Mr. Ashley. Mr. Watson further described the *Angophora* group.

Mr. C. S. Ashley.—Specimen of a New Guinea lime bottle made from a calabash.

Mr. F. J. Ludowici.—A piece of root of *Eucalyptus rostrata* cut out of the decayed centre of a live tree forty feet from the ground. The piece was about 1½ inches in diameter.

Mr. G. White.—Specimens obtained by his daughter during her recent trip abroad. These included a beech nut, horse chestnut, edible chestnut, field daisies, Scotch heather, stone from the Pyramids, Irish turf, seed pod from West Indies, shells, lime stones and various leaves, etc.

Mr. A. E. Watson.—Smelted antimony, specimen of tin, gold-bearing ore and coal which had been turned into coke by volcanic action.

Mr. Stirling.—Spoke of a waratah patch at Patonga, the seed-pods of which were riddled by insects.

#### EXCURSION TO HEATHCOTE.

Under the leadership of Mr. A. E. Watson, an afternoon excursion to Heathcote was held on Saturday, October 29, 1938. The party consisted of 19 members.

The walk to the Woniora River was about a mile and a half. Here a depot was selected and members broke up into small parties and explored the nearby area. The country is rough, but most interesting, the track being well defined, but stony.

During the afternoon tea period the leader described about 20 of the types of plants gathered, and gave information on the peculiarities, classification and botanical names of the plants under review.

Of special interest was a specimen of *Pseudanthus pimelioides*, a member of the Natural Order *Euphorbiaceae*. This shrub has a very restricted area of growth, but is quite plentiful about the bed of the Woniora River, but does not grow below the fresh-water limit. It appears to be essential that the roots should find place in the crevices of the rocks where they have access to the running water, and as the seeds are probably water-carried this would account for its limited distribution. What appears to be the six white petals of the flower are really the sepals of the calyx. The male and female flowers are separate on the one plant. There are no petals.

The "mountain moss," *Lycopodium densum*, was noticed

in several places. This is an interesting plant, as it is a relic of the few remaining types of the coal period now to be found in this country.

As might be expected in this sandstone region, the Proteaceous plants seemed to predominate and of the 17 genera in New South Wales we came in contact with 11 genera, and 21 species.

During the afternoon we were able to list 88 species, comprising 60 genera or 21 families of plants, most of which were in the flowering or early seeding stages. This number does not include the trees of the locality.—A.E.W.

#### EXCURSION TO COWAN.

Under the leadership of Mr. W. F. Blakely, an excursion to Cowan was held on Saturday, December 3, 1938. About 32 members attended.

The locality explored was within a few hundred yards of Cowan Station on the descent to Cowan Creek, in the Ku-ring-gai Chase. Some of the earlier arrivals went right down to the water, but there was no time for the main party to do this.

Quite a lot of interesting material was available, considering the time of year. Nearly 50 plant specimens in all were examined, most of which were flowering. In a short lecture, Mr. Blakeley gave the names of these, and some interesting facts concerning many of them. The species represented 18 families and 34 genera, the *Proteaceae*, naturally, predominating.

The locality is quite an interesting one, swampy, sandy and rocky soil being represented, and the flora showing good variety. An all-day excursion there next year, earlier in the spring, would seem desirable.—M.S.B.

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#### PEARLS (MUSSEL).

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The Scotch interpretation of the Birth of British Pearls. In an old curious manuscript of Hector Boetius, by Bellen-den, of Edinburgh, dated 1541.

In the mussillis are generit perles.

These mussillis arie in the morning (when the lift is cleir and temperate) openis their mouthis a little above the watter and maist gredellie swellis the dew, and after the measure of the dew they sweltie, they conceive, and bredis the perles.

—J. W. HAWLEY.

**NATURALISTS' SOCIETY OF NEW SOUTH WALES.**

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#### NOTICE TO MEMBERS.

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Members are reminded of rule 4 of the Society which reads: "All subscriptions shall become due on the first day of August and shall be payable in advance."

# The Australian Naturalist

Vol. X.

NOVEMBER, 1939.

Part 6.

## A KEY TO THE NEW SOUTH WALES SPECIES OF *DILLWYNIA*.

By W. F. BLAKELY.

(Continued from p. 168, Part 5.)

20. *D. spinescens* var. *inermis*, var. nov. Variat ramis robustis haud spinoscentibus.

A divaricate shrub, 4-5 feet high with robust, non-spinous branchlets. Leaves crowded, erect, 4-5 mm. long, minutely scabrous. Pod slightly hirsute, ovate, 5 x 3 mm. Seeds 2, black, reniform, smooth, 2 mm. long; caruncle slender, small. "Growing in exceedingly dry places in Charly's Forest near Braidwood". J. L. Boorman, 9.1915. (Type). Fl., Sept.-Nov.

*Subsection Axillares.* Flowers axillary, solitary or in pairs, often crowded into leafy spike-like racemes.

21. *D. stipulifera*, sp. nov.

Fruticulus virgatus 30-37 cm. altus, glabrus, foliis distantibus erectis 10-15 mm. longis, levibus, supra canaliculatis, subtus carinatis, apicibus acutis; floribus solitariis axillaribus sed in capitulis dispositis, pedunculis brevibus hirsutis, pedicellis glabris 2 mm. longis, calyce glabro 5 mm., longo turbinato; petalis deciduis vexillo flavo et rubo reniforme, aliis flavis, carina obtusa 3 mm. longa; ovario stipitato sericeo-hirsuto.

A virgate undershrub 12-15 inches high, glabrous or the young branches slightly pubescent. Leaves distant, erect, straight, 10-15 mm. long, smooth and channelled above, keeled beneath which gives the leaf a trigonous appearance; apex acute, straight or oblique. Stipules subulate, persistent, 1 mm. long. Flowers single in the axiles forming dense, capitate, globular, terminal clusters, 1 to 1.5 cm., which sometimes become infraterminal before the flowers fall. Peduncles hairy, 1 mm. long, the bracts small, obtuse; pedicels glabrous nearly 2 mm. long. Calyx 5 mm. long, glabrous, turbinate; standard reniform, yellow and red, the lamina 4 x 8 mm., the claw 2 mm. long; wings

yellow, 3.5 mm. long; keel obtuse, dark red, 3 mm. long. Ovary shortly stipitate, silvery-hairy; style smooth, hooked; stigma small.

New South Wales:—Between Clarence and Wolgan, J. H. Maiden, 11.1906 (Type). The leaves and flowers are somewhat similar to those of *D. glaberrima*, and the stipules are longer, while the axillary inflorescence resembles that of *D. floribunda*, the peduncles and pedicels are shorter, and the bracts and bracteoles more obtuse than those of the latter species. Fl., Nov.

22. *D. floribunda* Sm., Koen & Sims, Ann. Bot., i., 510 (1805); Bot. Mag., t., 1545 (erroneously as *D. ericifolia*); Lodd. Bot. Cab., t., 305.  
"Spiked Dillwynia".

A slender shrub, 3-6 feet high; branches almost glabrous to villous. Leaves usually crowded, erect, 10-15 mm. long, obtuse or with minute points, scarcely terete or somewhat flat, straight or slightly curved, tuberculate-scabrous, the young ones hirsute. Flowers axillary, on very short pedicels, solitary or 2 or 3 together, often crowded into leafy racemes below or near the ends of the branches. Calyx turbinate, 5 mm. long, glabrous, ribbed, the lobes short, the 2 upper ones broad falcate, united to the middle. Petals deciduous; standard reniform, emarginate, 6-7 x 11-12 mm., yellow with a small reddish centre; claw narrow, 4 mm. long; wings yellow, 6 mm. long; keel blunt, dark or light red, 5 mm. long. Pod hirsute, ovate, acute, 5-6 x 3 mm. Seeds reniform, mottled, 2 x 1 mm.

Recorded for all the States, except Western Australia. It is a very polymorphic species and seems to break into a number of more or less well marked forms. It is very common in sandy soil from Victoria to Queensland, favouring moist places, rocky hills, gullies and creek sides. I have not seen specimens of the common Port Jackson form from the other States. Fl., Aug.-Nov.

Syn.:—*D. ericifolia*, Sims.

23. *D. floribunda* var. *brevifolia* DC., com. nov. Leaves glabrous, 5-10 mm. long, scarcely terete, straight or subflexuose, tuberculate, mucronate. Fairly common throughout the Port Jackson district.

Syn.:—*D. rudis* var. *brevifolia*, DC., Prod., ii., 109 (1824).

24. *D. floribunda* var. *teretifolia* DC., com. nov.

A rigid shrub, 3-9 feet high; branches slightly hairy. Leaves glabrous, tuberceted, terete, straight or curved, 10-

15 mm. long. Flowers large, yellow, with a small dark centre. Hill Top; Mt. Wilson; Wentworth Falls; Lawson; Springwood; Maroota; St. Ives; Lindfield. Byron Bay. Fl., Sept.-Oct.

Syn.:—*D. rudis*, var. *teretifolia* DC., Prod., ii., 109 (1824); *D. teretifolia*, Sieb., Pl. Exs., ex. Benth., Fl. Aust., ii., 149 (1864).

25. *D. floribunda* var. *longifolia*, var. nov. Variat foliis longis filiformibus teretibus et floribus majoribus.

Young tips and branches almost glabrous. Leaves erect, numerous, filiform, terete, slightly tuberculate, apex oblique or straight, 20-25 mm. long. Flowers large, yellow, on rather long peduncles. Calyx glabrous, turbinate, 6 mm. long. Standard yellow, reniform, the lamina 5-12 mm. long; claw thick, 4-5 mm. long; wings yellow, 6 mm. long; keel obtuse, ciliolate, 5 mm. long. Ovary sessile, hirsute; style long, compressed. Hill Top, E. Cheel, 1.1915 (Type). Fl., Dec.-Jan.

26. *D. rudis*, Sieber, ex. DC., Prod., ii., 109 (1825).  
"Common Dillwynia".

A dwarf, very hispid shrub usually less than 3 feet high, with densely villous branches; leaves straight, rather thick, mucronate, scabrous from tubercles, hairy when very young, glabrous when old, 7-11 mm. long. Flowers axillary, on short pedicels, often forming leafy spikes, several inches long, darker in colour than those of *D. floribunda*. Calyx glabrous, usually rose-colour, 5-6 mm. long, the 2 upper lobes falcate, longer than the 3 acute lower ones, all minutely tomentose inside the margin. Standard reniform, the lamina 5-9 mm. long, dark orange to rich purple-brown; claw 4-5 mm. long, yellow or blotched with purple-brown. Wings obovate-oblong, orange and red, 5-6 mm. long; keel obtuse or obliquely obtuse, pale to reddish-brown. Bracts glabrous or ciliate, about 2 x 2 mm., very deciduous. It is often associated with var. *hispidula*, from which it is mainly distinguished by the glabrous calyx and smaller floral bracts. It is also less widely distributed, and is usually confined to rather firm shallow gravelly soil subjected to flooding. Loftus (common); Kogarah; Como; Richmond; Glenorie; Maroota, in very hard peaty soil in exposed heath land. It is also common from Hornsby to Hawkesbury River, and in Lindfield and Lady Davidson's Parks. Fl., Aug.-Oct.

27. *D. rudis* DC., var. *hispidula* DC., t.c.

A dwarf, hispid undershrub, 1-3 feet high, with rather

thick, rough branches. Leaves terete, tuberculate, scabrous, glabrous or hairy, 8-15 mm. long, dense, erect, thick and firm. Flowers in the upper axils, darker in colour than those of *D. floribunda*. Calyx rose-coloured, turbinate; costate, slightly hairy, ciliolate, 6 mm. long, the 2 upper lobes falcate, longer than the 3 acute lower ones, all tipped with a minute gland. Standard reniform, the lamina 4-8 mm. long, orange and dark red; claw 4 mm. long, thick, with a lanceolate spot extending into the centre of the lamina. Wings obovate-oblong, orange and red, 5 mm. long; keel obtuse pale to dark red, 5 mm. long. Jervis Bay; Como; Loftus; Kogarah; Kurrajong; Richmond; Clarence, Wiseman's Ferry district; Maroota; Canoe Grounds; Glenorie Port Macquarie. Also in Victoria; South Australia and Tasmania. Fl., Aug.-Oct.

Syn.:—*D. hispidula*, Sieb., Pl. Exs., ex. Benth., Fl. Aust., ii., 149 (1864).

This widespread variety is still under revision owing to the very complicated synonymy.

28. *D. sericea*, A. Cunn., Fields, N.S.W., 347 (1825).

"Silky Dillwynia".

A weak, slender shrub, 2-4 feet high; branches virgate, silky-hairy, particularly the young tips. Leaves 7-12 mm. long, terete, straight, glabrous or slightly hairy, tuberculate-scabrous, channelled, blunt or mucronate. Flowers axillary, solitary or in pairs, forming leafy racemes, and sometimes appearing as if terminal, but soon infraterminal owing to the rapid elongation of the flowering branches above the topmost flowers. Calyx turbinate, hirsute or almost glabrous, 5-6 mm. long, 8-10 ribbed, ciliolate, the 2 upper lobes almost united to the top, broad and acute, somewhat similar to the 3 lower ones. Standard yellow with a dark zone, reniform, 5 x 7 mm.; wings pale yellow, obovate-oblong, 5-6 mm. long, keel broad, obtuse, dark crimson, ciliolate, 5 mm. long. Ovary stipitate, silky-hairy; style long, hooked, flattened upwards, longer than in most species; stigma small, black. Pedicels hoary; bracteoles, subulate, smooth, ciliate.

Syn.:—*D. floribunda*, Sm., var. *sericea*, Benth.; *D. adenophora*, Endl.

A widely distributed species, usually found on slate and granite ridges in this State:—Bowral; Tallong; Trunkey; Abercrombie Caves; Yass; Albury; Temora; Cooma; Kybean; Wagga; Orange; Dripstone; Bathurst; George's Plains; Molong; Peak Hill; Bumbery; Denman; Guyra dis-

trict; Howell; Warialda. Also in South Australia, Victoria, Tasmania and Queensland. It is often severely grazed by stock; sheep and cattle appear to be very fond of it. Fl., Oct.-Dec.

29. *D. sericea* var. *glabriflora*, var. nov. Variat foliis fere glabris et. calyce glabro.

Leaves erect, smooth and almost glabrous, 5-7 mm. long. Flowers, dark purple-brown and orange; calyx glabrous. Pilliga Scrub, E. H. F. Swain, 9.1913 (Type); Wallangarra; Drake; Gilgandra; Coonabarabran; Weyba Creek, Queensland. Fl., Sept.-Nov.

*Section Xeropetalum.* Flowers terminal. Petals persistent. Calyx turbinate or somewhat campanulate.

30. *D. brunioides*, Meissner, in Lehm. Plant Preiss., i., 62 (1844).

"Brunia-like Dillwynia".

A compact shrub, 1-3 feet high; branches slightly hoary-pubescent. Leaves dense, 5-8 mm. long, spreading or recurved, thick, almost triangular, channelled, obtuse or very shortly pointed, glabrous, tubercular-scabrous or the upper ones slightly hirsute. Flowers darker than in the other species, 3-12 together in dense terminal heads or corymbs. Buds woolly-hairy, dark coloured. Bracteoles narrow, boat-shaped, very hirsute, 5 mm. long, deciduous. Calyx villous, 6-7 mm. long, broadly turbinate, the lobes all acute, nearly as long as the tube, the 2 upper ones united to the middle. Petals persistent; standard reniform, 5-6 x 10-11 mm.; claw 5 mm. long; wings 6-7 mm. long; keel rather acute, slightly curved at the top, 6 mm. long, ciliolate. Ovary hirsute, stipitate; style glabrous; stigma capitate. Pod stipitate, almost globular, hirsute, 3.5 mm. Seeds 2, somewhat cordate, black, pitted; caruncle small.

It seems to be confined to N.S.W., and prefers dry sandstone areas, particularly sunny rocky slopes. Wentworth Falls; King's Tableland; Leura; Katoomba; Medlow; Blackheath; Mt. Victoria; Box Point to Kangaroo River; Badgery's Crossing to Nowra; Currockbilly Mt. near Braidwood. It is a small and very beautiful species and should be very useful for rock-gardens. Fl., Sept.-Nov.

31. *D. cinerascens*, R.Br., ex Sims, Bot. Mag., t., 2247 (1821); Lodd., Bot. Cab., t., 527.

"Ashy-grey Dillwynia".

A small weakly-growing shrub, slightly hoary or nearly glabrous. Leaves spreading, filiform, 5-12 mm. long, straight,

or with recurved points. Flowers in small, terminal and axillary, almost sessile corymbs, or short racemes. Calyx bell-shaped, 3-4 mm. long; slightly pubescent, ciliolate; lobes short, the 2 upper ones united into a broad, slightly emarginate upper lip, longer than the lower ones. Petals persistent; standard orange and dark red, fan-shaped, 6 x 7 mm.; claw linear, 2-3 mm. long; wings oblong, reddish-orange, 5 mm. long; keel obliquely acute, 3 mm. long, dark red. Ovary hirsute, stipitate; style glabrous, hooked; stigma capitate. Common in Tasmania, Victoria and South Australia. Although recorded from the Hunter River by Bentham, it has not been found since, and must remain a doubtful species for this State. The so-called *D. cinerascens*, from Western Australia, with spinescent branches, is quite distinct from the Tasmanian plant. Fl., Oct.-Mar.

Syn.:—*D. acicularis*, Meissn. in Pl. Preiss., i., 62, not of Sieber.

32. *D. acicularis*, Sieber, ex. DC., Prod., ii., 109 (1824), not Meissner.

"Needle-leaved Dillwynia".

A robust shrub, 3-8 feet high or more; young branches and calyces hoary-pubescent. Leaves erect, straight, crowded, needle-shaped, channelled above, smooth and shining when dry; points oblique, 12-15 mm. long, 0.5 mm. broad. Flowers, in small terminal panicles, not much longer than the upper leaves, orange and dark purple-brown. Calyx bell-shaped, ciliolate, 5 mm. long; the 2 upper lobes united, keeled; the 3 lower shorter, acute. Petals persistent; standard 8 x 10 mm.; claw narrow, 2-3 mm. long; wings narrow, 6 mm. long; keel dark red, cuculate, 5 mm. long. Ovary silky-hairy; style glabrous; stigma small. Pod obliquely ovate, shortly stipitate, almost glabrous, with strong nerves to the valves, 6 x 4 mm. Seeds black, smooth, obliquely ovate, 3 x 2 mm.; caruncle thick, nearly 2 mm. long. Bargo River, J. H. Maiden and J. L. Boorman, Sep. and Dec., 1902; North of Wolgan, Shale Mine, R. H. Cambage; on sandstone and ironstone gravel  $\frac{1}{2}$  mile from Canoe Grounds Road, going west, W.F.B., and D. W. C. Shiress, Oct., 1927; August, 1929. It differs from *D. cinerascens* in size and habit, leaves, strictly terminal racemes, and in the larger flowers.

33. *D. acicularis* var. *leptophylla*, var. nov. Variat foliis tenuibus 20-30 mm. longis, teretibus in apicibus longis obliquis mollibus terminatis.



Leaves very slender, up to 30 mm. long, terete terminating in long soft oblique points. Bargo Brush to Paddy's River. A. H. Winter, Sep., 1929 (Type).

34. *D. juniperina*, Sieb., in Heug. Enum. Plant. Nov. Holl. occ., 33 (1837); Lodd., Bot. Cab., t., 401.  
"Prickly-leaved Dillwynia".

A rigid prickly shrub, 3-6 feet high; branches divaricate, pubescent. Leaves 5-12 mm. long, spreading, straight, channelled, keeled and rigid, with long pungent points. Flowers nearly sessile, several together in terminal clusters, or rarely axillary. Calyx pubescent, ciliolate, about 4 mm. long, bell-shaped; lobes short, the 2 upper united into a broad upper lip, either entire or emarginate, the 3 lower, short and acute. Petals persistent; standard orange-red, 5-6 x 6-7 mm. claw very narrow, 3 mm. long; wings narrow, 4-5 mm. long; keel obtuse, dark red, 3 mm. long. Ovary almost sessile, hirsute. A widely distributed species, very common from Nowra to the Queensland border, Northern Tableland, and north-west to Warialda and Warrumbungle Ranges. Also in Victoria. It is readily distinguished from all the other species by its very pungent leaves and rigid branches. Fl., Jun.-Nov.

Syn.:—*D. cinerascens*, DC., Prod., ii., 109, not of R.Br.

35. *D. uncinata* (Turcz). J. M. Black in Fl., S.A., 303 (1924).  
"Hooked-leaved Dillwynia".

A small diffuse shrub with hoary-pubescent branches. Leaves obtuse, terete, often recurved, 3-7 mm. long. Flowers in short corymbose racemes or clusters on very short articulate pedicels or peduncles, terminal or rarely in the upper axils. Calyx obtuse at the base, silky-pubescent, 5 mm. long, the united upper lobes slightly emarginate; standard with a very short claw, wings rather shorter and the obtuse keel scarcely more than half as long as the standard. Recorded for the southern districts of N.S.W. by Moore and Betche, but it is not represented in the Herbarium. I have not seen a specimen of this species. Fl., Aug.-Oct., according to J. M. Black.

Syn.:—*Eutaxia uncinata*, Turcz; *D. patula*, F. Muell.; *D. sparsifolia*, F. Muell.

DOUBTFUL SPECIES.—*D. elegans*, Endl., Nov. Stirp., Dec.

13. *D. elavata*, Paxt. Mag., vii., 117. I have not seen the types or specimens of these and prefer to leave them as doubtful species.

## HISTORY OF BALL'S HEAD RESERVE.

(For the following brief account of activities in connection with the reservation of this prominent feature of the Sydney Harbour landscape, we are indebted to Mr. H. E. Birch, Assistant Engineer of the Municipality of North Sydney.)

In 1926, the Government, under the leadership of Mr. Lang, dedicated 14½ acres at Ball's Head as a public reserve. At that time the headland was barren and unsightly, the trees having been destroyed over a period of years by bush-fires and firewood-getters, and the land was overrun with noxious weeds, most of the indigenous flora having been removed, while what remained was of stunted growth.

In 1931, a Ball's Head Beautification Committee was formed by the Australian Forest League, the Naturalists' Society of New South Wales, the Waverton Progress Association, and the North Sydney Municipal Council. Working bees spent several week-ends identifying the native flora; spaces were cleared to protect the young trees, and the North Sydney Council provided labour to continue the work during week days. W. W. Froggatt was very enthusiastic, and it was largely due to his knowledge and initiative that the work progressed so satisfactorily.

The inaugural tree-planting took place on July 25, 1931, and since then about 1,600 trees have been planted.

In May, 1935, an additional area of 8¾ acres was dedicated by the Government, then, under the leadership of Mr. Stevens, thus increasing the area of the reserve to 23¼ acres.

Once a year, during the past eight years, numbers of enthusiasts from the North Sydney Municipal Council, the Naturalists' Society of N.S.W., the Australian Forest League, the Waverton Progress Association, and other interested organisations, have ceremoniously planted trees on the reserve, so that in the years to come this reserve will contain the greatest collection of native trees in the County of Cumberland.

On Saturday, July 16, 1938, over 100 trees were planted on the reserve, and, in the presence of a large gathering, the Mayor of North Sydney (Ald. J. S. Stanton), unveiled a memorial to the late Mr. W. W. Froggatt, to whose enthusiastic support, North Sydney is indebted for assistance

in connection with the yearly tree-plantings. The memorial is in the form of a central lookout, near the roadway, on the north-eastern side of the reserve. Alderman Hunter said that the North Sydney Council and people would always be under a deep debt of gratitude to the late Mr. Froggatt, and the Naturalists' Society, for the interest shown in the reformation and beautification of Ball's Head. Alderman Hodgson, in supporting the remarks of the previous speakers, said he hoped the tree-planting ceremony would be an annual event for many years to come.

Mr. A. E. Watson, representing the Naturalists' Society, in the absence of Mr. D. G. Stead (President), expressed appreciation of the co-operation of North Sydney Council. He said that the Council was indeed blessed in having such a fine peninsula and a lovely place for a park; there was no other such place in the metropolitan area—its position, with rising escarpment and native rocks, placed there in beautiful harmony, was one of nature's great designs.

Trees were also planted by members of the Society in memory of the late Mr. Luke Gallard and the late Mr. A. E. Tebbutt, former members.

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Our annual Tree Planting at Ball's Head took place on Saturday, July 29, 1939, in conjunction with the North Sydney Council. The Society presented about 60 trees to the Reserve. Members and visitors met at the Froggatt Memorial Lookout, where short speeches were made by the Mayor of North Sydney, and two aldermen of the Parks' Committee, our President (Mr. M. S. Barnett), and Mr. Watson responded. We were honoured by having a distinguished visitor on this occasion, when Her Excellency, Lady Gowrie, wife of His Excellency, the Governor-General, attended and planted two trees. Lady Gowrie commented on the work done and the beauty of this outstanding reserve.

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## THE BALANCE OF NATURE.

By H. T. NICHOLAS.

The following has been taken from notes made during my investigations in New South Wales, and shows one of the many interesting plant and insect associations which occur around us.

*Bassia Birchii*, or "Galvanised Burr", is an indigenous plant belonging to the family *Chenopodiaceae*, which, during recent years, has assumed pest proportions, and, owing to advanced methods of transportation, a more rapid spread of its seed has taken place.

During January, 1937, I had occasion to examine a dense area of this burr in a western portion of New South Wales, and I found that the butts of the plants were completely riddled with weevil larvae, which were later determined as *Elaeagna*, sp. These larvae together with a few moth larvae caused the burr plants to die, break up, and be blown away. In the following spring, after good rains, a heavy crop of small burr plants appeared, and the odd remaining butts and stray older plants in this locality were then examined for the presence of the weevil larvae, in the hope that the weevils would again attack the burr plants. I found, however, that the last of the weevil larvae infesting the plants had been attacked and destroyed by "Robber fly" larvae (*Asilidae*). These fly larvae are particularly active and travel along the channels made by the weevil larvae in the roots. Unlike many fly larvae, they can survive long periods without food, and I have at present (14.2.1939) one larva still alive after seventeen months.

From the above observations, the following appears evident:—

- (a) The weevil has a place in causing the galvanised burr to break off at the crown, blow away; and assists in scattering the seeds over the country side.
- (b) The flies prevent the weevils from exterminating the burr.
- (c) Man with his rapid stock, car, and general movements has upset this balance, thus causing a too rapid seed dissemination and is faced with another weed problem.

The "Galvanised Burr" weevil is also found infesting "Saltbush" *Atriplex*, sp., *Rhagodia* and *Salsola Kali* in New

South Wales, and in these plants is also attacked by the fly larvae.

"Galvanised Burr", *Bassia Birchii*, should not be confused with the more common "Roley Poley", *B. quinque-cuspis*, which regularly breaks off at the ground level and goes rolling over the plains to pile high up a fence or in a patch of scrub. Although I have seen some of this "roley poley" break off without insect attack, a large proportion breaks away where moth larvae have hollowed out the root and crown portions. The larvae responsible are caterpillars of a Cossid moth of the genus *Xyleutes*. These moths are particularly interesting in that the females possess only abbreviated wings, while the males have perfect wings. The caterpillars are capable of travelling from one plant root to another plant root, and can survive for very long periods without food. Pupation takes place within a well eaten-out root, and there is often a long prepupal period. Moths emerged recently from larvae, collected seventeen months ago, at that time the larvae were almost full-grown, thus for a period of well over twelve months the larvae remained dormant in a web-sealed cavity in the root butt.

[For several years Mr. Nicholas has been concerned with the development of insects infesting plants of the family *Chenopodiaceae* (more particularly those of the genus *Bassia*), with a view to ascertaining those species which may have some effect in controlling the spread of these weeds.—Ed.]

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#### AN EXTRACT.

The following is the introduction to "Wildlife of the Atlantic Coast Salt Marshes", by W. L. McAtee, of the Bureau of Biological Survey, U.S. Department of Agriculture. (Circular No. 520, March, 1939, pp. 28.)

"Many salt marshes of the Atlantic coast are now undergoing intensified ditching in furtherance of mosquito control. Possible effects of these operations on wild life are a matter of great concern to naturalists, who urge that so far as possible the work be carried on in harmony with the highest conservation ideals.

Conservation means different things to different people. Some think of protecting only things that can be used, and here again there is more than one school of thought—or, at least, of action: One protects only to the date of use and takes what it wishes without planning for replacement—this has been compared to mining; the other strives

for replacement, so that there can be sustained use—this has been compared to crop production. There is also protection for beneficial economic tendencies, without direct use—this principle underlying the protection of insectivorous birds. Finally, there is conservation for its own sake, the goal of the nature lover.

Whatever his particular interest in wild life may be, the nature lover is one who, consciously or not, is impressed with the fellowship of all living things, a fellowship that is very real. He sees that in structure, in habits, and in impulses, his wild neighbours often seem much like himself. Either they are very human or he is very much like them; they are indeed blood relatives.

It should never be forgotten that they share with man also the joy of living. No man can possibly get as much pleasure from water as does a porpoise or an otter. However perfect his equipment, man can never be attuned to flying like the terns, the swallows, and other birds whose pliant grace, in calm or storm, is marvellous. No man can be at home in a tree like a woodpecker, which, born, cradled, and housed in trees its whole life long, must feel each evening when it comes for rest to its snug retreat that this tree, this nest, is the best and safest place in all the world.

That wild life enjoys living in general as much as man, and probably in many ways even more, is a thought that should never be entirely out of mind. Man assumes dominion over wild life and exercises it as he can, but in so doing he should as far as possible in the case of every creature, respect its right to existence, to its chosen home, and to undisturbed enjoyment of its way of life. As has been so often, but not too often, said, in following out ideas for readjusting wild life and its environment, man should do only what is necessary and no more."—[Ed.]

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In the Proceedings of the Linnean Society, N.S.W., Vol. 64, p. 408 (1939), McKeown records that the name of the well-known genus of Australian weevils, *Leptops* (to which the common fruit tree root weevil, *L. squalidus*, formerly known as *hopei* belongs), is preoccupied by a sub-genus of Catfish, and that *Leptops* must now be known as *Baryopadus*, Pascoe, 1870. In Junk's Catalogus Coleopterorum (1931), more than 100 species are listed for the genus *Leptops*.—[Ed.]

CUNJEVOI (*CYNTHIA PRAEPUTIALIS*):

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The word cunjevoi has been added to our vocabulary from the aborigines of this country, and is the name applied to an animal that was used by them as an article of food. It is used by fishermen as a bait.

The cunjevoi is a resident of the ocean reefs and belongs to the family *Cynthiidae*. It has a tough, leathery, membranous outer coat or cover.

The eggs develop into minute tadpole-like animals which swim about, water entering by the mouth and passing through the gill slits. A nerve tube extends along the back and tail. It is enlarged at one end to form the brain within which are two organs, an eye and the organ of hearing. Underneath is a rod or axis, the notochord which constitutes the backbone.

After swimming about for a few hours the embryo settles down, head foremost and anchors by papillary suckers to a rock; the tail-end, the eye and hearing organ become absorbed and undergo atrophy, the nerve ganglion alone representing the nervous system. The mouth is pushed round opposite to its former position, and thus the embryo becomes the adult cunjevoi. This remarkable degeneration results from the adoption of a sedentary mode of life.

The tadpole-like forms, which resemble young frogs in general appearance, are now regarded as degenerate forms of the ancestral stock, the Vertebrata, by the fact that the young possess a skeletal rod or rudimentary backbone, separating the dorsally situated nerve tube or cerebrospinal axis, from the ventrally situated intestinal tube, and having a cerebral eye.—J. W. HAWLEY.

[Cunjevoi is also the popular name of the green arum or spoon lily, *Colocasia*, of the family *Araceae*, which grows in moist situations in eastern and tropical Australia and is commonly cultivated in suburban gardens. The aborigines, it is stated, use the young bulbs for food after long and careful preparation. The juice of the leaves is used as an antidote to the sting of the giant nettle-tree, *Laportea gigas*.—Ed.]

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## A BOTANICAL EXCURSION TO CLARENCE.

By JEAN BUCKINGHAM (Junior Member).

The following notes were made on an excursion to Clarence, Blue Mountains, N.S.W., on December 30, 1938. Clarence is 88 miles from Sydney and has an elevation varying from 3,600 to 3,658 feet above sea level, and the formation is "Blue Mountain" sandstone. The country around is very undulating and in places much broken, but, nevertheless, there are some fairly extensive plateaux, well covered with forest trees and a great variety of shrubs, grasses and sedges, which make it a very interesting spot for the botanist and entomologist.

Mr. Blakely, Daddy and I caught the 7.30 a.m. train from Central to Clarence, and on our arrival we were met by Mr. Richards, who drove us to his mother's comfortable residence. On our way we passed two magnificent trees of *Eucalyptus radiata* and scores of *E. dives*, several fine specimens of *E. maculosa*, *E. viminalis* and *E. vitrea*. Close to the house we disturbed a rabbit which skipped nimbly under a clump of blackberries.

We lost no time in "going bush" and soon we were examining the dates and hieroglyphics in the old railway cutting at the entrance to the once famous Clarence Tunnel, which is 539 yards long and nearly half moon-shaped.

On emerging from the tunnel we discovered the lovely tea-tree, *Leptospermum sphaerocarpum* with its large white and pink petals, also the more common species *L. flavescens*. We next encountered *Dillwynia sericea*, but past the flowering stage; gorgeous masses of *Calycotrix glabra*, the dainty *Eriostemon obovalis*, the pretty *Pultenaea phyllioides*, *Epacris reclinata*, *Grevillea laurifolia*, *Lomatia longifolia* and several of its varieties, and the polymorphic *L. silaifolia*, *Conospermum ericifolium*, and large masses of *C. taxifolium*, with flowers much whiter than those on the coast. In the moist cuttings *Gleichenia dicarpa* formed beautiful light green clumps, and *Ponceletia ponceletioides* hanging from the rock chinks.

We had afternoon tea at a refreshing spring of icy-cold water, then decided to make our way back along the western escarpment which is thickly clothed in places with the dainty little she-oak *Casuarina nana*, and here we dis-



covered the very interesting *Eucalyptus pauciflora* var. *nana*, with whipstick stems and reddish twigs laden with buds and fruits, and *E. stricta*, with narrow leaves and quaint urn-shaped fruits.

But the joy of the evening was the beautiful *Gompholobium uncinatum*, and as the setting sun lit up its rich brick-red butterfly-like flowers I thought it the loveliest thing I had ever seen. This plant is only 3 to 6 inches high and is worthy of a place in any rock-garden. *Phyllota squarrosa* was everywhere, and the only species noted. It occurs in two forms, one with all yellow flowers and the other with the standard and wings yellow and the keel a rich purple-brown, and according to Mr. Blakely it is identical with the type form in the Melbourne Herbarium. We next found a very slender variety of *Conospermum taxifolium*, with flowers in long racemes, and on the top of the tunnel we located *Astrotricha floccosa* var. *subpeltata*, which has blush-pink young leaves, while nearby was the more graceful *A. ledifolia*, with a light inflorescence 2 to 3 feet long, and *Boronia microphylla*.

Black and white magpies near the house sang their last evening songs from the shelter of the tall gums and pines, and we too decided it was time to rest for the night.

The next morning we were up at 5 o'clock and were on the old Clarence Wolgan Road by 6 o'clock. It was a lovely crisp morning, and the mountain dew tinted the ruddy foliage of the young gum tips with silver. The mist in the valleys was like a vast silvery sea, while around the distant crags and peaks it flickered upwards like little whiffs of smoke, eventually forming into beautiful fleecy clouds on a still high strata. The Currawongs greeted us with their rollicking notes, and we saw a small flock of beautiful King Parrots feeding upon the flowers and fruits of the Mountain Ash and Peppermint.

Daddy discovered a prostrate *Isopogon anemonifolius*. It spreads its stems and short lateral branches flat on the ground, each stem being tipped with rather large flowers. Here we gathered a new *Tetralthea* which has minutely velvety stems and leaves, and fairly large pink flowers. By this time it commenced to get warmer, and the butterflies were on the wing. We succeeded in capturing several beautiful sword-grass and mountain browns, and also some quaint elephant beetles.

Arriving at the "clay pits" we searched for fossils, but were unsuccessful. Later, Mr. Richards kindly gave me

three, which he obtained from the pipe-clay beds at a depth of about 9 feet. One is not unlike a fern, *Dryopteris parasitica*, in structure; another resembles *Blechnum capense*, and the third is reed-like, with very strong longitudinal veins. Mr. Barnett, later, said they were at least about 150 million years old. *Eucalyptus pauciflora* var. *nana* was abundant at this spot, as also was *E. multicalus*.

Crossing the stony knob we again encountered the pretty *Gompholobium uncinatum*, and in a shallow moist valley, the pretty ground orchid, *Diuris sulphurea*, and *Thysanotus tuberosus* with very large flowers. On the old track from Clarence to Lithgow, opposite the Zig-Zag, *Dillwynia spinescens* grew in profusion, this being the most westerly locality yet recorded for it. On the right of the track, going west, the steep escarpment was covered with *Actinotus Helianthi*, and *Dampiera stricta*, nearby, seemed bluer than ever. *Dillwynia ericifolia* grew along a terracotta seam jutting from a sandstone ledge; and the stately *Acacia penninervis* looked lovely on the side of the wild gorge; some trees were fully 30 to 40 feet high, and were laden with flowers.

Returning via the Transmitting Line, we crossed the head of a long swamp, in which were innumerable brown sword-grass butterflies, and along the track to the Lithgow Water Works we found a new species of *Veronica* with heart-shaped leaves and sky-blue flowers.

Another swamp was thickly margined with *Goodenia dimorpha* and *Xyris gracilis*, together with fairly large patches of *Drosera binata* and the pretty *Utricularia dichotoma*, and the var. *uniflora*. Various gums and *Casuarina nana* were plentiful; the latter I discovered makes a comfortable bed to rest awhile; it is also the favourite plant of several kinds of beetles.

In a kink in the hills we saw some fine trees of *Eucalyptus Blaxlandi* and *E. oreades*, and in the distance across a big swamp some quaint sandstone formations resembling ancient castles were very interesting. In a gorge nearby we heard the clarion call of some unknown bird. Along the track there were numerous wombat burrows, and in the swamp colonies of shiny black ants built their nests on the tea-tree and reeds above the water.

Just as we came in sight of the Lithgow Water Works we found the pretty little *Actinotus Forsythii* among some dry sloping rocks. It is smaller than *A. Helianthi*, but just as exquisite with its pink centre.

Here we discovered a low, widespreading tea-tree with small leaves, small round petals, pink sepals and small funnel-shaped fruits, which Mr. Blakely said was new to science. It was associated with *Leptospermum parvifolium*, *Acacia Hamiltoniana*, *Trachymene Billardieri* var. *lanceolata*, and some distance away we saw for the first time *Leptospermum marginatum*. Making our way through the dense mass of tea-tree and *Banksia marginata* we arrived at a creek-side just below the overflow of the Upper Dam and were delighted to find a solitary plant of *Isopogon Dawsoni*; while *Acacia floribunda* lined the creek. We went some distance along the left bank of the Dam, and were rewarded by finding a new *Phebalium* with small round leaves, and small cream and pink flowers. At this spot we decided to go down stream along the well-kept path, which was lined with ferns, and in one place *Coprosma hirtella* was abundant, also *Leucopogon lanceolatus* in ripe fruit. The scenery there was wild and grand, but unfortunately visibility was bad and I could not take "snaps".

Wombat tracks were evident all along the path, and it seems that these animals must come down the steep hillside for water, as we noticed their "rubbing posts" in various places as we ascended. We had afternoon tea near one of their large "dug-outs", as it was a safe place to light a fire. Before departing we left some slices of apples, bananas, cake and bread and cheese for Mr. Wombat and family and wished them a happy new year. I saw a large brown snake glide into a hole in the ground near the upper track, and a large grey and a red wallaby bounded along a flat.

Approaching a swamp we found the beautiful *Gompholobium Huegelii*, and along the old Newnes railway line *Helichrysum lucidum* and *Daviesia latifolia* in great profusion, also *Eucalyptus goniocalyx* and some very fine specimens of *E. Blaxlandi* and *E. Sieberiana*. The Wombats have taken possession of the old line, and in many places it is undermined with their burrows.

About a mile from Newnes Junction we were pleased to find for the first time the charming Australian Blue Button, *Brunonia australis*, which commemorates Robert Brown, the greatest botanist that ever visited Australia. It was a thrilling joy to add it to our collection; as also the beautiful *Helichrysum leucopsidium* which was nearby. In a marsh we collected the lovely snow daisy, *Celmisia longifolia*, and near Newnes Junction *Baeckea densifolia*, with

large white flowers, *Eucalyptus rubida*, and *Dipodium punctatum*.

Arriving at the old Clarence railway line we decided to follow it home, and add to our collection some more butterflies from the cuttings, and in a short time we had all we wanted, for in one sweep of the net I caught four lovely sword-grass browns. We also collected some strange and interesting beetles from under logs and sleepers, which completed a delightful and interesting outing.

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### FAIRY WRENS AND EMU WRENS.

By E. GOSTELOW.

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Fourteen members of the family *Sylviidae* are known as fairy wrens, and many of the species are so widely separated, geographically, that few persons can truthfully say they have seen more than half the number in their particular habitat.

While the males of each species are attractively plumaged, the females are brown, with one exception, *Malurus amabilis*, which has a blue back. After the breeding season, the males, for the first three years, moult into the brown phase. They are rather pugnacious during the breeding season.

With one or two exceptions, the nests are dome-shaped, and the eggs, which usually number three or four, are white, but are differently freckled in the various species. The nest and eggs of *M. leuconotus* have, up to the present, not been described.

Only two species are met with close to Sydney, *M. cyaneus* and *M. lamberti*, the former being by far the commoner. *M. cyaneus* has been known to lay and to rear a brood after its nest has been robbed four times.

*Malurus leucopterus* has a rather romantic history. It was first discovered on Dirk Hartog Island by M. Quoy, a naval surgeon, and it was not again heard of for nearly a century, when it was re-discovered on the same island by a collector for the late H. L. White.

*M. melanocephalus*, the red-backed species, erects its crown and mantle when excited or uttering a song.

*Rosina coronata*, the purple-crowned species, has the strongest note, and is regarded by many as the most beautiful member of the family. It does not carry the tail so far over the back as the other species.

The largest species is *Malurus splendens*, which measures 5½ inches in length, the smallest *M. melanotus* being 4¾ inches. They are all very similar in habits.

There are only three members of the genus *Stipiturus* (emu wrens) in Australia. They, and members of a South American genus, are the only known birds with but six rectrices.

The tail feathers of these wrens have the same structure as those of the emu, and it is from this that these birds derive their popular name. They are very shy birds, and their note, a squeak, is only uttered when they are disturbed. Having poor powers of flight, they move through the undergrowth in a mouse-like manner.

The two larger species lay three or four eggs in a round nest, whilst the smallest, *Stipiturus ruficeps*, inhabiting spinifex country, lays two eggs in an oval nest. The species are similar in habits.

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#### A TUSSOCK MOTH, *ORGYIA ANARTOIDES*.

A large hairy caterpillar, which proved to be the larva of *Orgyia anartoides*, was collected at the excursion to Narrabeen, on April 29. This larva commenced to spin a cocoon almost immediately, and pupated, after discarding the larval hairs, which then protruded through the walls of the cocoon; an adult, wingless female, hatched 14 days later.

This moth belongs to the family *Lymantriidae*, many genera of which have wingless females.

The above species of *Orgyia* is well known as a garden pest, the caterpillars feeding on geraniums and other plants.—FRANK A. HASEMER.

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#### ICHNEUMON WASP PARASITES, *LISSOPIMPLA SEMIPUNCTATA*.

During 1927, at the Prickly-pear Field Station, Scone, two breeding cages, containing cocoons of *Cactoblastis cactorum* (the Prickly-pear moth), from which large numbers of parasites, *Lissopimpla semipunctata*, had emerged, resembled a hive of bees due to the noise of all the parasites buzzing about.

Some eighteen months ago we had a similar experience with cocoons from a sandy locality in this district. Why these parasites occasionally occur in numbers like this no one knows, but apparently there would seem to be some relationship with local conditions.—H. NICHOLAS.

## NATURALISTS' SOCIETY OF NEW SOUTH WALES.

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Proceedings.

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MARCH, 1939.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, March 7, 1939, at 8 p.m.

The President (Mr. M. S. Barnett), in the chair, with about 45 members and visitors present.

Fauna and Flora Sanctuary.—The Hon. Secretary read a letter from Miss M. F. Cromnelin, regarding the proposed fauna and flora reserve at Patonga. It was moved by Mr. E. C. Bailey and seconded by Mr. J. C. Wiburd, that a letter be sent to the Woy Woy Council, advising that this meeting was unanimous in its support of Miss Cromnelin's endeavour to have portion of the reserve at Patonga re-gazetted as a fauna and flora sanctuary.

New Members.—Miss E. Browne and Mr. H. Preston were unanimously elected members of the Society.

Nomination of Members.—Miss E. Boulter, 184 Frederick Street, Rockdale. Nominated by Miss E. M. Thompson, seconded by Miss D. Dobbin. Mr. A. J. Shearsby, Yass. Nominated by Miss E. M. Thompson, seconded by Miss D. Dobbin. Miss K. Sare, 9 Belgrave Street, Kogarah. Nominated by Mr. H. Doherty, seconded by Miss F. Nixon.

Lecture.—G. A. Waterhouse, D Sc., B.E., delivered an extremely interesting and informative lantern lecture on "Australian Butterflies". In the course of his address he stated that butterflies which had been collected by Sir Joseph Banks, at Botany Bay, in 1770, were still well preserved in the British Museum of Natural History. His experiments concerning the theory of natural hybrids of *Tisiphona abeona*, a species of "brown", which shows extreme variation, were also discussed. The lecturer was accorded a very hearty vote of thanks.

Exhibition of Specimens.—Mr. A. E. Watson: Specimens of Eucalypts from Mount Blaxland.

Mr. E. C. Bailey.—Specimens of *Passiflora* from Central Australia.

Mr. C. S. Ashley.—Specimens of Cowrie shells, fluor-spar and pyrites.

Mr. F. Hasemer.—Specimens of wasps of the family *Thynnidae*.

Mr. M. S. Barnett.—Specimens of fossils from the upper silurian beds in the Yass district.

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APRIL, 1939.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, April 4, 1939, at 8 p.m.

The President (Mr. M. S. Barnett), in the chair, with about 50 members and visitors present.

Correspondence.—The President read a letter from the New South Wales Federation of the Bush Walking Clubs, asking for support of their club, in an endeavour to prevent the Garrawarra Park Trust being dissolved, and the Park being merged with National Park. Mr. Bailey moved that a resolution be sent to the Secretary of the Garrawarra Park Trust, and this was seconded by Mr. Wiburd. Miss T. Y. Harris spoke in support, and said that she knew the area well. She also told of the good work done by the Bush Walkers' and the Garrawarra Trust.

The Secretary was instructed to forward the following resolution:—"This meeting is of the opinion that the transfer of the Garrawarra Primitive Reserve to the National Park Trust would not be in the best interests of the Reserve, and that the Naturalists' Society of New South Wales would much prefer that the Reserve continue to be administered as at present", and that a copy of this resolution be forwarded to the Secretary of the Garrawarra Park Trust. This was carried unanimously.

New Members.—Miss E. Boulter, Miss K. Sare, and Mr. A. J. Shearsby were unanimously elected members of the Society.

Nomination of Members.—Miss B. K. Bricknell, 14 Tamarama Street, Bondi. Nominated by Mrs. C. J. Rudder, seconded by Miss D. Dobbin. Mr. W. Boyd, 41 High Street, Marrickville. Nominated by Mr. J. C. Wiburd, seconded by Mr. M. S. Barnett. Miss K. B. Challis, 170 King Street, Sydney. Nominated by Miss D. Dobbin, seconded by Mr. M. S. Barnett.

Lecture.—Dr. R. J. Noble (Government Biologist, Department of Agriculture, N.S.W.), delivered an extremely instructive and interesting address, entitled, "Some Common Plant Diseases". Numerous fine lantern slides illustrated

the lecture, which indicated to members the many plant diseases farmers, orchardists and others have to fight against, continuously. A hearty vote of thanks to the lecturer was proposed by the Rev. Norman McKie and seconded by Miss W. Rosling.

Exhibition of Specimens.—Miss T. Y. Harris exhibited a collection of preserved plants collected recently during an excursion to Alice Springs.

Mr. C. S. Ashley.—Specimen of a fungus, *Polyporus*, sp., from *Conjola* (South Coast), which grows in close association with plant roots, also specimens of Tasmanian scallop shells and sponges from Dr. Clark Webster; specimens of *Olearia*, *Pittosporum*, and *Melaleuca hypericifolia*.

Mr. A. E. Watson described the excursion of the previous Saturday to Ball's Head, when an endeavour was made to begin a list of plants indigenous to that area. On this occasion 48 plants were named and listed.

The President moved that an Assistant Librarian be appointed, and a motion to this effect was to be submitted to the next meeting. Miss Dorothy Booth was suggested as the assistant.

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#### MAY, 1939.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, May 2, 1939, at 8 p.m.

The President (Mr. M. S. Barnett), in the chair. About 50 members and visitors were present.

Announcements.—The President spoke of the proposed appointment of an Hon. Assistant Librarian, brought before the April meeting. It was moved by Mr. J. C. Wiburd and seconded by Mr. C. S. Ashley, that Miss Dorothy Booth be appointed.

The President read a letter from the Minister for Lands (the Hon. C. A. Sinclair), regarding the proposed fusion of the Garrawarra Park with the National Park, and also told members that the Minister had agreed to receive a deputation on the subject, and that he (the President), had been appointed as the representative of the Society by the Council.

The President reminded members of the additional monthly meetings and discussions which would be held in the Library of the Department of Education. On May 17, Mr. E. H. Zeck would be in charge (entomology).



An additional excursion was also to be held on May 13 to Dobroyd Point.

The President also mentioned that invitations were sent to two of the leading girls' schools, inviting students to attend this month's lecture, but no reply had been received by the Society.

Excursion.—Mr. C. K. Ingram described the excursion to Pussy Cat Bay, held on April 10. There he had collected 92 plant specimens, representing 37 families and 81 genera.

The President stated that the excursion held on the previous Saturday to the University Science Students' Cottage, near Narrabeen, had been partly spoiled by rain. It had been decided to visit the Cottage again.

New Members.—Miss B. K. Bricknell, Mr. W. Boyd and Miss K. B. Challis were unanimously elected members of the Society.

Nomination of Members.—Mr. E. Gordon, Demonstration School, Haberfield. Nominated by Mr. C. K. Ingram, seconded by Miss D. Dobbin. Mrs. C. K. Ingram, Penleigh Hall, 155 Parramatta Road, Haberfield. Nominated by Mr. Ingram, seconded by Miss D. Dobbin. Mr. and Mrs. W. Tombleson, 22 Goodrich Avenue, Kingsford. Nominated by Dr. Clarke Webster, seconded by Miss D. Dobbin.

Exhibition of Specimens.—Dr. Clarke Webster: Seeds of two varieties of Kurrajongs.

Miss Hull.—Forwarded seeds of the waratah and the giant lily from Mangrove Mountain, also a letter regarding them.

Mr. J. C. Wiburd.—A larva of a butterfly sent by Miss N. Luckie. Mr. Zeck described the butterfly which had been identified as a common Australian "brown", *Euploea corinna*, with a range from Sydney to Cape York and the islands of Torres Strait.

Mr. C. S. Ashley.—Larvae of the grape vine moth, *Phalaenoides glycine*, found feeding on fuchsia plants, a grasshopper, *Cyrtacanthacris*, sp., and cocoons of stinging caterpillars, *Chelepteryx*, sp.

Mr. F. Hasemer.—Exhibited wasps of the families *Exeiridae*, *Psammocharidae*, *Thynnidae*, *Scoliidae* and *Braconidae*, and also a "Cuckoo Bee", *Crocisa*.

Mr. E. H. Zeck.—Specimens of living larvae of the Cypress pine Saw-fly, *Zenarge turneri*. The adults are rare in collections, and it is many years since these insects

have been recorded causing damage to cypress pines. The specimens were collected by Mr. H. George, Public School, Hopefield.

Miss M. Davidson.—Specimens of parasitic wasps and their cocoons. These wasps belonged to the family *Braconidae* and their larvae attacked various species of caterpillars.

Mr. M. S. Barnett.—Specimen of the light coloured Hawkesbury sandstone (Triassic) from La Perouse, showing dark, irregular markings throughout, which, while somewhat resembling definite organisms, were regarded as carbonaceous material.

Lecture.—Mr. M. S. R. Sharland delivered an extremely interesting and instructive lecture, entitled, "Sea Birds". The lecture was illustrated by numerous lantern slides, a great number of which were taken from photographs obtained by the lecturer himself. Mr. Sharland was accorded a very hearty vote of thanks.

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#### JUNE, 1939.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, June 6, 1939, at 8 p.m.

The President (Mr. M. S. Barnett), in the chair, with about 65 members and visitors present.

New Members.—Mr. E. Gordon, Mrs. C. K. Ingram, Mr. and Mrs. W. Tombleson were unanimously elected members of the Society.

Announcement.—The President read a letter from the Secretary of the Royal Zoological Society of Victoria, offering a £25 prize for an essay on Australian Fauna.

It was announced that the Society's Library would be open to members from 7 to 8 p.m. each meeting night.

Mr. A. E. Watson spoke about Mr. Blakely's "Key to the *Dillwynia*", and said that if members brought their copy of the Journal to the outing at Engadine, he would assist them to understand the key. Mr. Watson said the key would be of great value to students of botany.

Excursion.—Mr. J. R. Wills gave a short account of the outing to Dobroyd Point, Manly, held on May 13, 1939, and also described the plants growing on the area traversed.

Mr. Wills explained what took place at the conference regarding Muogomara Sanctuary on May 14, 1939. As a result of the motions passed, the Railway Department had

decided to alter the direction of the high tension line, for the new railway bridge over the Hawkesbury River.

Lecture.—Mr. E. C. Andrews, formerly Government Geologist, delivered the first Froggatt Memorial Lecture. Mr. Andrews spoke of the life and work of the late Mr. W. W. Froggatt, and his interest in this Society, since its inception. The lecture delivered was entitled "Japan and its People", and was illustrated with numerous coloured lantern slides, which showed the scenic beauty of the lakes, gardens and mountains of Japan, also its cities and its people. Mr. Andrews also discussed the habits and customs and religions of the Japanese. The lecturer was accorded a very hearty vote of thanks.

Exhibition of Specimens.—Master Peter Korsman: Specimen of the giant wood moth, *Zeuzera macleayi*; this was discussed by Mr. Zeck.

Mr. F. J. Ludowici.—Specimen of "Blackfellow's Bread" from the Oberon district.

#### JULY, 1939.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, July 4, 1939, at 8 p.m.

The President (Mr. M. S. Barnett), in the chair, with about 50 members and visitors present.

Correspondence.—Letter from the chairman, State Advisory Committee, re Exportation and Importation of Fauna, forwarding notice of motion to be placed before their next meeting to the effect that (the mover stated) the Committee as at present constituted could not give the best advice to the Chief Secretary, and suggested that the Linnean, Royal and Naturalists' Societies and the Rangers' League be excluded from representation, and that representatives of the Amateur Aviculturists and the Professional Bird and Animal Dealers be represented. The President advised that this notice had been discussed at the Council meeting, and the Council had suggested that the following resolution be sent to the State Advisory Committee re Exportation and Importation of Fauna:—

"With reference to a notice of motion to come before the State Advisory Committee re Exportation and Importation of Fauna, to the effect that certain bodies be excluded from representation on that Committee, the Council of the Naturalists' Society of New South Wales is of opinion that such steps would not be conducive to furnishing the

best practical advice to the Chief Secretary on questions for which that Committee was constituted, and it therefore considers that this Society (which has the welfare of native fauna in the forefront of its activities) should continue to be represented."

Mr. Bailey moved that the advice he sent, that the Society's representation be continued. Mr. Grey stressed instances of the undesirability of bringing fauna in indiscriminately. Mr. Wiburd seconded the motion.

Nomination of Members.—Miss L. Steinhoff, 17 Park Road, Arncliffe. Nominated by Mr. H. Doherty. Mr. Edwin Cheel, 40 Queen Street, Ashfield. Nominated by Mr. E. C. Bailey, seconded by Mr. C. S. Ashley.

Exhibition of Specimens.—Miss W. Rosling: Showed a series of coloured slides of native wild flowers.

Mr. R. G. Stone.—A series of slides dealing with the elementary cells of botanical, animal and mineral structures, and read a paper in which he discussed their differences.

Miss M. Davidson.—Specimens of a parasitic Braconid wasp, which had emerged from a caterpillar. The total number being 151.

Mr. E. C. Bailey.—Specimen of a *Bilbergia*.

Mr. J. R. Wills.—A series of slides showing types of plants, common to sand dunes, mangrove swamps and fresh water lakes.

Mr. M. E. Gray.—A series of slides showing rivers, waterfalls and wild flowers.

Mr. C. S. Ashley.—Specimen of shark's egg, and piece of serpentine rock showing asbestos through it.

Mr. F. A. Hasemer.—Two scorpions from National Park, a wingless female moth of the genus *Orgyia*, bred from a caterpillar collected at Narrabeen. Longicorn beetles, a "Bee fly", a new variety of "Web-spinner", *Metoligotoma reducta* var., collected beneath dead leaves at Leichhardt, also another "Web-spinner", *Notoligotoma nitens*, from beneath bark at Leichhardt.

Mr. A. E. Hamilton.—Specimen of a butterfly.

Mr. J. R. Wills.—Specimen of *Grevillea capitellata*.

Miss D. Dobbin.—Specimens of pressed wild flowers gathered at Woodford during June.

AUGUST, 1939.

The annual meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, August 1, 1939, at 8 p.m.

Mr. G. Ross Thomas, Director of Education, was in the chair. The President (Mr. M. S. Barnett), and about 70 members and visitors were present.

Apologies were received from Mrs. and Miss Froggatt, Miss McAnene, Mr. Powell and Miss Kaylock.

New Members.—Miss L. Steinhoff and Mr. Edwin Cheel were unanimously elected members of the Society.

Nomination of Members.—Mr. P. Herry, 18 Warringa Road, Cammaray. Nominated by Miss D. Dobbin, seconded by Mr. J. R. Wills. Mr. G. Ross Thomas, 11 Fleet Street, Carlton. Nominated by Mr. M. S. Barnett, seconded by Mr. E. Gostelow. Miss Nancy Desmond, 34 Waratah Street, Oatley. Nominated by Mr. F. A. Hasemer, seconded by Miss M. Davidson. Miss M. Mason, c/o Post Office, University of Sydney. Nominated by Mr. F. A. Hasemer, seconded by Miss M. Davidson. Mr. J. A. Drummond, Pittwater Road, Pymble. Nominated by Mr. M. S. Barnett, seconded by Miss M. Davidson.

Secretary's Report.—The report of the activities of the Society for the past year was read by the Hon. Secretary (Miss D. Dobbin).

Treasurer's Report.—Owing to the illness of the Hon. Treasurer (Mr. John Powell)—the Treasurer's report was read by Mrs. A. E. Watson. A vote of thanks was passed to Mr. Stanley F. Allen for auditing the balance sheet.

Presidential Address.—The President (Mr. M. S. Barnett) delivered his address, which was entitled "Sugar Cane and Some of its Insect Enemies".

Election of office-bearers for the year 1939-1940:—

President: Mr. A. E. Watson.

Vice-Presidents: Mr. M. S. Barnett, Mr. D. G. Stead, Mr. E. H. Zeck.

Hon. Treasurer: Mr. John Powell.

Hon. Assistant Treasurer: Miss L. Kaylock.

Hon. Secretary: Miss Dolce Dobbin.

Hon. Assistant Secretary: Miss Lillian Halloran.

Hon. Editor: Mr. E. H. Zeck.

Hon. Librarian: Mr. A. Booth.

Hon. Assistant Librarian: Miss Dorothy Booth.

Hon. Lanternist: Mr. G. White.

Hon. Assistant Lanternist: Mr. E. C. Bailey.

Other Members of Council: Mrs. A. E. Watson, Miss D. Ross, Miss W. Rosling, Messrs. C. S. Ashley, H. Doherty, A. E. Hamilton, J. W. Hawley, F. J. Ludowici, J. C. Wiburd, and J. R. Wills.

Publication Committee: The President, Hon. Editor and Hon. Secretary.

Exhibition of Specimens.—Mr. A. E. Hamilton: Exhibited a large collection of photographs of beautiful orchids.

Mr. A. Booth.—Exhibited various types of books and periodicals from the collection in the Society's library.

Mr. C. S. Ashley.—Specimens of Australian timbers, crocodile skull and teeth and cave calcite specimens; a horned toad from Mexico, and wood of *Lignum vitae* from British Guiana.

Mr. E. Gostelow.—Water colour paintings, illustrating types of West Australian flowers, comprising some 50 species and paintings of Australian butterflies.

Entomological Branch, Department of Agriculture.—Exhibited collections of carnivorous carab beetles, and tiger beetles; gall insects of the family *Coccidae*. and beetles of the family *Scarabaeidae*.

The Colonial Sugar Refining Co.'s Laboratories.—Exhibited specimens of insects which injure sugar cane and photographs of insects which attack sugar cane.

Miss Jean Buckingham.—A large variety of pressed wild flowers, including an undescribed new species of *Tetratheca* from Clarence, N.S.W.

Mrs. G. Pring.—Seed pod of *Pithecolobium* from Bellingen; seeds of Tulip-wood tree *Harpullia biloba*, match-box bean *Entada scandens*, and seed pod of devil's claw *Martynia*.

Mr. M. E. Gray.—Coloured photographs, illustrating Australian animals, flowers and scenes.

Miss G. Ballantyne.—Exhibited eleven named species of *Epacris*.

Mr. A. E. Watson.—Named collection of fresh wild flowers; pea from Somerset, England; piece of flint from chalk cliffs at Brighton, England, and natural graft of a parrot's leg bone.

Miss W. Rosling.—Collection of native wild flowers.

# The Australian Naturalist

Vol. X.

MAY, 1940.

Part 7.

## THE SUGAR CANE AND SOME OF ITS INSECT ENEMIES.

By M. S. BARNETT.

Abstract of Presidential Address delivered at the  
Annual Meeting of the Society on August 1, 1939.

In delivering the customary presidential address at this, the thirty-ninth annual meeting of the Society, I would first like to thank the office-bearers and members generally for their willing co-operation in carrying on the activities of the Society during the past year, and to add that this has made my duties far easier than would otherwise have been the case.

As it seems usual in our organization for the Hon. Secretary to furnish, in a separate report, some details of membership, meetings, excursions held, lectures, etc., I shall try to avoid repetition by merely stating that advances in several directions have been made during the past year. Our membership has increased, two field excursions are now held each month, and a series of mid-monthly sectional meetings have been commenced, these taking the form of instructional or conversational classes, for those who desire to improve their knowledge of nature subjects in a systematic way. At such discussion so far, only entomology has been considered, but it is hoped soon to add other subjects, such as botany and geology. (\*) The sessions are led by some member who has had experience in the subject set down, and should be of particular interest to those of our younger members who have the time and inclination

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(\*) Since the above was written botanical discussions have also been held.—[Ed.]

to attend; and it is hoped they will see the value of availing themselves of the opportunity thus offered.

I may also refer to a rather novel method that was used in an attempt to determine what means could be adopted to make the Society of more practical benefit to members and service in the community generally. This took the form of a questionnaire, and the replies to this were many and varied, though it was somewhat disappointing that quite a large number of members, who must have held some opinions, refrained from committing them to writing. However, many suggestions were of distinct constructive value, though others seemed quite impossible of achievement, especially in view of the limited financial resources of the Society. Definite action followed in certain directions—such as those mentioned previously—and it is hoped that further advances will be possible in the coming year.

I will now proceed to the technical part of this address, for which I have chosen the title:—

#### THE SUGAR CANE AND SOME OF ITS INSECT ENEMIES.

To some, the above subject may seem more suitable for treatment from the economic point of view rather than for presentation to a gathering of "naturalists"; and it may thus be thought less appropriate than those which usually form the basis of the retiring President's address. However, I think members will find that this is not altogether the case, and by way of apology, I would say the following:—The subject is one with which, in my former occupation, I became reasonably familiar, and it is, as far as I know, quite new to the Society; botanically, the sugar cane is a plant of much scientific interest, having for many years been studied in very close detail by numerous research workers in various parts of the world; entomologically, the large army of insects that infest the cane can scarcely fail to be of interest to nature students, if only from the point of view of their life histories; and, lastly, even in such an apparently "dry" subject as sugar, there can be traced, if looked for, a large amount of romance, in connection both with the artificial improvement of the plant and the control of its natural enemies. Numerous occasions like the present would, of course, be required for a proper discussion even of the fringe of such a large subject; so I intend, as far as possible, to give more prominence to the



latter two aspects mentioned above, to the omission of many other details.

#### SOME TECHNICAL SIDE-LIGHTS.

I wonder how many of us realize, when helping ourselves to a lump of sugar, what a tremendous amount of human effort, mental and physical, lies behind the presence of that small article of daily consumption on our table. Apart from the commercial and engineering work involved, there are, throughout the world, whole armies—one might say—of chemists, pathologists, entomologists, and other investigators, as well as field and factory workers, engaged in the production of the raw material and treating it scientifically before the finished product appears.

Hosts of books and journals are devoted to sugar and the sugar cane alone. Chemically, it may interest some who have not dabbled much in that branch of science, to know that the cane sugar (or sucrose) that we eat belongs to the large group of substances known as carbohydrates, consisting—broadly speaking—of carbon and water chemically combined. If, for instance, one were to take 8 lb. of pure carbon, and 11 lb. of pure water, and could, by invoking the aid of the right form of energy, induce their constituent atoms to arrange themselves according to the particular frame-work in which they exist in the molecule of sugar, one would have 19 lb. of pure cane sugar as the result. Synthetic sugar as a commercial article has, however, so far defied human efforts. But in nature the sun's rays provide the necessary energy, and sugar is built up from carbon dioxide and water in the tissues of many plants, although only a few of them—sugar cane, beet, sorghum, maple, etc.—possess it in sufficient quantity for profitable extraction.

This being an abstract, and not a verbatim report of the address, it should here be explained that the cane itself, its planting, cultivation and harvesting, and the processes of transforming its sugary content into the bagged product, were dealt with by means of a number of lantern slides; but for the present purpose, all this may be briefly condensed as follows:—

#### THE CANE AND ITS TREATMENT.

The sugar cane (*Saccharum officinarum*), belongs to the large botanical family known as the *Gramineae* or grasses, many of which are of the greatest service to man—

wheat, maize, rice, etc. In size, the members of the group range from very insignificant plants to the giant bamboos, sometimes exceeding 100 feet in height with stems up to 9 or 10 inches thick. The sugar cane, as grown for milling, varies in thickness from less than an inch to  $2\frac{1}{2}$  inches or more, with a height of 8, 10 or 12 feet or over, according to variety, soil, climate, etc. It has underground stems or rhizomes, a jointed stalk consisting of nodes and internodes, leaves arranged opposite and fan-wise, clasping leaf-sheath and blade, lateral buds and inflorescence or "tassel". Each leaf nourishes the internode to which it is attached, and when its function is done the internode is fully grown, and the leaf dies, sometimes falling away. The complete stalk exhibited to-night shows these features. The sugar content of the cane may vary from 10 to 20 per cent., and weight per acre, from perhaps 10 to 60 tons under ordinary rainfall, to a much higher figure under irrigation. It is grown in most tropical and sub-tropical countries throughout the world, the heaviest producers normally being India, Cuba and Java. Australia grows only about  $4\frac{1}{2}$  per cent. of the world's crop. The plant has a very old association with the human race, being referred to by ancient writers, long before the Christian era, and its use being of undoubted antiquity in China. Originating, as generally believed, in Eastern Asia or Polynesia (or both—as some think), there were two forms of separate origin. The sugar cane spread by man's agency, first to the Mediterranean areas, and thence to the Western Hemisphere and other parts of the world.

Under cultivation, the cane is propagated by cuttings, a foot or so long, in drills from 4 to 6 feet apart, and it takes from about 10 to 15 months to mature, according to conditions, or it may stand over to the second year in certain sub-tropical parts. The stools, containing anything from 6 to 20 stalks or more—according to variety, etc.—grow again after cutting, and one, two or more of such "ratoon" crops from the one planting are often harvested. The harvesting is done by hand with special large knives—the mechanical harvester not yet having come into its own—and is loaded by hand or labour-saving devices into rail trucks, or punts if water transport is available, and taken to the factory. There it is crushed between several sets of heavy rollers, and the juice is limed, heated, skimmed, clarified and concentrated under vacuum; after which the crystallized mass is dried in centrifugals and bagged. All this happens in the raw sugar factory, whence the "brown"

sugar is sent on to the refinery to undergo a somewhat similar process, including decolorization, and appears finally as the table product. Or the refining may be done in the same factory, if more convenient. (The slides illustrated many of these features.)

#### SUGAR CANE IMPROVEMENT.

Reverting to field conditions, the sugar cane had been propagated for so many centuries vegetatively, that it was generally believed, until about 50 years ago, that it had lost the power of germinating from seed. Two investigators, however, in the West Indies succeeded in raising some seedlings about 1889 (though there had been some reports of earlier successes); and thereafter the practice—which, in reality, presents little real difficulty—was soon initiated in all parts of the world where there was sufficient scientific interest to appreciate the advantage thus opened for obtaining improved strains.

The sugar cane flower is hermaphrodite, but in some varieties the "male" tendency is more marked, that is they shed pollen freely, but the stigmas show little receptivity. In others the reverse is the case, the "female" tendency being more pronounced. This enables many effective "crosses" to be produced, though the identity of the "male" parent of any seedling must always be somewhat doubtful, as the cane naturally is wind-fertilized. The only real way to secure "definite" crosses would be by emasculation of the flowers, but these are so minute and the process entails so much trouble, that it is not now attempted in practice. The general system is to raise very large numbers of seedlings, and select severely.

The cultivated sugar cane is heterozygous to a marked degree, and seedlings from seeds borne on the one "tassel", or flowering head, may show extraordinary variation, some perhaps resembling large tufts of grass, while others develop into plants of tall and robust habit. The process of selecting and testing then becomes very protracted and laborious, but many remarkably valuable results have been obtained; and it is here that I would like to introduce a small chapter in plant genetics that to me seems to bear a touch of romance.

In Java, many years ago, the sugar planters were greatly troubled by a very serious disease known as "Sereh", which produced such stunted growth in the cane as to threaten the very existence of their industry. In despair

the planters besought the aid of scientific men from Europe. Much success followed in due course, and from this initial step there ultimately arose the very efficient and world-famous system of technical control, both in field and factory, which has operated in that island ever since. The production of disease-resistant canes that would possess also high tonnage and sugar content, has since always been prominent in the activities of the Java scientists. They have studied the characters of all the most likely parents in the minutest detail, even to the extent of counting the chromosomes in the cells of different strains. The number of chromosomes in the nucleus is, of course, a specific character. It had been noticed that a very thin indigenous cane which the natives called "Glagah" (practically only a reed, devoid of sugar, but still a species of *Saccharum*) was highly resistant to certain diseases. This was found, microscopically, to have 56 chromosomes in the cell nucleus. The experimentalists crossed this plant with a leading commercial cane having 40 chromosomes. The result was a number of seedlings with 136 chromosomes (i.e., twice 40 plus 56—the duplication in the former case being quite in order, but not calling for explanation here). But for practical use, these were disappointing, and some discouragement was felt. Later, however, it was discovered that another "wild" cane, growing in a certain locality in the island and known there as "Kassoer", resembled some of the artificial seedlings and also possessed 136 chromosomes. This cane was obviously a great improvement on "Glagah", though still very far from being a commercial variety.

The theory was then advanced that "Kassoer" must be a natural hybrid from "Glagah", and this idea gave fresh impetus to the cane breeders. They used "Kassoer" as a parent, crossing the progeny with standard canes, and repeating the process with the succeeding generation, until within a few years a number of seedlings were evolved containing only one-eighth "wild blood". This amount was found sufficient to retain the disease-resisting character and vigorous growth habits of the primitive parent, coupled with the high sugar content of the commercial canes. In this manner have arisen some of the most valuable sugar cane varieties known to-day, many of which have since found their way to practically all the sugar-growing countries of the world. The stalk exhibited to-night is one of the seedling varieties so raised, and is descended from stock which—through the courtesy of the Java people—I was able

to bring back with me when visiting that centre in 1927. This cane is now prominent in many of the cane areas of Australia and Fiji.

Many other countries—Hawaii, West Indies, India, etc., and even Australia—have done excellent work in improving the sugar cane to suit their own particular conditions. In India, encouraged by the Java experience, the geneticists have gone even a step further than the crossing of species and varieties, and have latterly aimed at "inter-generic" hybrids, by attempting to cross *Saccharum* with plants of other genera—certain grasses, sorghum, bamboo, etc. Some of the sorghum-sugar cane hybrids have so far proved of interest and possible value under certain conditions. But it is the particular work of the Dutch scientists that stands out pre-eminently amongst the achievements so far in plant genetics; and it is of interest to speculate upon the fact that the original "sereh" disease was really a blessing in disguise to the Java planters. For, had it merely been "troublesome", and not a definite threat to the industry, it would no doubt have been "tolerated", as many other diseases are; and the close co-operation established between science and practice, culminating in such marked advantage to the industry as a whole, might well have been deferred for many years.

#### INSECT ENEMIES.

Turning now to the entomological side, the sugar cane, in common with most cultivated plants, is beset by numerous insects of various kinds; in fact, it seems to have much more than its fair share of such enemies, being the victim of almost every type—beetles, moths, leaf-eating and leaf-sucking insects, locusts, etc. Most of these do their work in the larval or grub stage, eating into stems, roots or leaves, and others attack the leaves and stems.

With the uncontrolled distribution of sugar cane by man in the past, the enemies and diseases transferred with the cuttings have gained access to many new regions, far from their own habitat. Here they have generally found the new environment most congenial, particularly in the absence of the parasites that controlled them in their own homes; and many, have in a few years wrought very serious damage, in some cases almost causing the extinction of the industry.

The transfer of material for propagation is, of course, much more rigidly controlled nowadays, being either pro-

hibited altogether, or permitted only under the very closest technical supervision.

As regards the extent of damage, the losses caused by "borers" of various kinds are probably the most serious. These "borers" are lepidopterous or coleopterous larvae, which damage the stalk, bud, or growing "top" of the cane. The Noctuids seem the most widely represented, comprising the notorious "moth-borer", *Diatraea saccharalis*, of the West Indies, Louisiana, etc. The well-known "army worm", *Cirphis unipuncta*, a cosmopolitan pest of many cultivated crops, is often present in cane fields, but fortunately, is in general controlled by natural means. Other borers of various types, not all Noctuids, are found in India, Java, etc., but the main species in Java and the East Indies is another, *Diatraea striatalis*.

Our Australian representative of Noctuid cane pests (apart from the "army worm") is an indigenous "moth-borer", *Phragmatiphila truncata*, reported all along the east coast from about the Illawarra to North Queensland; it has turned its attention to sugar cane, evidently finding it a suitable alternate host; but this borer again is very effectively checked by several wasp parasites.

Of pests, the destructive "weevil-borer", *Rhabdocnemis obscura*, of the Australasian region and Hawaii, is outstanding. Its control has been a problem of the first magnitude, and some facts regarding it will be given later. Root-eating grubs also play a big part, some being a nuisance in Java, the West Indies and Hawaii; but prominent amongst these must be placed the Queensland cane-grub or "grey-back", *Lepidoderma albohirtum*. Of the legion of other cane pests, many of which, fortunately, cause only secondary damage, one could mention "mealy bugs", aphids, locusts ("grasshoppers"), mole-crickets, wire-worms and numerous others, not excluding "white ants" in certain parts. However, time will permit of reference to only one more, viz., the notorious "leaf-hopper" of Hawaii, which some 35 years ago bid fair to wreck the industry there, but which was checked in time by brilliant entomological work, of which also more later.

#### SOME LIFE HISTORIES.

As to life histories, only one or two examples will be given. The "moth-borers", generally, have similar habits. The moth lays its eggs in clusters on the leaves, and the young caterpillars on hatching enter the cane through the

"top" or a bud, or other tender part. As the stalk grows, the "borer" (caterpillar) tunnels about in the soft tissue, occasionally emerging out of the stalk and entering at another place, and finally pupating inside. The beetle borer is somewhat different. The female, a typical brownish "weevil" about half an inch long, makes punctures in the soft rind under the leaf sheaths with its proboscis and places the eggs therein. The young grub tunnels throughout the stalk, growing and moulting, and finally spins a cocoon of cane fibre around itself, and enters the pupal form. This cocoon is a remarkably secure and well-constructed protection for such an apparently helpless creature to make for itself. Being legless, it never comes out of the stalk as does the moth-borer, but every here and there, in tunnelling, it comes near the surface and makes a tiny "pin-hole" in the rind. The reason for this does not seem to have been properly explained, but the apparently aimless habit is of great importance, as it means the undoing of the borer through laying it open to parasite attack, as will be explained later. A remarkable instinct further dictates that, before retiring to pupate, the grub shall make provision for its own exit later, when it assumes the beetle form. This it always does by chewing a much larger hole (an "emergence" hole), in the rind, and then spinning its cocoon in the stalk about half an inch above. The adults are nocturnal, and fly mostly at dusk. This beetle-borer can cause an enormous amount of damage, not only by consuming the actual substance of the stalks, but by weakening them and causing them to fall and deteriorate, thus greatly lowering the quality.

The "grey-back" beetle of the North Queensland cane fields is a Melolonthid of typical form, allied to the notorious European cockchafer; it is well over an inch in length, and freely coated with fine greyish hairs. When the summer rains begin to soften the ground about November or December, the beetles emerge from the soil in vast numbers. They swarm and feed on the neighbouring trees, and in about a fortnight the females commence to lay their eggs by burrowing a foot or so into the ground. Usually, near the base of a cane stool, they form with their bodies a small oval-shaped cavity in the soil, and place perhaps up to a couple of dozen eggs therein. These hatch in about 10 days, and the young grubs begin feeding on the cane roots, and pass through several stages in the next few months, being particularly harmful as they increase in size. About May, or earlier, the "yellowing" of

the crops begins to indicate the effects of the grub attack, which is often accentuated by dry weather. Individual crops frequently fall and suffer much deterioration before they can be harvested—if at all in some cases. The “grey-back” has many natural enemies—“digger wasps”, birds, etc., which exercise some restraint, but its proper control, has long been, and still is, a most formidable problem. Much hand-collecting and other means have been tried in the past, and soil fumigation with carbon bisulphide and paradichlorobenzene has latterly come into use; but a novel biological means, and one therefore of interest to the naturalist, has been the introduction by the Queensland Government of a giant American toad, further reference to which will also follow.

The sugar cane “leaf-hopper”, *Perkinsiella saccharicida*, is a small insect of the family Delphacidae, which, both in its adult and nymphal stages, sucks the leaves and tender parts of the plant, and can cause very serious injury by reason of its great numbers. Not only is the cane weakened by the removal of sap, but the punctures permit the entry of disease organisms; and the “honey-dew” which, in common with aphids and other related *Homoptera*, the insect excretes, encourages the plentiful growth of a sooty fungus which coats the leaves. The female oviposits in punctures in the mid-ribs or other tender parts of the plant, the laying of as many as 300 eggs being possible in its life of a month or so (according to Hawaiian experiences). The young hatch in a few weeks and at once get busy with their beaks, continuing the puncturing right through their several moultings to the adult stage.

#### SOME STORIES OF BIOLOGICAL CONTROL.

I will proceed with a few facts of probable interest, in connection with the biological control of the insect enemies of the cane.

The setting of one insect (or other enemy) to fight another that is harmful to progress, while we look on and do nothing, has long been fascinating to the human mind. It seems quite logical, if man has artificially disturbed the balance of nature by introducing some harmful insect to a new environment, for him to follow this up by also transferring one or more of its natural enemies to hold it in restraint. You will recall that some of the earliest attempts in this direction were the transfer of a predatory mite from America into France for the vine phyl-



loxera some sixty years ago, and later of a wasp from Europe to America for the cabbage-white butterfly. The first real stimulus, however, that the method received, was by the introduction of an Australian ladybird, *Rodalia (Vedalia) cardinalis*, into California some 50 years ago, for the control of "Cottony Cushion Scale", *Icerya purchasi*, of citrus trees. This turned out a pronounced success within quite a short period, and the good services of this little insect were soon availed of in many other countries, including New Zealand and Hawaii. This accomplishment has become a classic in biological control; and encouraged by the practical demonstration in their own territory, the Hawaiian sugar scientists set to work to find an enemy for the cane "leaf-hopper"; and this unfolds another rather romantic story.

The leaf-hopper had come to Hawaii from some unknown source, and in a few years had spread to such alarming dimensions as to threaten the existence of the industry. After unsuccessful search and inquiry throughout the sugar world for its country of origin, and consequently a possible enemy (in which search they had apparently not included Australia, in view, no doubt, of its inferior place as a sugar producer), a well-known entomologist in Hawaii had his attention directed to an article in a Queensland paper. I now give the story here as I received it verbally, many years ago, from the writer of that article. He was employed in cane field operations in a semi-scientific way, and, though by no means highly trained, was a keen observer. Some short notes by him on the "grey-back" beetle in a local paper were the ones which had been observed in Hawaii; and the entomologist referred to wrote him a letter on the "off-chance", asking a number of questions and sending him at the same time some preserved specimens of their "leaf-hopper". The leading questions were worded somewhat as follows:—Have you ever seen these particular insects in your cane fields? If so, how long is it since they were first observed? Can you say whether they have increased much in numbers in that time? Do you consider they cause any special damage to your cane crops, etc.? The recipient of the letter at once recognized the specimens as those of an insect he had observed for many years in the Queensland cane fields, but at no time occurring in any great numbers or showing any particular increase; and, moreover, not injuring the cane so much as to attract any special attention. He replied accordingly and, I understand, sent back specimens.

Anyhow, he told me the reply he received began: "Eureka! I am coming by the next boat!"

With the above facts before him, the entomologist was convinced that Australia was the much sought for home of the leaf-hopper, and that natural enemies of some kind must be controlling it in the field, or otherwise it would long ago have assumed plague proportions. He also rightly judged that such enemy or enemies should not be hard to find. He therefore lost no time in coming, and within a short while had tracked down a small Chalcid wasp, *Paranagrus optabilis*, which laid its eggs in those of the "hopper" and so destroyed them. This wasp was in due course transported to Hawaii, and was later assisted by another Chalcid, *Ootetrastichus beatus*, from Fiji, where the same leaf-hopper occurs. Though some additional parasites were also used later, these two, within a few years brought about a very rapid decline in the incidence of *Perkinsiella*, and the Hawaiian sugar industry was saved.

It is not always, however, that one, or even more than one, natural enemy can control a pest satisfactorily. They may themselves have their effectiveness reduced by some unforeseen disabilities in their new environment. This was actually the case with the two parasites mentioned, which, although very effective in a general way, were somewhat hampered in certain localities by conditions of rainfall. So the Hawaiian people were not satisfied, and another leading entomologist came to Queensland in 1920. Here I should state that in this generalization, it has not appeared necessary so far to mention names, but I feel I must mention that of Dr. F. A. G. Muir, one of the world's leading advocates and practical men in support of biological methods. Over a period of years, he had visited many remote corners of the earth in search of parasites, and the hardships met with undoubtedly curtailed his useful life. He very soon located, on the Herbert River, Queensland, a leaf-hopper enemy of quite a different type—a bug, *Cyrtorhinus mundulus*—a much larger and more robust insect this time, which sucked the eggs of the hopper. This enemy had been missed formerly, perhaps partly because it belonged to the family *Miridae*, whose representatives are almost exclusively plant feeders, the present one being quite an exception. The *Cyrtorhinus* was successfully transported, and completed the good work done by the Chalcids, so that the leaf-hopper is said to be a somewhat rare insect in the Hawaiian cane fields to-day.

I had the pleasure of some personal contact with Dr. Muir, and an interesting side-light was revealed later by correspondence. The small colony of *Cyrtorhinus* he took to Hawaii was subsequently assisted by other consignments from Fiji. They might all, of course, have been obtained much more easily from Fiji in the first place, but their presence there, and habits, were not then known. On returning to Hawaii, Dr. Muir remembered a "job-lot" of insects he had collected in the cane fields when visiting Fiji some ten years previously, and to which he had not since then been able to give the attention he desired. On looking through this collection, he was pleased to find a specimen of this *Cyrtorhinus*, thus definitely establishing its presence in Fiji. This fact should impress naturalists generally with the value of collecting specimens whenever opportunity occurs in their wanderings, especially in new localities. Some day any one of them may become of particular interest or value.

The story of the control of the beetle-borer is also well worth narrating briefly. This insect, as mentioned, has been responsible for very serious sugar losses in Queensland and Fiji (particularly), and in Hawaii. Dr. Muir was sent to the East Indies in search of a possible enemy. Southern China, Malaya, Java and some of the neighbouring islands gave no success, but Muir eventually found the borer and an apparently effective parasite in a small island (Amboina) in the Moluccas, west of New Guinea. This being a far cry for successful transport, Muir proceeded to New Guinea, and was rewarded by soon locating the same parasite near Port Moresby. Even from this centre, transport difficulties were great, with an insect of this particular type, a Tachinid fly, and two intermediate breeding stations had to be established, in North Queensland and Fiji. Here special cages were erected and new generations bred, until the last hop to Hawaii was possible. The fly soon established itself in its new home, and has since done excellent work in controlling the borer in most localities there.

The habits of this fly, known as *Ceromasia sphenophori*, are worthy of brief reference to. About the size of an ordinary house-fly, the viviparous female settles on the cane stalk and moves diligently about in search of the "pin-holes" already referred to. Finding one, it seems to know by some uncanny instinct, or sense of smell, whether a borer is inside, or if the tunnel has been vacated, and it deposits a larva only in the former case. This larva (or "maggot")

can be observed, with a lens, to make straight for the "pin-hole" and disappear quickly down it. Thence it finds its way along the tunnel and enters the borer grub, and several as a rule are found in the one grub. They feed on the substance of the grub, but instinct seems to dictate that they should avoid the vital parts, and so permit the grub to remain alive long enough to construct its own cocoon, which then becomes a protection for the parasites. The typical fly puparia are formed later in this cocoon, and the adult flies emerge in due course, finally escaping through the "emergence hole" originally intended for the beetle.

Persistent efforts were made later to establish this fly in North Queensland and Fiji, by breeding and distributing great numbers, at considerable expense. But in certain parts only have they "taken on" and been able to continue unaided, dying out in most centres (for reasons only imperfectly understood), in spite of many thousands being released. Two illustrations of how whimsical nature can be in such matters are afforded by the fact that some flies that escaped from Muir's cages in Queensland in 1910, supplemented by a few he released at the time (perhaps only several dozen in all), were able to hold their own and found a permanent colony there entirely without any human assistance in the way of replenishment of their numbers, or otherwise. Their survival remained quite unrecognized locally, and was only discovered when an entomologist visited the place on a different quest some eight years later. An almost parallel instance occurred in Fiji. Thus, it would appear that Nature sometimes does in her own quiet way what she seems loth to do at human bidding.

One other little item, perhaps of some interest in connection with this borer, may be added. A number of years ago it was the writer's duty to examine a small parcel of cuttings of some new cane varieties from New Guinea, for growing here in close quarantine. This had to be very critically done, for any signs of insects or disease; and all was "plain sailing" until near the end, when a tunnel was found containing a beetle-borer cocoon. This, on opening, contained, not a grub, or a pupa, or a beetle, as was to be expected, but a single empty fly puparium! It must surely be quite unusual to have such plain evidence thus gratuitously supplied of the existence of a welcome parasite, which had cost so much in human effort and expense to

locate in the first place; and the matter would have aroused very special interest and claimed immediate action, had it occurred prior to Muir's discovery.

It should be added, before leaving the subject of biological control in Hawaii, that this territory, being insular and of comparatively late origin geologically, with a restricted indigenous fauna and a warm even climate, seems specially suitable to the rapid spread of introduced insect species, and it thus provides a more favourable field for parasite work than would older continental areas.

The present remarks would not be complete without a further short reference to the Queensland cane grub and its control. The use of any suitable enemy, no matter what the disparity in size or type, provided it has no special undesirable qualities otherwise, must be considered "fair" in pest control. The huge American insect-eating toad, *Bufo marinus*, a clumsy, repulsive-looking, sluggish creature, measuring when fully-grown up to 6 or 8 inches in length and 4 to 5 inches in breadth, and of corresponding bulk, was brought into Queensland a few years ago by the Queensland Government, to combat the cane grub. These animals have since been bred in large numbers in captivity and released, and they have multiplied exceedingly in the field. There were grave misgivings on the part of some, regarding the wisdom of this introduction, and much speculation as to the future activities of the toad, so that its further distribution was for a time restricted to certain of the northern cane areas. But some have since been liberated in Southern Queensland, and as they know no State barriers, they must assuredly now be regarded as part of the Australian fauna. The toads are said to have been very successful against cane beetles in Porto Rico and elsewhere, and may do their work well in the Queensland cane areas; but they can hardly be so desirable everywhere, and one may express the hope that most parts of the continent will be found uncongenial to their presence. However, I do not feel competent, through lack of experience in such matters, to comment more fully, and can only remind you of some further details and personal views contributed by our former president, the late Mr. W. W. Froggatt, in the January, 1936, number of the Society's journal, in which he expressed grave fears for the fate of much of our smaller beneficial ground fauna of various kinds through the future activities of the toad.

NOTES ON *LEPTOSPERMUM*.

By EDWIN CHEEL.

In New Zealand the species *L. scoparium* is commonly known as "Manuka", and is regarded as the original plant from which tea was brewed—hence it is also called "Tea-tree". It is recorded by Dr. W. Anderson, who visited New Zealand on "H.M.S. Résolution" that "it was used as a substitute for tea". Phillip Miller and Thomas Martyn (1807), also state that it was the "Tea Plant of Cook's Voy., i., 100 t. 22" and that "There are three (3) sorts of it: that which has the smallest leaves and deepest colour is the sort we brew with, but doubtless all three might safely serve the purpose. The tea plant is a small shrub, with 5 white petals, etc."

Various accounts have been recorded concerning its qualities. The following is most interesting:—"Its infusion or tea is pleasantly aromatic and fragrant; if not suffered to stand too long, in which case, it becomes bitter. Mixed with an equal quantity of the New Zealand spruce (*Dacrydium*) it was found to make excellent and highly palatable beer, of the most salutary qualities, the *Dacrydium* being too astringent alone".

Another statement reads as follows:—"In Van Dieman's Land and New Zealand, where it grows abundantly, the settlers make a palatable and wholesome beer from it, and in Port Philip, in 1841, when tea rose from £3 to £15 per chest, many of the poorer class of settlers used it as a substitute."

It seems to be quite clear that the "Tea Plant" of New Zealand is the species figured on plate 22 of Cook's 2nd voyage (1777) which was thought to be serviceable to the health of the crew. Further references concerning the plant are made by F. Manson Bailey in his "Comprehensive Catalogue of Queensland Plants", p. 186 (1909), and J. H. Maiden's "Useful Native Plants of Australia", p. 38 (1889). Reference is also made to the New Zealand species being esteemed as a valuable honey-yielding plant by Kirk, and also by W. S. Campbell in *Agricultural Gazette of N.S.W.*, p. 835 (1899).

Although the various forms, varieties, or subspecies in New Zealand, Tasmania, and Australia, have been classified as one species under the name *Leptospermum scoparium*, by Bentham (1866), Mueller, Bailey, Maiden and other

botanists, it remains to be proved that the essential oil contained in the leaves is of the same quality if distilled separately from the distinctive forms.

Dr. Lanterer (*vide* Bailey) is of opinion that the young shoots and leaves of all species of this genus are of the same service to the urinary organs, and against gravel, as those of the uva-ursi (*Arctostaphylos uva-ursi*). In New Zealand as well as in Australia, distinctive types can be propagated from seeds, and each type will produce variable colour forms, and the distinctive colour forms can be kept distinct by propagating them from cuttings.

Cheeseman (1916) recorded two forms having been found in a maritime morass near Ahipara, New Zealand. Cockayne (1918) has drawn attention to the teratological phenomena of *Leptospermum scoparium* occurring in Nature and makes reference to two records of double flowering forms. In the Gardener's Chronicle, p. 167, April 5th (1919), the *var. Leonard Wilson* is recorded, and it is of special interest to note that *Leptospermum scoparium Nichollsii* was exhibited at the International Horticultural Exhibition at Chelsea (London), and won the cup for the best novelty, as well as a 1st class certificate—*vide* Gardener's Chronicle, June 15th, p. 397 (1912). See also a beautiful illustration of this plant in Botanical Magazine, pl. 8419.

An interesting note concerning the origin of "*Nichollsii*" was published in the "Auckland Weekly News" by Mr. J. Drummond as follows:—"Only a single plant of it was found wild in New Zealand. It was a large shrub, and it grew conspicuously in a white manuka copse on a sandy prominence at Chaney's, about a mile from the River Styx, and about six miles from Christchurch, on a farm now owned by Mr. W. P. Spencer. Mr. Spencer first saw the crimson blooms\* twenty-five years ago. In the summer of 1905 he wore a spray in his buttonhole on going to Christchurch to discuss business with the late Mr. Nicholls. As Mr. Nicholls admired the flower, Mr. Spencer presented the spray to him. On the same day (or soon after) Mr. Nicholls visited Mr. Nairn's & Son's nursery with a spray in his buttonhole. He refused to state where the plant grew, except in a general way, but he supplied Mr. Nairn

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\*The colour is really a carmine purple to carmine cochineal carmine. See Duthenay, pl. 116 (3), but is commonly described as "blood-red" or "crimson".

with several cuttings. Mr. Nairn eventually distributed the variety to many parts of New Zealand. He named it after Mr. Nicholls, and this seems to have given the impression that Mr. Nicholls found it. About three years after this Major A. A. Dorrien-Smith brought some plants to England and gave me one, which I increased from cuttings and from seeds. The seedlings vary very much, but there are some good forms among them, and I think some are superior to the original plant."

Certain authorities have stated that it (*Nichollsii*) originated as a seedling from a white-flowered plant discovered in the South Island known there as *Leptospermum Chapmanii*. It must be noted, however, that the foliage of *L. scoparium* var. *Nichollsii* is darker than that of "*Chapmanii*", being of a copper-beech hue, and not green. *L. scoparium* var. *Walkeri* of the New Zealand nurseries, seems to be an intermediate form between "*Nichollsii*" and "*Chapmanii*", hence the following note by Dr. J. P. Lotsy is of special interest.

Dr. Lotsy states:—†"Here and there *Leptospermum scoparium* is in flower, one of these has slightly pink instead of the usual white flowers, which suggests that *L. Nichollsii*, a deep pink form of *L. scoparium*, may have arisen from the union of two white flowering specimens, each of which possessed but a part of the set of factors required to form the pink colouring matter. The fact that *L. Nichollsii* does not breed true, but segregates into a number of forms ranging from white to deep pink concords with this assumption."

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#### NOTICE TO MEMBERS.

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Members are reminded of rule 4 of the Society which reads: "All subscriptions shall become due on the first day of August and shall be payable in advance."

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†Genetica (1925), 244.



## GUIDE TO THE LAND SHELLS OF NEW SOUTH WALES.

By TOM IREDALE.

(Contribution from the Australian Museum.)

Probably no group, in recent years, has been so neglected as the land shells, though they have more interest than most others. Perhaps the droughty conditions of most of our State is responsible for this neglect, as snails must have plenty of moisture, and it is useless to search for them in dry places and in dry weather. Less than one hundred and twenty species are at present listed, though probably three or four times that number will later be catalogued.

This is not the place for a technical discussion on the intriguing features of our snail fauna, their classification and nomination, but it seems part of a Naturalists' Society to interest itself in the accumulation of data regarding these. So this essay is provided as a rough guide, and it is hoped as an incentive to collect snails even when other objects may be the real aim of the naturalist. I have just issued a Basic List of the Land Mollusca of Australia in the Australian Zoologist, which gives all the classification and systematic nomination. Anyone interested in technical matters is referred to that List, and the names there determined, are used here without further reference, save in cases where further research demands emendation.

Although the early colonists noted the strange birds and other animals, even insects, none seems to have noticed any snail, through the fact that no extraordinary snail lives around Sydney and especially as snails are absent in dry seasons such as the early colonists experienced. Therefore the enthusiastic French naturalists (Cf. Austr. Mus. Mag., Vol. III., p. 357, 1929) were the first to record a local snail, and that was so peculiar that it gained the name of *Helicarion* from *Helix*, a snail, and *Arion*, a slug. It may be here explained that a slug is merely a shell-less snail, and that the local novelty was a slug-like snail bearing only a small degenerate shell upon its back. Then the famous botanist, Allan Cunningham, collected some very notable large shells, but the basis for our study was provided just one hundred years ago by that great naturalist, John MacGillivray, who later collected on the North Coast. Then, in Sydney, he arranged the collection of Dr. James Cox, so that the latter issued the first

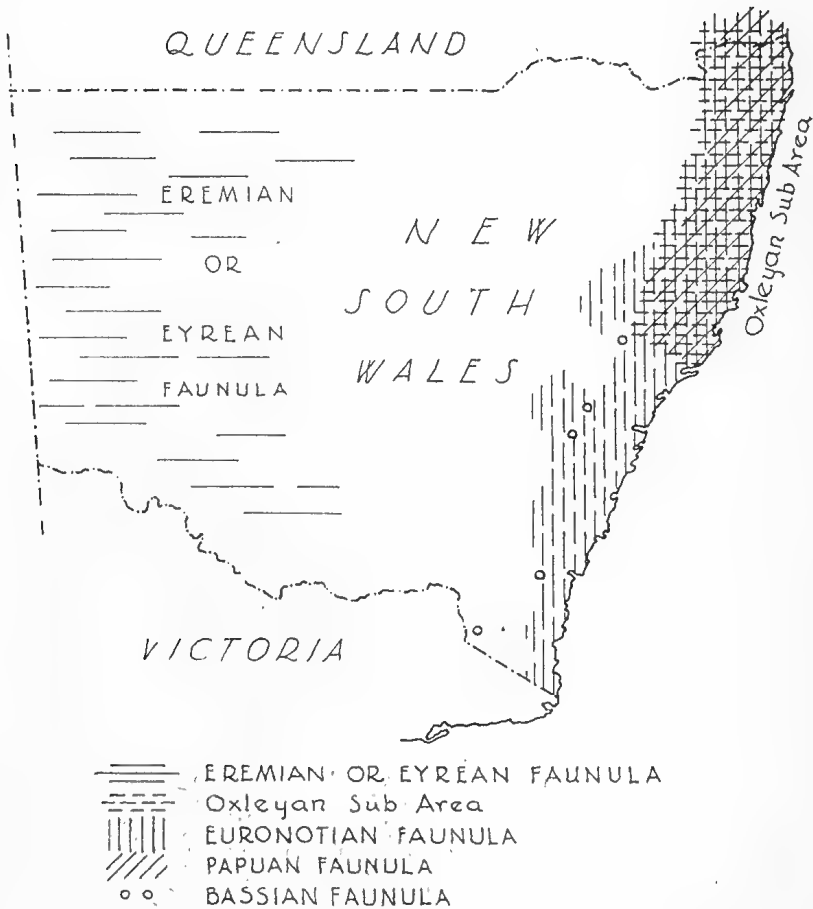
list of our land shells, and then the first (and only) Monograph which had been practically prepared by MacGillivray. Dr. Cox was the most important student of our land shells as he assisted collectors by purchasing their spoils, while also financing them on their trips. Personally, he was careless of the details so necessary for accurate study, but his enthusiastic assiduity amassed a huge collection which is now in the Australian Museum, and is being slowly purged of useless material.

An earlier collector was the Rev. R. L. King, while Strange (the martyr) was responsible for some additions, though the work of the latter was mostly in Queensland. It is impossible in this place to detail all the recent workers, but C. T. Musson was responsible for some interesting records, while C. F. Laseron secured some notable forms. S. W. Jackson must be mentioned on account of the excellent collections he has made, while R. Helms was the first to collect Mount Kosciusko snails.

Inside the political boundaries of New South Wales there are three distinct faunulae, and these are very easily distinguished by means of the land shells. Thus the main faunula has been called the Euronotian, and there are southern intruders belonging to the Bassian, while in the North there is a scant invasion of the Papuan or Torresian faunula. The dry interior of inland New South Wales is unexplored conchologically, but the few records indicate the presence of a large series belonging to the Eremian or Eyrean Faunula of Central Australia. These faunulae are quickly recognised as the northern shells are bolder and more attractive, while the southern ones are very small and very insignificant. Desert snails are larger but very unattractive in form, and in their dull desert coloration. The most interesting feature is the snail faunula of the Oxleyan Sub-Area, apparently a very specialised product of the Euronotian faunula, including the largest and most bizarre of all Australian shells.

The figures here given have been drawn by Miss Joyce Allan, to whom my sincere thanks are again tendered, and the species can be generally determined from them. However, the governing factor is locality, and any specimens from a distant locality should be critically examined, and for this reason the original locality is mentioned in this place, but exact details are available in the Basic List above-mentioned.

Snails must have moisture to exist; in Australia prob-



## THE FAUNAL REGIONS OF N.S.W

ably every species has developed the art of closing the mouth of the shell with a membranaceous lid called an epiphragm, to resist attack by small insects, while lying dormant. In the Northern Hemisphere snails hibernate, that is lie dormant through the winter, but here the reverse is the case as they go "into winter quarters" for the summer, that is aestivate during the dry summer months. As dryness often persists for long periods, sometimes unfortunately running into years, local snails may lie inert for that period. Hence it is practically useless to search for snails during dry weather, but they must be sought in damp

places whenever a rainy spell sets in. Many snails will be found in crevices under rotten logs and stones in damp surroundings, while some even bury themselves in the soil about the roots of trees, while a few live on the trunks and even on the leaves of trees. Those frequenting the last-named situation are always very different from the ground dwellers. As shells are composed of lime, it is obvious that they will flourish better where lime is naturally abundant.

All land shells belong to the Class Gastropoda of the Phylum Mollusca, the majority being grouped in a Sub-Class Pulmonata, a few, the first to be noticed, representing the Sub-Class Prosobranchia. These are easily recognised as they are operculate, that is they close the aperture of the shell with a horny lid.

#### Family HYDROCENIDAE.

This family includes many minute operculate molluscs which are developing from marine and fresh water forms into land-living forms, but still inhabiting an area near the sea coast. Only one rare species has yet been dis-



Fig. 1. *Omphalorissa laseroni*, *Ceratopoma draytonensis*, *Hildapina subpolita*, *Dolopupina pineticola*, *Elasmias wakefieldiae*.

covered in this State, on the Macleay River, many years ago, by Mr. C. F. Laseron. It was crawling in numbers on a limestone outcrop on the side of a hill, and was at the time not determined. It proved to be a very unexpected relation of a species described from North Queensland, and an intermediate location for the genus is Olsen's Caves, near Rockhampton. The shell is very small, 2.5 mm. high by 1.5 mm. broad, regularly conical, with four rounded whorls, spire elevated, imperforate. The first whorl is punctate, the remainder crossed by fine revolving lirae, about thirty in number on the last whorl. The mouth is oval, the columella thickened with a pad-like callus, and the operculum, if examined by means of a microscope, has a projecting claw on the inner side. Its exact relationships

are at present unknown, but on account of the opercular and shell features it is ranged next the Indian genus *Georissa*, the Australian genus being called *Omphalorissa*, the specific name being *laseroni*.

#### Family HELICINIDAE.

These curious little solid conical operculate shells are somewhat common in the lands north of Australia, and run southwards down the coast of Queensland, reaching into northern New South Wales. All the species are very difficult to discriminate, but each seems to favour restricted localities, and when two species are found together they are superficially very different. Two species are known from this State, *Ceratopoma jana* from Port Macquarie, one of the smallest species, being only 3 mm. in height, and 4 mm. in breadth. The shell is roughened only slightly, but under the microscope a fine wrinkle sculpture can be detected, and there are a few concentric grooves. The mouth is oval, the outer lip strong, but not thickened, and the operculum horny and thick. The coloration is greyish, obscurely mottled with brown. Further north, on the Richmond River, lives a similar shell, larger, about 6 mm. broad by  $4\frac{1}{2}$  mm. high, and with the spire whorls reddish, contrasting with the later ones. It is a straggler from South Queensland, having being described with the name, *draytonensis*, from the "Drayton Range, North Australia". This locality turns out to be the Great Dividing Range, near Toowoomba, a place unthought of at the time, and we do not think of that town now as being in North Australia. Musson found it fairly plentiful under stones in South Queensland, though some species also live on tree trunks.

#### Family PUPINIDAE.

Another tropical group of striking looking little glassy pupoid shells with circular mouth and concentric operculum, again only a few species ranging southwards into this State. The juveniles are helicoid in shape, sculptured with slanting striae, and perforate with a squarish mouth. These appear so different that at first they are never associated with the adults. The glassy appearance enables the recognition of most of the species, the other members (none in New South Wales) which remain striated and not shining, having the peculiar mouth as easily recognisable. The mouth is circular with a thick lip bearing a slit at each side. On the left-hand side the slit is horizontal or slightly ascending, while on the right-hand side the slit

is vertical. The position and formation of these slits are characteristic of the various groups and species. Three or four species are known to occur in this State, but research will undoubtedly uncover more as many species live in Queensland, and new forms are continually being added. They may be found in earth under scrub near the roots of trees, and appear somewhat gregarious. The largest local one is *Dolopupina wilcoxi* from the Clarence River, measuring 10 mm. in length and 5 mm. in breadth, both slits ascending, the operculum smooth. From the Richmond River a similar shell is known, but it is only 8 mm. in length, comparatively a little more obese, and may be regarded as a subspecies, *D. wilcoxi edna*.

In the same locality two other smaller species occur, the smallest about 5 mm. in length, being practically a miniature of the preceding, was described years ago as *pineticola*, but more recent collections have showed that the more common little shell, about 6 mm. in length, was very distinct, and it was named *subpolita*. Re-examination proves the latter to be quite dissimilar in that the striation of the juvenile stage is retained in the adult—hence the specific name—also that the left-hand slit is horizontal, not ascending, while the operculum is ridged on the outer surface. This is therefore allotted a new generic name, *Hildapina*, and no close relatives are yet known.

#### Family DIPLOMMATINIDAE.

Another intruder from the north, only one small species, but this time rather an attractive little shell, sinistral, pupoid, thin, crystalline white or brownish, sculptured with upstanding lirae, the mouth circular, the edges broadly expanded. In my Basic List this family has been displaced as it should precede the family Elasmatinidae in the preceding Sub-Class as the species are operculate. Only one species occurs in the far north of the State, about 3 mm. long, and it is called *Velepaina strangei*.

#### Subclass PULMONATA.

This subclass includes all the remaining land shells and slugs which at present number a little over one hundred species, but this appears to be really only a fraction. All the preceding really belong to the Papuan Faunula, and these are accompanied by the tree-dwelling Papuinids, but, of course, the bulk of the species are referable to the Euronotian Faunula, *Meridolum* being the most characteristic genus. This is overshadowed by the extraordinary

development in the Oxleyan Sub-Area of the magnificent *Hedleyella*, *Pedinogyra* and *Annakelea*, the most peculiar of all our land shells. It is difficult at present to associate them with any other groups, early attempts being very futile. A few small shells represent the Bassian faunula, the slug-like *Cystopelta* being very remarkable, while the interior of the State shelters an uncovered faunula of *Sinumelon* and *Meracomelon* forms representing the Eremian element. The accompanying map may show the facts better than any long explanation.

#### Family ELASMATINIDAE.

This is another tropical family, of which representatives enter our State. The shells are very small, thin, transparent, conical, with a thin lip, a twisted columella and a plica on the base of the body whorl. These live on

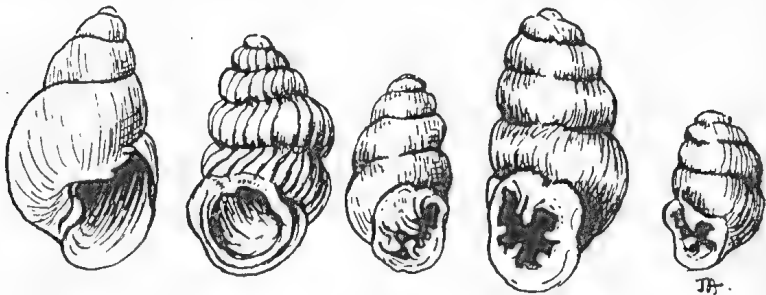


Fig. 2. *Tornatellinops pressus*, *Velepalina strangei*, *Australbinula hedleyi*, *Gyrodaria strangeana trita*, *Wallivertilla kingi negata*.

the ground, on the limbs of trees or even on the leaves of trees. Three species are known, the one from the north being subglobose and is found living on leaves, and is unmistakable, its name being *Elasmias wakefieldiae*. A very differently shaped shell was described from Sydney with the name *jacksonensis*; it has a similar twisted columella and a plica, but is very lengthened and narrow, its proportions being 4 mm. long by  $1\frac{3}{4}$  mm. broad, while the *Elasmias* may reach 3 mm. in length, but would be  $2\frac{1}{2}$  mm. broad. Recently a third species has been separated, which related to *jacksonensis* is shorter and comparatively broader, the whorls more convex, and this is named *Tornatellinops pressus*, sp. nov., the type from the Macleay River, measuring 3 mm. in length, by nearly  $1\frac{3}{4}$  mm. in breadth.

## Family GASTROCOPTIDAE.

For the minute pupoid shells a family Vertiginidae was accepted in the Basic List, but research on South and Western Australian shells has compelled modification, and it is found that five families are necessary, the species now living here being of different origin. All the species are small and pupoid, but vary in the formation of teeth in the aperture. Generally they live in the soil at the bases of shrubs and trees, but some venture on to the trees themselves. The species referred to the present family may be dextral or sinistral, and have a complex apertural armature. Probably many species will later be discovered, but at present only three are known, one from the interior, the other from the coast, but also occurring in the interior. Folds or plicæ occur on the columella (columellar) on the base of the outer lip (basal), on the inside of the outer lip (palatal), and on the base of the shell (parietal). The true *Australbinula (hedleyi)* has a very complex armature, the parietal folds (three) elongated and twisted, the columellar one crass, the basal small, but the palatals strong and twisted. The total shell dextral only measures 2.5 mm. in length, so that a microscope is necessary to study these minute but very interesting shells. This was described from Narrabri, where a larger sinistral form of *strangeana* which may be called *trita* occurs. This species, *strangeana*, was described from Sydney, and is 3½ mm. long with the mouth armature plainer. Two parietal lamellæ are fairly straight, attingent, not twisted, the columellar lamella is straight and the palatal ones are simple. The Narrabri specimens have the teeth more pronounced and stronger than the typical ones, and further inland there may be many species as similar shells occur throughout the Centralian Area. On account of the simplicity of the teeth the *strangeana* series must be separated with a new generic name, *Gyrodaria*. A smaller dextral shell was found associated with *strangeana* at Picton, and was at first regarded as an aberration only, the discrepancy in size being neglected. Later it was named *rossiteri*, and it is a valid species being found as far north as Wingham, while probably more search will reveal more species. It measures about 2½ mm. by 1½ mm.

## Family CYLINDROVERTILLIDAE.

Pilsbry has separated the southern Vertiginids from the typical northern forms, and the above seems the correct family name. The members are still smaller shells than



those of the preceding family, and are thin, translucent, sinistral, mouth rather triangularly formed, outer lip thin and irregular, a few weak folds within the aperture. There is one small palatal fold, a short columellar lamella placed well back and two small palatals. The original *kingi* was described from Parramatta, and two different species live in South Queensland, but the one here figured is from the Tweed River, and being a little smaller, less than 2 mm. in length but a little broader, over 1 mm. in breadth, with the striae finer, and the teeth bolder, it is here named *Wallivertilea kingi negata* subsp. nov.

#### Family PUPOIDIDÆ.

The shells belonging to this family are the largest of these minute Pupoid shells, varying from 4 to nearly 7 mm.



Fig. 3. *Themapupa amolita*. *Themapupa comperta*, *Imputegla circumlita*, *Omegapilla nelsoni*, *Opeas ardelio*.

in length. They may be sinistral or dextral, rather stout, unicolor brownish, with the mouth practically unarmed and the lips expanded. Their distribution is not yet well known, as we find them entering the State from the north and also from the south. The former localities show a smaller shell, both are dextral, with a broadish base, an expansive edging to the mouth and one inconspicuous nodule at the junction of the outer lip with the body of the shell. This is here called *Themapupa comperta* sp. nov., the type being from Collarenebri, Northern New South Wales, collected by Sid. W. Jackson, who also collected it at Scone, the

southernmost record. The southern one, found at Broken Hill by E. W. Lower, is larger, the whorls less rounded, the base comparatively narrower, the outer lip less expanded and the angular nodule more pronounced. This is here named *Themapupa amolita* sp. nov., and measures 6 mm. in length with 2 mm. in breadth, while the preceding northern species measures 4 mm. in length by  $2\frac{1}{4}$  mm. in breadth.

#### Family PUPILLIDAE.

Apparently the members of this family are of different origin from any of the preceding, only one shell of southern distribution occurring as far north as Sydney whence it was described. This shell is sinistral, cream or reddish, broadly cylindrical, whorls flattened, about 4 mm. long by 2 mm. broad, the mouth armature simple, a parietal lamella, a small deeply set columellar one and a couple of deeply set palatal tubercles. So far it is a rather rare shell, and is known as *Omegapilla nelsoni*.

#### Family PUPISOMIDAE.

A curious little helicoid, rather than pupoid, shell, pale brown, very thin, mouth unarmed, living on orange trees or found in the earth below has been placed with the Pupoid shells, but its relationship must be very weak. Pupoids are longer than broad and even when this does not exactly apply the reason is fairly obvious. The present shell is different, at no stage of its growth recalling a pupoid; it only measures about 2 mm. broad and rather less in height, the whorls rounded, weakly striated, the outer lip thin, a very narrow umbilicus, and its name is *Imputegla circumlita*. When it comes down from the trees it buries itself in the earth below, plastering itself with dirt as most of these small pupoids do.

(To be continued.)

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## BARNACLES AND GEESE.

William Turner, the father of British Botany in the sixteenth century, wrote: "For some of them will saye synghe that I graunte that I have gathered this article of so mayne writers that I offer unto you an heape of other mennis laboures and nothings of myne owne. To whom I answere that of the bees honye, that the bees gather out of so manye floure of herbs, shrubbes and trees, that are growing in other mennis medowes, feldes and closes maye justelye be called the bees honye".

So may I plead an apology and acknowledgment to Agnes Arber in 1912 Herbals.

This ancient legend or fable of the geese is of considerable antiquity and is quoted by many writers, one of whom gives a quaint account of the origin of the geese from driftwood in the sea.—"In the small boris and hollis of which growis small wormis. First they schaw thair heid and feit and last of all they schaw thair plummis and wyngis finally quhen thay ar cumyn to the iust mesure and quantite of geis thay fle in the aire as othir fowlis dois".

William Turner's 1544 account is as follows:—"When after a certain time the firwood masts or planks or yard arms of a ship has rotted in the sea then fungi as it were break out upon them in which in course of time one may discern evident forms of birds which at last become alive and fly and in order to confirm this.—I took council advice and my informant "Gyraldus" who taking oath upon the very gospel which he taught and that he said of this bird was absolutely true and that with his own eyes he had beholden young as yet but rudely formed and also handled them and if I were to stay in town for a month or two he would take care that some growing chicks would be brought to me".

Gerard, a well-known herbalist about 1590. His oft-quoted account of the Goose tree, Barnakle tree, or the tree bearing geese—he relates how trees actually bearing shells, which open and hatch out barnacle geese.

This is his account:—"There is a small Ilande in Lancashire called the Pile of Foulders wherein are found broken peeces of old and brused ships some whereof have beene cast thither by shipwracke and also the trunks or bodies with the branches of old and rotten trees, cast up

there likewise, wherein is found a certain spume or froth, that in time breedith unto certaine shels in shape like those of the muskle, but sharp pointed, and of a whitish colour, wherein is contained a thing in forme like a lace of silke finely woven, as it were togethir, of a whitish colour, one ende whereof is fastend unto the inside of the shell even as the fish of oisters and muskles the other ende is made fast unto the belly of a rude masse or lumpe which in time commeth to the shape and forme of a bird, when it is perfectly formed the shel gapeth open and the first thing that appeereth is the foresaid lace or string, next come the legs of the bird hanging out and as it groweth greater it openith the shell by degrees till at length it is all come foorth and hangeth onely by the bill, in short space after it commeth to full maturitie and falleth into the sea where it gathers feathers and growth to a fowl bigger than a Mallard, and lesser than a goose".—J. W. HAWLEY.

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### FIRS.

By GINA BALLANTYNE.

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Their wild black branches taut-strung to the sky  
 Are wizzard harps the sad wind surges through;  
 In fierce and yet funereal majesty  
 They rise, an awesome shadow on the blue.

What strong, unresting spirits earth could bind  
 No longer in her narrow plot of peace,  
 Have sought a new mortality, to find  
 In these vast forms tempestuous release?—

Bringing to a long battle of wind and cloud  
 More than the strength of time-hardened limbs—  
 Their mighty stature lifting them to proud  
 Communion with pale skies their darkness dims.

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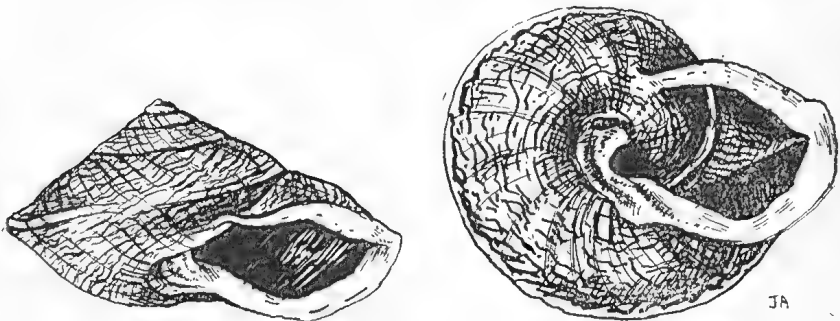
## A NEW GUINEA LAND SHELL IN QUEENSLAND.

By TOM IREDALE.

(Contribution from the Australian Museum.)

Nearly thirty years ago Australian ornithologists were startled by the discovery of peculiar New Guinea Parrots living in North Queensland. Cape York, the nearest point to New Guinea, had been thoroughly searched for over half a century, and it was known that certain bird forms of New Guinea alliance lived there. The new discovery took place at Lloyd Bay, many miles south, and it opened up a new vista to zoogeographers as to the distribution of our avifauna. Years before on the heights of the Bellenden Ker Range a distinct New Guinea element had been recognised, but the Lloyd Bay birds differed again.

I was also interested in shells and wondered if any of the strange New Guinea shells lived on either of these



places, as they did not on Cape York, though shells had been as industriously collected there as birds. Almost at the same time the well-known ornithologist, Mr. Sidney W. Jackson, collected on the Atherton Tableland, not far from the Bellenden Ker Range, and though he unearthed many novelties none was of peculiar New Guinea design.

Now I am able to record that there is a New Guinea element corresponding to that of the birds, present in the shell fauna of the North, and describe the most important shell discovery on land made in recent years.

Mr. Joe Shaffery, of Mossman, North Queensland, has sent me a selection of the land shells collected in that locality, and a dozen species reveal that the Bellenden Ker

and the Atherton groups occur there with the addition of a very remarkable New Guinea form.

This is here described as *MELIOBBA SHAFFERYI* genus and species new. The shell is large, measuring 44 mm. in diameter, and 25 mm. in height, depressedly conical, sharply keeled, imperforate. Coloration purplish and green, the expanded lips of the mouth shining white. The whorls are five, the apical whorl small, smooth, a little elevated, the next a little rounded, the succeeding ones flattened, strongly keeled, the last whorl descending abruptly to form the mouth which is oblique with the lips expanded and flattened; the columella small, arcuate, expanded, entirely sealing the umbilicus, base rounded, a contraction appearing behind the expanded lip. The sculpture consists of an oblique progressive malleation, irregularly spaced, and here and there crossed by a regressive growth-top line; on the base the malleation is irregular. The coloration follows the concentric malleation, the raised ridges being lilac, the hollows purple, the latter colour disappearing until in the last quarter the shell becomes yellowish green, which colour also pervades the lower part of the base. Mr. Shaffery states that the animal is black.

Nothing at all like this shell occurs in Australia otherwise, but a similar shell lives behind Port Moresby, New Guinea; this differs in having the umbilicus open and is of different coloration.

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#### NOTICE TO COUNTRY MEMBERS.

Country members may obtain reliable information about any specimens of natural history they may collect and forward, addressed to the Hon. Secretary of the Society, Box 2178 LL., G.P.O., Sydney.

No member should be afraid to forward specimens because they are common to their district; they may be rare and interesting examples of our flora or fauna not found elsewhere, and, if of general interest, notes on such specimens could be published from time to time in "The Australian Naturalist".

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THE NOMENCLATOR ZOOLOGICUS AND SOME  
NEW FISH NAMES.

By GILBERT WHITLEY.

*Nomenclator Zoologicus* (Zoological Society of London), 4 vols., 1939/40. Edited by S. A. Neave. Price, 8 guineas, post free.

The Zoological Society of London is now issuing a new *Nomenclator Zoologicus*, edited by Dr. S. A. Neave, O.B.E. This valuable work gives an alphabetical list of the names of genera and subgenera in zoology with the original reference to each from literature between the years 1758 and 1935. The first volume (A-C) was mailed from London last October and the second (D-L) was to be issued in December; the whole work will be completed in four volumes of which the price is eight guineas sterling, post free. The *Nomenclator* is of handy size with clear and accurate printing and will include more than 225,000 entries. "So far as the proportionate representation of the various classes of animals is concerned, the names of the Insecta outnumber the whole of the rest of the Animal Kingdom. . . . The Mollusca come second, and are followed by the Arachnida. The Crustacea are also a large group, so that it will be realized that the dominance of the Arthropods over the other animals on this planet is complete". Naturalists may not only obtain, from this *Nomenclator*, the desired reference to any genus, but may determine whether a name for a new genus has been used before. It is unfortunate that some generic names have been employed more than once; in such cases the first (earliest published) name stands and the homonym, or preoccupied name, has to be renamed, unless it can be demonstrated to be a synonym of some other earlier name. I notice a large number of preoccupied fish names, often with cross-references to names which have been substituted for them, but there are still a number which require renaming, even when we heed Dr. Neave's warning to hesitate before running the risk of increasing the difficulties of other systematists. For over ten years I have been compiling an alphabetical list of the thousands of generic names applied to fishes between 1758 and the present day. This *Genera Piscium tum fossilium tum viventium* manuscript is largely rendered inoperative by Dr. Neave's far greater work, which spares me much

further labour on it. Indeed, it has afforded me pleasure to supply a number of names from my *Genera Piscium* as a minimal contribution to the *Nomenclator*. As a result of checking my MSS with the new *Nomenclator*, I have come to the conclusion that some new names are necessary for certain preoccupied fish genera, as listed alphabetically below. For references to literature, see the *Nomenclator Zoologicus*.

*Acropoma* Owen, 1854 = *Allipoma*, nov. (Scombridae).

*Allolepis* Heintz, 1932 = *Allolepichthys*, nov. (Astrolepidae).

*Anognmius* Cope, 1877 (non 1871) = *Bananognmius*, nov. (Raphiosauridae).

*Anomalopterus* Vaillant, 1886 = *Anomalopterichthys*, nov. (Alepocephalidae).

*Archaeoniscus* Sauvage, 1890 = *Archaeonichthys*, nov. (Palaeoniscidae).

*Ariopsis* Peyer, 1928, preocc. by Gill, 1861, which is not a *nom. nud.*, since Gill quotes a genotype and Gill's genus is regarded as a *Hexanematichthys* in Jordan's *Genera of Fishes*. I propose *Peyeria*, nov. for *Ariopsis* Peyer (non Gill). (Tachysuridae).

*Arthropterus* Agassiz, 1843 = *Arthrobatis*, nov. (Rajidae).

*Aspidophorus* Obruchev, Priroda iii., 1936, p. 118, *vide* Zool. Rec., preocc. by *Aspidophorus* Lacépède, 1802 = *Obruchevia*, nov. (Thelodontidae).

*Auchenopterus* Gunther, 1861 = *Cremnotekla*, nov. (Bleniidae). Gunther's name was emended to *Auchenipterus* and substituted by *Cremnobates* but both these alternatives are also preocc.

*Cabotia* De Buen, 1930 = *Cabotichthys*, nov. (Eleotridae).

*Cantoria* Kaup, 1858 = *Cantorusia*, nov. (Cynoglossidae).

*Centroodus* McCoy, 1848 = *Carlukeus*, nov. (Undinidae).

*Cephalacanthus* Beyrich, 1848 = *Cephaliscus*, nov. (Palaeoniscidae).

*Ceraspis* Schlueter, 1887 = *Cornaspis*, nov. (Cornaspidae, nov., formerly Ceraspidae).

*Ceratocheilus* Ribeiro, 1918 = *Osteomystax*, nov. (Doradidae).

*Ceratolepis* Gross, 1933 = *Ceratolepichthys*, nov. (Antiarcha?).



- Chilodus* Giebel, 1848 = *Giebelodus*, nov. (Cladodontidae).  
*Chloea* Jordan & Snyder, 1901 = *Chloeichthys*, nov. (Gobiidae).  
*Clastes* Cope, 1873 = *Clastichthys*, nov. (Lepisosteidae).  
*Coccocephalus* Watson, 1925 = *Coccocephalichthys*, nov. (Palaeoniscidae).  
*Cocius* Jordan & Hubbs, 1925 = *Cociella*, nov. (Platycephalidae).  
*Coelosteus* Gross, 1930 = *Coelosteichthys*, nov. (Palaeopterygii).  
*Colobodes* Steininger, 1841 = *Colobichthys*, nov. (Astero-dontidae?).  
*Columbia* Eig. & Eig., 1892, preocc. by *Columbia* Rang, Nouv. Arch. Mus. Paris, iii., 1834, p. 217 in molluscs. The fish may be renamed *Columatilla*, nov. (Percopidae).  
*Cooperella* Gunnell, 1933, preocc. doubtless requires a new name, but I have not seen Gunnell's paper, no copy being available.  
*Cryptaspis* Bryant, 1934 = *Alloccryptaspis*, nov. (Heterostraci).  
*Ctenopoma* Heckel, 1856 = *Ctenopomichthys*, nov. (Pygaeidae).  
*Cyrtaspis* Bryant, 1932 = *Cyrtaspidichthys*, nov. (Pteraspidae).

The genotypes of the new genera are those of the ones they replace.

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#### CONTRIBUTIONS TO JOURNAL.

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Contributions from members to "The Australian Naturalist" will be welcomed, particularly manuscript of lectures delivered at monthly meetings of the Society, as well as descriptions of exhibits.

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## SHARKS AND SWORDFISHES.

At the March meeting, Mr. David G. Stead stated that during the past few weeks Tiger Sharks of large size, the larger Hammerhead Shark and Blue Pointers (Mako) had been very numerous in offshore waters, while the dangerous Whaler Sharks had been in their usual summer abundance off the beaches and in the estuaries. Unusually large numbers of the large Swordfishes of the type known as Marline-Spike Swordfish—the Marlin of the fishermen—had also been observed at the surface and many had been taken by game fishermen. The Marlin were of two species: the Black Marlin, *Makaira* sp., and the Striped or Banded Marlin, *Makaira mitsukurii*. Unknown to most fishermen, both of these giant fishes may be present in considerable numbers without revealing themselves at the surface of the ocean at all, as they normally swim a few fathoms below the surface, but during the past summer many have been seen at the surface at one time, and, during a few days, there were hundreds within a short distance of Sydney Heads, with many others recorded north and south.

Mr. Stead pointed out that the Marlin and the Blue Pointer Sharks are often competitors for the same small food fishes, and sometimes find themselves in actual combat. During the present summer season several Marlin were taken with recent wounds apparently caused by shark bites and with healed contusions. Similarly the Blue Pointers showed fresh stabs and healed wounds caused by the Marlin bayonets.

Mr. Stead added that there was evidence that the great southerly ("Notonectian") current was flowing far more strongly than usual at this period and this could account for the larger numbers of Tiger Sharks at the surface and the surface activities of the Marlin. "Tropical" fishes, such as the Yellow-mouth Perch, *Lethrinus chrysostomus*, were also being taken in numbers about the entrance of Port Jackson. During January also "cold surf" had been recorded suddenly at several surfing beaches. Mr. Stead considered that this phenomenon was caused by the strongly flowing warm current eddying against bottom irregularities in the ocean, this causing an upward swirl of the cooler underlayers of the sea water. The unusually strong warm current would, doubtless, also account for an exceptionally hot and humid summer in coastal areas; but such periods were usually followed by copious rains, which were so much needed at present.

### THRIPS.

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*(Letter to the Editor.)*

Sir.—For some years now I have noticed a tendency, even on the part of recognised entomologists, to talk of a single specimen of these insects as a “thrip” (or even the whole group as “thrip”), more than one individual of course being referred to as “thrips”; and this has even now worked its way into print in some cases. Just because the latter word has a plural sound to us, they perhaps unconsciously invent a singular form for it, and thus imagine they are conforming with the ordinary rules of English.

But the word is really a Greek one straight out, of only four letters, meaning originally “a worm or beetle that eats wood”. Represented by English sounds these letters become: th, r, i, ps. The sounds conveyed by the first and fourth Greek characters happen to be inexpressible by single letters in our alphabet, so we have to use two. But this does not permit us to cut a single letter of another language in halves. It would seem just as logical for certain foreigners (an Italian, for instance, whose language does not possess our double-sounding consonant “x”) to spell the English word “fox” as “focs”, and then refer to a single animal as a “foc”. This would appear to us rather ridiculous.

Therefore, I think we should stick to the original source of the word, and refer to one specimen of the group in the same way as I sign myself.

Yours, etc.,

A. THRIPS.

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## ADDITIONS TO THE FLORA OF NEW SOUTH WALES.

By W. F. BLAKELY.

## RUTACEAE.

*Zieria Murphyi*, n.sp.

Frutex gracilis virgatus dense pubescens 1-2 m. altus, foliis simplicibus raro trifoliatis, breviter petiolatis, linearibus vel oblongo-lanceolatis, 2-3 cm. longis, 2-5 mm. latis; floribus pedicellatis, solitariis, confertis vel breviter cymosis, pedunculis axillaribus; calyce 3 mm. longo, sepalis acuminatis, tubum longioribus, petalis in gemmis imbricatis 4 x 2 mm., extra dense pubescentibus, intra glabris; antheris oblongis inermis, ovario glabro.

A slender, virgate, densely velvety-pubescent shrub 3-6 feet high, with shortly petiolate, simple, rarely trifoliate, linear to oblong-lanceolate leaves, with closely revolute margins, 2-3 cm. long, 2-5 mm. broad, dark green and deeply channelled above, somewhat hoary beneath, the midrib very conspicuous. Flowers pedicellate, solitary, clustered, or shortly cymose, on axillary peduncles shorter than the leaves, surrounded by linear, leafy, deciduous bracts, as long as or longer than the peduncles and pedicels. Calyx 3 mm. long, with acuminate segments longer than the tube; petals imbricate in bud, 4 x 2 mm., densely pubescent on the outside, glabrous within, pale blue to violet, soon drying almost white; anthers oblong, inermis; style very short; stigma green, capitate; ovary glabrous.

It is unlike any other New South Wales species, particularly in the constantly simple leaves, a character which is also characteristic of *Z. involucrata*. Named in honour of Edward Murphy of Wingello, a collector of native seeds and plants, who discovered this interesting species in Gold Gully, Penrose, N.S.W., 2/10/1938.

*Phebalium Buckinghamii*, n.sp.

Frutex gracilis virgatus 1-2 m. altus, ramis juvenilibus et foliis dense stellato-pubescentibus; foliis petiolatis, alternis, orbiculatis, ovatis vel obovatis, supra viridibus, infra ferrugineo-stellato-tomentosis 4-10 x 4-6 mm.; petiolis 2-4 mm. longis; floribus solitariis, terminalibus vel in axillis superioribus, subsessilibus, calyce parvo minute dentato; petalis in gemmis valvatis, lanceolatis, 4-5 x 2-3 mm., flavis; filamentis gracilibus, glabris quam petalis breviori-

bus; ovario dense tomentosum, stylo glabro quam ovario longo, stigma magna capitata vel lobata.

A slender wiry shrub 3-6 feet high or more, with a reddish-brown bark on the old stems, the young branches and leaves densely stellate-pubescent. Leaves petiolate, alternate, orbicular, ovate to obovate, thick, dark green above, rusty stellate-tomentose beneath, 4-10 x 4-6 mm.; petioles slender, 2-4 mm. long. Buds globose, stellate-pubescent. Flowers solitary, terminal or in the upper axils, sub-sessile; calyx small, the teeth minute; petals valvate, lanceolate, narrowed at the base, 4-5 mm. long, 2-3 mm. broad, bright yellow, glabrous above, rusty stellate-pubescent beneath. Filaments slender, glabrous, shorter than the petals; stamens almost square, emarginate, the connective prominent, nearly as long as the cells; pollen copious, bright yellow. Ovary densely woolly; style glabrous, as long as the ovary; stigma large, capitate or lobed, light green. The solitary Hibbertia-like flowers distinguishes it from all the New South Wales species.

Gold Guliy, Penrose, W. F. Blakely, Jeane and W. J. Buckingham, and E. Murphy, 15/10/1938; 2 miles N.E. of Wingello railway station, same collectors, 30/9/1939. This distinctive plant is dedicated to my esteemed bush mate, William John Buckingham, of Lindfield, who has taken a life-long interest in the flora of his native land, Australia.

#### TREMANDRACEAE.

##### *Tetralthea Richardsiana*, n.sp.

Fruticulus compactus 12-36 cm. altus, ramis ramulisque gracilibus glabris vel minute pubescentibus; foliis subsessilibus, verticillatis, erectis vel patentibus, linearibus, marginibus revolutis, 4-11 x 0.5-1 mm.; pedicellis filiformibus puberulis, 8-12 mm. longis; petalis 4, deciduis, oblongo-lanceolatis, obtusis, 7 x 3-4 mm.; ovario compresso-cordato, pubescente; capsula compressa ovata glabra 5 x 3 mm.; seminibus oblongis aliquantum hirsutis, 4-5 mm. longis.

A compact, heath-like undershrub of 6 to 18 inches, with slender, glabrous or minutely pubescent stems and branchlets, or the whole plant minutely pubescent. Leaves sessile, 3 to 6 in regular whorls, erect or spreading, linear, with very closely revolute margins so as to appear terete, 4-11 x 0.5-1 mm. glabrous or minutely scabrous-pubescent when dry, softly velvety when green. Flowers

axillary, solitary or 2 or 3 together on puberulus or glabrous, filiform, erect or recurved pedicels, 8-12 mm. long. Buds conical, scarcely acute; sepals 4, lanceolate or triangular, about 2 mm. long, 1 mm. broad at the base, slightly pubescent along the inner margins, pale pink to purple-brown. Petals 4, deciduous, oblong-lanceolate, obtuse, 7 x 3-4 mm. purple-pink, faintly 3 to 5 veined. Anthers slightly shorter than the slender, glabrous style. Ovary compressed-cordate, minutely pubescent. Capsule almost flat, ovate, apiculate, glabrous, faintly veined, furrowed down the centre, 5 x 3 mm., but not seen in a fully developed state. Seeds pendulous, one in each cell so far as observed, oblong, slightly hairy, nearly 5 mm. long.

Old Clarence Siding, Blue Mountains, J. H. Maiden, 9/1898; Clarence to Wolgan, J. H. Maiden, 11/1906. Wide-spread on poor, sandy, subpeaty soil over pipe clay, at an elevation of 3,400 to 3,600 feet, Clarence to Ball Trig. Station, and near Newnes Junction, W. F. Blakely, Jeane and W. J. Buckingham, 25 and 26, 11/1938; near Upper Dam, Lithgow Water Supply, Clarence, same collectors, 21/10/1939. 22 mile post old Clarence-Wolgan road, same collectors, 30/12/1939.

Near *T. ericifolia* Sm., from which it is readily separated by the different vestiture, non-scabrous leaves, narrower purplish petals, pubescent ovary, with a solitary ovule in each cell. Named in honour of Mrs. H. E. Richards, of Clarence, Blue Mountains, who has taken a keen interest in the flora of the district for over forty years.

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#### THE SOCIETY'S BADGE.

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The Society's Badge may be obtained from the Hon. Secretary or the Hon. Assistant Secretary. Price, 2/- (postage and package extra).

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## OBITUARY.

WILLIAM BUTLER GURNEY.

1882—1939.

W. B. Gurney was born in Sydney on May 2, 1882, and died on September 21, 1939, after a brief illness. Gurney was an Honorary Secretary of the Society during 1906-1907, and was elected President for the year 1910-1911, and was later, for a number of years, a Vice-President.

In August, 1900, he entered the service of the Department of Agriculture, as Assistant Entomologist to W. W. Froggatt, on whose retirement, in 1923, he was appointed Chief Entomologist of New South Wales.

About 1911 he was appointed Lecturer in Entomology at the Sydney Technical College, and held this position until his resignation, a few years before his death. Many of his former students, some, members of this Society, will remember the enthusiasm he inspired in them, both in his lectures and on field excursions.

He was appointed delegate from New South Wales to the Fourth International Congress of Entomologists, held at Cornell University (U.S. America), in August, 1928. He visited various parts of America, and during 1928-1929 visited England, France, and Italy, to enquire into recent developments in insect pest control. In 1934-1935 he visited East Africa and India in a search for parasites to control white wax scale of citrus and fruit flies. Numbers of these parasites were forwarded to Sydney, and were developed here, and subsequently were liberated in the field.

He was a Fellow of the Royal Entomological Society of London, a member of the Linnean Society of New South Wales, the Royal Zoological Society of New South Wales, the Australian and New Zealand Association for the Advancement of Science, and the Australian Institute of Agricultural Science.

He published numbers of papers on various insects, but was most particularly interested in problems concerning fruit flies, grasshoppers, and the biological control of insect pests.

He was keenly interested in music, art and literature, and possessed a marked originality of mind. Those who

knew him will regret the passing of a genial and understanding character.

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JOSEPH WILFRED DWYER.

1869—1919.

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The Right Reverend Dr. Dwyer, who, at the time of his death was the Roman Catholic Bishop of Wagga, was for many years a member of this Society.

He was born in East Maitland on October 12, 1869. He devoted much of his time to educational work, and throughout his life was keenly devoted to cultural pursuits, and particularly to music and the study of Australian flora. He contributed several botanical papers to the Society's Journal. He was elected a member of the Society on April 6, 1920.

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JOHN HUBERT PLUNKETT MURRAY.

1861—1940.

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Sir Hubert Murray, who had been Lieutenant-Governor of Papua since 1908, died in Samarai on February 27, 1940.

He was born in Sydney on December 29, 1861, and had been a member of this Society for many years.

In 1926, Sir Hubert was leader of the Australian Delegation to the Pan-Pacific Science Congress in Tokyo, and President of the Australian and New Zealand Association for the Advancement of Science in 1932. He was created C.M.G. in 1914 and K.C.M.G. in 1925.

One of his sons, Dr. P. Murray, a former member of this Society, had a distinguished career in science at the Sydney University. He has been in England for a number of years engaged on research work.—[Editor.]

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## NATURALISTS' SOCIETY OF NEW SOUTH WALES.

Proceedings.SEPTEMBER, 1939.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, September 5, 1939, at 8 p.m.

The President (Mr. A. E. Watson), in the chair, with about 36 members and visitors present.

Correspondence.—The correspondence was dealt with at the Council meeting.

New Members.—Mr. P. Herry, Mr. G. Ross Thomas, Miss Nancy Desmond, Miss M. Mason, and Mr. J. A. Drummond were unanimously elected members of the Society.

A report on the tree-planting excursion to the Chullora railway workshops was given.

Announcements.—Mr. A. E. Watson advised that an outing would be held at the garden of Dr. A. E. Finckh, at Mosman, on September 16, and that the ordinary monthly outing would be held at Jannali on September 30, and that an all-day excursion to Cowan would be held on Eight-Hour Day, and that on September 21, Bird Day would be celebrated. Mr. J. R. Wills invited members to attend a lecture on aboriginal lore, to be held at the W.E.A. headquarters. Members were also invited to attend a wattle planting ceremony to commemorate the jubilee of South Granville Public School on September 9.

Exhibitions of Specimens.—Mr. H. Doherty exhibited specimens of shale.

Miss M. Davidson.—Specimens of *Albizzia*, a native of South Africa.

Mr. A. E. Watson.—A blind snake, *Thylops polygrammicus*, from Inverell.

Miss G. Ballantyne.—Specimens of sundew, *Drosera*, and acacias from Marley.

Mr. E. Cheel.—A series of coloured pictures of flowers and butterflies of various countries.

Lecture.—Mr. Edwin Cheel delivered an extremely interesting and informative lecture on *Leptospermum*. The

lecture was illustrated with living specimens of various species of *Leptospermum*, both native and New Zealand being included. Mr. Cheel also told members of his research, over a number of years, on various species and of his numerous experiments with them. The lecturer was accorded a very hearty vote of thanks.

OCTOBER, 1939.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, October 3, 1939, at 8 p.m.

The President (Mr. A. E. Watson), in the chair, with about 40 members and visitors present.

Correspondence.—The correspondence was dealt with at the Council meeting.

Nomination of Members.—Mr. Clive Treford, Public School, Bolivia. Nominated by Mr. A. E. Watson, seconded by Miss D. Dobbin.

Announcements.—Mr. H. Doherty read an account of the all-day outing to Cowan, held on October 2, and gave a list of botanical specimens collected, which comprised 22 families, 50 genera and 61 species.

The President (Mr. A. E. Watson), announced the recent death of Mr. W. B. Gurney, and members stood as a mark of respect.

The President called members' attention to the library, which was open each meeting night from 7 to 8 p.m.

Exhibition of Specimens.—Mr. C. S. Ashley: Specimens of *Clianthus Dampieri*, Sturt's desert pea, and a species of *Banksia* from Millthorpe, N.S.W.

Mr. M. S. Barnett.—Seed pods of the Queensland bean.

Mr. Frank Hasemer.—Described a specimen, brought by Mr. Ashley, of a king cricket.

Mr. A. E. Watson.—Read Mr. Edwin Cheel's notes on *Prostanthera incisa*, grown from a cutting, taken from a plant in National Park, and compared the plant with one which nurserymen sell as *P. incisa*.

Miss Gina Ballantyne.—Exhibited specimens of *Acacia* from Woodstock, and a heath from Roseville.

Miss D. Dobbin.—Exhibited pressed botanical specimens which were exhibited at the bi-monthly meeting held in September.

Lecture.—Mr. J. C. Wiburd delivered an extremely interesting and informative address on the Yarrangobilly Caves. The lecture was illustrated with a great number of lantern slides which clearly showed the beauties of these caves. The lecturer was accorded a very hearty vote of thanks.

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NOVEMBER, 1939.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, November 7, 1939, at 8 p.m.

The President (Mr. A. E. Watson), in the chair, with about 36 members and visitors present.

Correspondence.—Letter from Royal Zoological Society, N.S.W., forwarding an invitation to attend the Exhibition to be held at Manly, from November 2 to 18. Schools Branch of the Forest League forwarding an invitation to members to attend a Tree Planting ceremony. Other correspondence dealt with at Council meeting.

Election of Members.—Mr. Clive Treford was unanimously elected a member of the Society.

Nomination of Members.—Dr. D. Munro Armstrong, 201 Macquarie Street, Sydney. Nominated by Mr. A. E. Watson, seconded by Miss D. Dobbin. Miss Lillian Whiting, c/o Messrs. Stevenson and Turner, 16 Barrack Street, Sydney. Nominated by Mr. L. G. Harrison, seconded by Miss D. Dobbin. Miss Violet Tangye, Public School, Llandilo, via St. Mary's. Nominated by Miss L. Halloran, seconded by Miss D. Dobbin. Mr. M. B. Dunlop, 45 The Avenue, Strathfield. Nominated by Mr. A. E. Watson, seconded by Miss D. Dobbin.

Members' Evening.—Mr. H. Doherty: Pictures and description of the geological aspects of Old Man Valley, Hornsby.

Miss W. Rosling.—Exhibited and described a series of lantern slides, showing how the grain of wood is made up by cell structures.

Mr. M. E. Gray.—A series of lantern slides showing pictures taken during a 26-mile trip along the Cox River.

Mr. John Powell.—Slides taken during a trip to South Africa, illustrating the animals, birds, trees, etc.

Miss Gina Ballantyne.—Exhibited specimens of pressed

flowers belonging to the orders *Myrtaceae* and *Droseraceae*.

Miss Jean Buckingham.—Specimens of Central Australian flora, collected for her by Mrs. Dale, of Alice Springs. Seventeen species were exhibited.

Mr. E. P. Bailey.—Flowering specimen of a cactus.

Mr. J. R. Wills and Mr. C. S. Ashley.—Specimens of flowering plants collected in the Broken Hill district.

Mr. W. F. Blakely.—Exhibited and described three new Australian plants, *Zieria Murphyi*, and *Phebalium Buckinghamii* from Gold Gully, Penrose, and *Tetratheca Richardiana* from Clarence, Blue Mountains.

Mr. F. Hasemer.—Specimens of insects, including a wasp-like longicorn beetle, taken at the excursion to Hornsby, also the giant Fig longicorn of northern New South Wales, and a series of *Buprestidae*.

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#### DECEMBER, 1939.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, December 5, 1939, at 8 p.m.

The President (Mr. A. E. Watson), in the chair, with about 50 members and visitors present.

Correspondence.—Letter from Master Douglas Turner, Hon. Secretary of Junior Field Naturalists' Society, Hobart, Tasmania, asking for junior members of this Society to exchange specimens with him.

Miss Sulman re sale of Calendars in aid of Kindergarten Union. Other correspondence dealt with at Council meeting.

New Members.—Dr. D. Munro Armstrong, Miss Lillian Whiting, Miss Violet Tangye, and Mr. M. B. Dunlop were unanimously elected members of the Society.

Exhibition of Specimens.—Miss Jean Buckingham: Specimens of native flowers collected at Mount Clarence, and the Lethgon and Wolgon Valleys. These included six species new to science. Mr. M. S. Barnett spoke regarding the value of the specimens exhibited.

Mr. J. R. Wills.—Collection of pressed flowers from the Broken Hill district.

Lecture.—Mr. Gilbert P. Whitley, F.R.Z.S. (Ichthyologist to the Australian Museum), delivered an extremely in-

teresting lecture on "Marine Collecting in Australia", illustrated with numerous lantern slides, which depicted the Australian waters and sea coasts from Sydney to Broome, Lord Howe Island, Middleton and Elizabeth Reefs, the Barrier Reef and many other places of great interest. The lecturer was accorded a hearty vote of thanks.

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FEBRUARY, 1940.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, February 6, 1940; at 8 p.m.

The President (Mr. A. E. Watson), in the chair, with about 40 members and visitors present.

Correspondence.—The correspondence was dealt with at the Council meeting.

Nomination of Members.—Mr. T. McCarthy, Chief Entomologist, Department of Agriculture, Box 36a, G.P.O., Sydney. Nominated by Mr. E. H. Zeck, seconded by Mr. M. S. Barnett. Mr. Tom Iredale, Conchologist, Australian Museum, College Street, Sydney. Nominated by Mr. E. H. Zeck, seconded by Mr. M. S. Barnett. Mr. Errol Johnstone, High School, Tamworth, N.S.W. Nominated by Miss Watts, seconded by Miss D. Dobbin. Miss Hilda Butler, "Wenby", 20 North Street, Marrickville. Nominated by Miss D. Dobbin, seconded by Mr. A. E. Watson.

Members' Night.—Mr. John Powell: Lantern slides, illustrating the ceremonies in connection with the fire-walkers of Fiji, preparation for feasts, etc.

Mr. W. F. Blakeley.—Described as new to science the following Australian plants:—*Callistemon Shiressii* sp.n., *Eucalyptus obtusifolia* D.C. var. *dendromorpha* var. nov., *Eucalyptus carnabyi* sp. nov., and *Eucalyptus rhodantha* var. *petiolaris* var. nov. Mr. Blakeley said that Mr. Shiress had collected the seeds of the *Callistemon* exhibited and had grown a great number, many of which he had given to Taronga Park.

Mr. John Hawley.—Slides showing the use of stone tiles and straw thatch, as roofing materials on English buildings. The photographs were taken in the Cotswolds, Gloucestershire. Mr. Hawley also read a passage from the Journal of the Transactions of the Suffolk Naturalists' Society, referring to the Journal of our Society.

Mr. H. Doherty.—Exhibited fossils collected at Gerrin-

gong and Huskisson, and also a piece of granite.

Miss H. Butler.—Specimen of the Rangoon creeper.

Miss Gina Ballantyne.—Specimen of *Grevillea sphacelata*.

Mr. C. S. Ashley.—Specimen of a yam, *Discorea transversa*, and *Kennedya rubicunda*.

Miss D. Dobbin.—Mentioned a specimen of spider, *Gasteracantha minax*, sent from Bombala by Miss Bewley. It did not live long enough for exhibition.

Mr. M. S. Barnett.—Specimen of a convolvulus hawk moth, *Herse convolvuli*.

Mr. A. E. Watson.—Spoke of his and Mrs. Watson's trip to Tasmania during December and January. He also exhibited plants collected on top of Mount Wellington, Tasmania, showing dwarf growth.

Mr. M. S. Barnett.—Specimens of fossil plants sent in by Mr. Royce, from the brick pits at Mortdale.

Mr. C. S. Ashley.—Specimen of sponge from Bermagui, South Coast, and also distributed seed of *Acacia adunca* sent down by Dr. Clarke Webster from Woodstock. Plants of Central Australian passion-fruit, the seed of which came from Rosedale Mission Station.

# The Australian Naturalist

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Part 8.

ADDITIONS TO THE AUSTRALIAN MYRTACEAE. *Index P.O.*

By W. F. BLAKELY. *1/6/30*

*Callistemon Shiressii*, Blakely, sp. nov.

Frutex vel arbuscula, 10-30 pedes alta (circa 4-9 m.); cortice chartaceo; ramuli novelli et folia juniora molliter pilosa. Folia matura angusta, glabra, alterna, breviter petiolata, lanceolata, plerumque undulata, 2-4 cm. longa, 5-8 mm. lata. Spicae terminales, 3-5 cm. longae, rhachis et calyces lanoso-hirsuti; calyx globoso-urceolatus 2-3 mm. longus; sepalis deltoidea pilosa, circa 1 mm. longa; petala elliptica, concava, alba, fere hyalina; stamina alba, 8-10 mm. longa. Fructus sessilis, depresso-globularis, 4 x 4 mm.

A compact shrub or small tree of 10-30 feet, with a stem diameter of 3-6 inches or more; bark papery, cream to buff-coloured; the young branchlets and young leaves softly hairy. Mature leaves glabrous, moderately dense, alternate, shortly petiolate, narrow lanceolate, straight or undulate, 2-4 cm. long, 5-8 mm. broad, paler on the lower surface than on the upper, the midrib conspicuous, terminating in a pungent point, lateral veins irregular, flexuose or branched, intramarginal vein nerve-like and very close to the margin; oil dots numerous, visible on both surfaces, especially on the lower. Spikes terminal, but soon infraterminal, 3-5 cm. long, the rhachis and calyxes woolly-hairy.

Floral bracts usually 3 to each flower, the two lateral ones cordate, 1-nerved, hairy, about 1 x 1 mm., the lower lanceolate-acuminate, very concave, striate, hairy beneath, 3-4 mm. long, 2 mm. broad. Calyx globose-urceolate, 2-3 mm. long; sepals deltoid, acute, very hairy, about 1 mm. long; petals elliptical, concave, almost transparent, about 3 x 8 mm. Stamens numerous, very fine, white or cream-coloured, 8-10 mm. long; anthers versatile, attached below the middle, almost oblong, the cells frail, opening longitudinally, pollen very fine, cream-coloured. Fruit sessile, depressed-globular, thin and smooth, slightly constricted

at the top, orifice broad, 4 x 4 mm., 3-celled, the valves deltoid, enclosed. Seeds very narrow, almost terete, straight or curved, light to dark brown, smaller and less angular than those of *C. salignus*.

Bull Ridge, via Windsor, H. J. Leroy, 10/1913; Grose Vale, Miss Joyce Vickery, 26/9/1936; Gosford, H. Deane, 10/1888; on shale ridges about 1 mile north-west of Narara railway station, W. F. Blakely and D. W. C. Shiress, 5/1927, and 26/2/1929, the type; 1 mile north of Narara, W. F. Blakely, 10/1931, and 1/1940; Howe's Mountain, near Singleton, J. L. Boorman, 8/1913. Named in honour of my esteemed bush mate, David William Campbell Shiress, who for nearly thirty years assisted me in the botanical exploration of the lower Hawkesbury River and other places.

Its position is near *C. salignus* from which it differs in the much smaller leaves, with more prominent oil dots, strongly veined foliage bracts, smaller spikes and flowers, woolly rhachis and calyxes, more persistent, and hairy floral bracts, the lower one of which is smaller and not clawed, smaller sepals and petals, thinner and more globose fruits, and in the new growth being more flesh coloured, without the violet tinge so characteristic of *C. salignus*. It is mainly confined to the steep shale ridges, while *C. salignus* occupies the damp and low-lying soils.

It is a handsome shrub or small tree, with light green foliage that is useful for table decorations; it will stand clipping or severe pruning if necessary, and should be most useful for lawns and street planting, especially in heavy soils, as it is very hardy and drought resistant when once established, and looks well all the year round.

383a. *Eucalyptus obtusiflora*, D.C., var. *dendromorpha*, Blakely, var. nov.

Crit. Rev. Part ix., Pl. 44, figs. 5a-5c, as *E. virgata* var. *stricta* (arboreal form); Part xxxix, p. 300, as *E. fraxinoides*.

Ab. *E. obtusiflora*; surculorum foliis laete viridibus, internodis minus glandulosis, foliis maturis magis falcatis, gemmis peracutis, statura, habitu differt.

Tree up to 40 feet high. Scaly bark at base, whitish and smooth on upper part of trunk (Cambage); timber pale. Cotyledons reniform; seedling leaves opposite for 4-5 pairs, the first 3 pairs sessile, lanceolate, rounded at the base, the subsequent pairs shortly petiolate, slightly lobed at the base, broadly lanceolate, tapering at the base, 7-12 x 2.5-4 cm., moderately thin, light green, with bright



purple-brown midribs and internodes. First alternate leaves markedly petiolate, lanceolate, oblique at base, 12 x 3 cm. Oil dots very numerous in the opposite leaves, and more so in the alternate ones. Intermediate leaves alternate, petiolate, broadly lanceolate to falcate lanceolate, acuminate, thin, venulose, 10-14 x 3-5 cm., slightly resinous; oil dots very numerous. Mature leaves alternate, petiolate, obliquely lanceolate-falcate to acuminate, rather thin, 7-12 x 1-3 cm. somewhat resinous; oil dots copious.

Umbels, 3-10 flowered; peduncles compressed, 10-15 mm. long, 2-3 mm. broad. Buds pedicellate, clavate, rough with oil glands, 5-10 x 4 mm., the operculum acutely conical, 3-4 mm. long. Fruit pedicellate, globose urceolate, truncate, 8-10 x 8-10 mm., the disc forming an oblique annulus inside the slightly constricted orifice, and partly extending over the enclosed 4-celled capsule. Fertile seeds reddish to dark brown, granular to D-shaped, about 2 x 2 mm. almost inseparable from the sterile ones.

New South Wales.—West Albion Park, near Macquarie Pass, R. H. Cambage, June, 1901, the type. Bong Bong Pass, West Dapto; near top of Mt. Budawang, 4,000 feet. Maiden, in Critical Revision, l.c., placed this variety under *E. fraxinoides*, from which it is difficult to separate on herbarium material, but the seeds and seedlings, however, are definitely distinct from those of that species. I am indebted to Mr. Percy Murphy, of the firm "Andrew Murphy", Woy Woy, for drawing my attention to the marked difference between the seeds of *E. fraxinoides* to those of *E. obtusiflora* and allies.

It differs from the species in the bright green seedling leaves, less glandular internodes, more falcate mature leaves, pointed buds, and in size and habit. It is superior to the species in size, resists fairly low temperatures, prefers wet sandy or granitic soils, and should be useful for ornament, shelter, small timber, and fuel in moderately cold regions.

Flowers, July-September.

597b. *E. Carnabyi*, Blakely et Steedman, sp. nov.

Frutex "Mallee" congestus, caulibus gracilibus, creberrimis, 4-8 pedes altus (ca. 1-2 m.), ramuli foliaque subglauc. Folia plerumque alterna, petiolata, oblonga, mucronata, vel lato-lanceolata, crassa, coriacea, 5-8 cm. longa, 1.5-3.5 cm. lata, venae subtilissimae, subobscurae; umbellae erectae, axillares, triflorae; pedunculi compressi, 10-12 x 2-3 mm., gemmae brevi-pedicellatae, quercu-glandi-

formes, 20-22 x 10-12 mm.; calyx late turbinatus, quam acute conicum operculum brevoir; antherae "Platyantherae"; fructus ligneus, late turbinatus, subsessilis, glaber, 20 x 22 mm.; discus amplus, semiconicus, valvae triangulares, exsertae.

A Mallee forming clumps up to 10 feet in diameter, stems slender, numerous from the rootstock, 6-8 feet high, covered with a dark brownish bark for 3 to 5 feet from the ground, then smooth barked to top; branchlets subterete, glaucous; foliage light grey, somewhat clustered. Mature leaves usually alternate, petiolate, oblong, mucronate, to broadly lanceolate, thick, coriaceous, drying a pale yellowish to grey-green on both surfaces; slightly perforate, aequilateral, 5-8 cm. long, 1.5-3.5 cm. broad, the venation subobscure, the lateral veins very fine, close and irregular, diverging at an angle of 50-60 deg. from the prominent, yellowish midrib; intramarginal vein confluent with the thickened margin.

Umbels erect, axillary, 3-flowered, on compressed peduncles, 10-12 mm. long, 2-3 mm. broad; buds shortly pedicellate, acorn-like, 20-22 x 10-12 mm., but not seen fully ripe, the calyx broadly turbinate, subangular or somewhat compressed, glaucous, shorter, and of a greater diameter than the base of the acutely conical to subrostrate, smooth, very thick, woody operculum. Filaments white or yellowish, very numerous, the anthers subversatile to adnate, broader than long, opening in orbicular lateral pores. Fruit woody, broadly turbinate, subsessile, smooth, 20 x 22 mm., the disc forming a broad semiconical annulus around the contracted orifice, and adnate to the 4-5, very strong, triangular, exserted valves. The calycine ring rather broad and oblique. Seeds dark brown, orbicular, subrugose, ridged, 3 x 3 mm., sterile seeds linear, 4 x 1 mm.

Victoria Plains, and near Moora (Type), Western Australia. I. Carnaby and H. Steedman, March, 1937, and April, 1939.

It is closely allied to *E. Oldfieldi*, from which it differs in the broader, subglaucous leaves, peculiar acorn-like buds, which resemble the fruits of some species of *Quercus*, and in the much larger and thicker fruits.

It is small and ornamental, and its rather large acorn-like buds are very attractive. In its native habitat, various species of parrots feed upon the buds just before they open, and the ground around the plants is often thickly covered with the partly eaten buds. The birds seem to relish the anthers and ovules. It belongs to a 10-

14 inch rainfall region, but like many other semi-arid species, it is apt to thrive, under cultivation, in regions with a far higher rainfall. It flowers about June or July. Named in honour of Isaac Carnaby, entomologist and naturalist.

599b. *Eucalyptus rhodantha*, Blakely and Steedman. var. *petiolaris*, Blakely and Steedman, var. nov.

Ab typo, *E. rhodantha*, foliis oppositis ac alternis, petiolatis, haud amplexicaulis, cordatis vel lanceolatis, flavo-viridibus, calycis tubo longiore et magis attenuato, operculo magis rotundato differt.

Branchlets terete, reddish-brown to subglaucous. Leaves opposite or alternate, shortly petiolate, cordate to cordate-lanceolate, the apex short or acuminate, 5-10 x 3.5-6 cm., yellowish green, thick, coriaceous, finely veined, the midrib yellow, shading into purple brown, very conspicuous on both surfaces.

Flowers solitary, so far as observed, on terete peduncles, 3-4 cm. long. Buds markedly pedicellate, orbicular-clavate, apiculate, costellate, 4 x 3 cm.; calyx broadly funnel-shaped, costate to narrowly winged, as long or longer than the galeate, apiculate, woody operculum; pedicels angular or compressed, sometimes with narrow wings, 15-20 mm. long. Fruit broadly turbinate, pedicellate, 30 x 40 mm., the disc semi-conical, 8 mm. broad, valves 5, woody, enclosed or flush with the top of the disc.

In the original description of the species, published in the Proceedings of the Linnean Society of New South Wales, 1938, p. 68; the size of the fruit was quoted in error as 15 x 20 mm. instead of 30 x 35 mm.

Moora district, Western Australia, H. Steedman, April, 1939.

It differs from the species, in the opposite and alternate, petiolate, non-amplexical, cordate to lanceolate, yellowish-green leaves, longer and more attenuated calyx-tube, and rounder operculum, without the long rostrate beak.

It is very attractive and is worthy of a place in any garden. It flowers about June or July.

#### NOTICE TO MEMBERS.

Members are reminded of rule 4 of the Society which reads: "All subscriptions shall become due on the first day of August and shall be payable in advance."

## GUIDE TO THE LAND SHELLS OF NEW SOUTH WALES.

By TOM IREDALE.

(Contribution from the Australian Museum.)

## PART II.

(Continued from p. 236.)

## Family SUBULINIDAE.

This family comprises long elegant acicular glassy shells and the local form has been regarded as an imported alien. However, many specimens were collected by S. W. Jackson years ago in the scrub at Byron Bay, north New South Wales, and many years previously Brazier had found the same shell at the Tweed River. These had been determined as *tuckeri*, the North Queensland shell, with a great extension of its range, although Cox had described a similar shell from Rockhampton nearly eighty years ago with the name *Bulimus walli* which apparently must now be reinstated. The New South Wales shell is ten millimetres long, about 3 mm. broad, the whorls rather flattened, the sutures very finely puckered throughout and the longitudinal striae very delicate. It is here named as a new species, *Opeas ardelio*, the generic name *Opeas* being preferred to *Eremopeas*, used for *tuckeri*, as the apical whorls do not show any concentric striation. It was figured on page 235.

## Family SUCCINEIDAE.

The Amber shells received their name from their coloration, but this feature is not strongly marked in Australian forms. In shape these differ from all the preceding shells, having a short spire and swollen body-whorl, the texture thin and fragile. They recall fresh-water shells in form, and are often mistaken for such, as many dwell in damp places. However, some Australian forms live under the bark of gum trees, generally in clusters, and these are comparatively small. Three species are only admitted in the local list, but there is a probability of many others. The animals in other countries have been dissected and show notable differences, and no anatomical work has yet been done locally. The small tree living form has been separated as *Arborcinea*, the others being allotted to *Austrosuccinea*. The former may be recognised from its habitat and small size, being only 7

mm. long by 4 mm. broad with scarcely any spire; it is ruddy-horn in coloration and is known as *Arborcinea eucalypti*. The other two are much larger, one being over 10 mm. in length, one broader than the other, the latter being coarsely ribbed, but otherwise they are similar. The broader measures 12 mm. long by 9 mm. broad, the narrower being less than 8 mm. for the same length. Both were described from about the same locality, near Mulgoa, the broad one being named *macgillivrayi*, the narrower *nortoni*. It may be noted that these shells are dextral, as some freshwater shells, otherwise not unlike, are sinistral.

#### Family, PARALAOMIDAE.

This family is used for the Australian shells formerly placed in the family Laomidae, a family based on a dissimilar Neozelanic genus. The type of the genus *Para-*



Fig. 4.—*Austrosuccinea nortoni*, *Paralaoma smecosta*, *Arborcinea eucalypti*, *Lotula microcosmos*, *Trocholaoma ringuicola*.

*laoma* was discovered on the Kermadec Islands, and attracted attention because the shells were found in dry places, in crevices in pumice blocks, a very unlikely place to find snails. Since then the genus has been recognised through southern Australia, under dry conditions. Many species occur, but they are so much alike that at one time all were included under the one specific name *morti*. The shells are all very small, less than 3 mm. in breadth and about half that in height, thin, helicoid, mouth open, edge thin, umbilicus variable. The sculpture consists of many very fine ridges, the initial whorls smooth, the umbilicus small, the mouth open, about as broad as high, the form depressed helicoid in the type species *morti*, which was described from the Sydney district. From Byron Bay comes a similar shell with the sculpture consisting of very fine ridges, intervening spaces having threads longitudinally. It is smaller than *morti*, only about 1.75 mm.

in breadth and more depressed, and is here named *Paralaoma sinecosta* sp. nov. From Mount Kosciusko shells are larger and more globose, and more regularly sculptured, and this species is named *Paralaoma gelida* sp. nov. Minute shells of the aspect of *Paralaoma* occur in northern parts of the State, and it is suggested that the shell named *Helix microcosmos* by Cox, and placed in the Basic List under *Sodaleta*, should be transferred to this neighbourhood, and placed under a new genus *Iotula*, the shell very minute, helicoid, thin, base rounded, mouth open, umbilicus minute, the sculpture consisting of very fine radial striae, breadth 1.25 mm., height 1 mm.

I placed under the genus *Paralaoma*, a shell described by Cox from Wollongong as *Helix murphyi*, and which has not been seen since. It is described as a larger shell, about 4.5 mm. in breadth by 4 mm. in height, rather strongly keeled, but otherwise the description reads more like one of this group than any other. The species was named for Murphy, a lad who accompanied Leichhardt's first Expedition, and who, according to Cox, was the first Australian to take an interest in conchology. Some Tasmanian shells, which recall *Paralaoma* but are taller, have been distinguished with the generic name *Trocholaoma*, and a representative has been found within the limits of New South Wales, on Mount Kosciusko, and was recorded at first as *parvissima*, but the local shells are larger and less elevated, with a narrower umbilicus and more pronounced sculpture. This shell measures 1.5 mm. in height and 1.5 mm. in breadth, and was named *Trocholaoma ninguicola*.

#### Family FLAMMULINIDAE.

This family name is retained, although the type of *Flammulina* is a Neozelanic shell, as most of the Australian species belong to Tasmania, and have been shown to be related. While the Mount Kosciusko species, *Flammulops excelsior*, is not unlike the Neozelanic forms, the other two genera admitted in the local list, *Oreokera* and *Hedleyoconcha*, are more doubtful relatives. Thus, *Flammulops* is a thin shell with flattened spire, expanded mouth, no umbilicus, the initial whorls sculptured with fine spiral striae, the adult sculpture being fine radial riblets. Many species live on trees, generally on the trunks, and have a mucous gland at the tail, leaving a notable slimy trail. While this slimy trail is well known through the common European *Helix* leaving it, many of our snails do not leave any appreciable track.

*Oreokera* lives in northern New South Wales, South Queensland, and even to Bellenden Ker Range, North Queensland. Such a range suggests dissociation from the true Flammulinids, but anatomical study is necessary to establish this. Curiously enough, anatomical research led to the association of *Hedleyoconcha* in this family, but a more modern approach will almost certainly justify its separation, as it is very unlike conchologically. However, to revert to *Oreokera*, the type is a depressed helicoid, sub-discoidal, texture thin, mouth oval, broader than high, umbilicus small, columella reflected so as to hide it. In coloration it is horny-brown, rayed with darker reddish-brown, and the sculpture consists of very fine thread-like riblets, which do not persist on the base, where instead can be seen a fine transverse striation. This can be only faintly distinguished on the upper side. It measures



Fig. 5.—*Flammulops excelsior*, *Oreokera dorrigoensis*, *Cralopa intensa*, *Elsothera sericatulá*, *Gyrocochlea vinitincta*.

about 7.5 mm. broad and 3.5 mm. in height, the last whorl being faintly keeled, the outer lip thin. It was named *corticicola*, as it was found living under a piece of bark. Shells from the Dorrigo scrub unexpectedly prove very distinct, being much more closely ribbed above with the ribs continuing on the base, and the spiral striation obscured and scarcely distinguishable. This is the species figured, and it is here called *Oreokera dorrigoensis* sp. nov., the type measuring 8 mm. in breadth by 4 mm. high.

The genus *Hedleyoconcha* placed here by Pilsbry is now removed to the neighbourhood of the family Durgellidae with family rank. In no shell nor animal feature does it show relationship with the Flammulinidae, the recorded characters justifying its separation.

#### Family CHAROPIDAE.

This family includes a very large number of very small snails, varying in size from about 1 mm. to 8 mm., rarely over. They are easily recognised by their discoid shape, with somewhat characteristic sculpture, radial ribs, more or less closely packed. The family is regarded as of great importance on account of its apparent age, and has been commonly used in geographical discussions, a great

American author even imagining a vast Pacific continent to account for the presence of these little snails throughout the Pacific Isles. However, we do know that these shells are more numerous in Tasmania, Southern Australia and the West, showing great similarity in form, so much so that one species was recorded from Mount Kosciusko to Perth.

It is important that everyone of these little snails seen by any naturalist should be collected as they must be examined microscopically to differentiate the species. They are found in damp places, in crevices of dead wood, sometimes under stones, rarely on tree-trunks. The characters for separation are first the features of the initial whorls known as the protoconch, then the umbilical formation, the spire form and the details of the sculpture. The general spire form and umbilical nature can be seen by the naked eye, sometimes the coloration is diagnostic, but the protoconch and sculpture must be criticised under the microscope. Hence many new species await discovery and description, and the few here distinguished serve merely as a suggestion of this cryptozoic fauna. The word "cryptozoic" means hidden life, and it is an excellent word, as no one ever sees any of these minute things without looking for them.

As regards the protoconch it usually consists of one and a half whorls, and is distinctly separated from the adult whorl, usually with discrepant sculpture. It may be smooth, or reticulately sculptured; that is, spiral crossed by radials, or spiral alone. When it is radially sculptured the radials are sometimes obscure, and rarely in agreement with the succeeding adult sculpture. The adult sculpture always consists of crowded radial riblets, the interstices being sometimes smooth, sometimes crossed by spiral lines, and often showing similar radial riblets of extreme fineness. As there may be over one hundred riblets counted on the last whorl, it will be readily acknowledged that a microscope is absolutely necessary.

Consequently no attempt is here made to differentiate exactly the species, but a general idea only is offered, and when a tentative determination has been made, careful microscopic criticism becomes necessary to name correctly any species. In this connection locality is the best guide, and a shell from any new locality is suspect. Eight genera were admitted in the Basic List and more are here used to assist in exact discrimination. In the first genus the shells vary from 3 mm. to over 8 mm., the largest in the



family, and type of the genus *Gyrocochlea*, which may be defined thus:—Shell very small, discoid, spire sunken, widely umbilicated, the protoconch smooth, the aperture unarmed, sculpture of very numerous radial riblets, coloration usually unicolor brown, but sometimes rayed with darker. This diagnosis will be used comparatively rather than reiterate the same items over and over again. Thus the next genus, which I call *Cralopa*, is based upon a species previously included in the preceding genus, but differing in its smaller size, 2.5 mm. or under, its narrower umbilicus and its flat but not concave spire, the only species yet described being *stroudensis*. A third genus, *Elsothera*, agrees in the flat spire, but is slightly larger and bulkier, the sculpture finer, and the umbilicus minute or the shell imperforate, with the protoconch radially ribbed. A fourth, *Allocharopa*, is smaller, more discoid, the protoconch radially ribbed, but the shell widely umbilicate. A somewhat similarly formed genus is *Egilomen*, which is easily separated by the sculpture, consisting of distant prominent riblets, with intervening minute ones, and the essential difference of a smooth protoconch. A rather different group is *Pernagera*, which has the spire elevated, the sculpture with rather coarse riblets predominating, a wide umbilicus and a smooth protoconch. Two groups recall *Gyrocochlea* in general appearance, but have the protoconch spirally grooved. One, *Pillomena*, has the spire concave and the umbilicus narrow, while the other, *Roblinella*, has the spire flat and a wide umbilicus, the former with the sculpture of close ribbing in the letter, the ribs being somewhat distant. An extraordinary development is seen in some species, the ribs developing hair-like processes. The genus is called *Setomedeia*, and the protoconch is smooth, the ribs a little distant, the spire a little elevated and the umbilicus wide. All the preceding groups have the mouth higher than wide, and internally there are no lamellae or teeth, but some similar shells have lamellae inside the lips, both on the inner and outer lips. The genus *Rhopodon* comprises small shells with radial sculpture, as usual, protoconch smooth, spire flat, umbilicus wide and many lamellae, three or four on the inner lip and four to seven on the outer lip. A similar shell with only one lamella on the inner lip and a couple of small ones basally on the outer lip is here named *Letomola* gen. nov., as in addition the protoconch is very large and smooth, the sculpture is zigmoid and somewhat irregular, and the outer lip is sinuate and narrower above and broadened below.

A few notes on the species are now given, but probably many more groups as well as species would be discovered were search undertaken. The genus *Gyrocochlea* inhabits the coastal north of the State, living in the wet scrub, and seven species have been named as follows: *vinitincta*, 8.5 mm. broad by 5.5 mm. high, from the Upper Richmond River, is the largest, usually unicolor brown, with 130 riblets on the last whorl; *omicron*, the next largest, is 6 mm. broad by 3 mm. high, and is particolored, brownish, rayed with darker, and shows almost the same number of riblets, about 125 on the last whorl, and comes from the same locality; from Port Stephens a similar shell, but again smaller, 4 mm. by 2.25 mm., unicolor, and

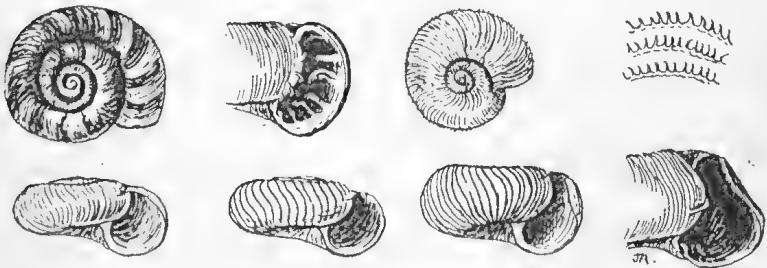


Fig. 6.—Upper row: *Allocharopa brazieri*, *Rhophodon peregrinus* (mouth), *Piliomena nivea* (top), *Setomedea seticosata* (hairs on ribs). Lower row: *Pernagera monticola*, *Egilomen altior*, *Roblinella conjuncta*, *Letomola contorta* (mouth).

with the same number of riblets on the last whorl, these looking more crowded, has been called *conferta*; two others about the same size have been named *impressa* and *prava*, the former being the most southernmost yet found, from Kurrajong, again uniform buff, but with more crowded riblets, one hundred and thirty-two being counted on the last whorl, while the latter, *prava*, comes from the Upper Tweed River, and has as many riblets on the last whorl, is uniform brown with the spire flat, not concave as in the last-named.

The two smallest, 3 mm. across, are similar in coloration and sculpture, being uniform cinnamon, and having one hundred and eight to ten riblets on the last whorl; one, *eurythma*, from the Northern Rivers has the spire flat while the other, *planorbis*, from Port Stephens, has the spire sunken. While the above differences read very slightly, it must be remembered that we are dealing with very small objects and one millimetre difference is very obvious to the eye.

Thus the genus *Cralopa* is recognisable by its comparatively small size, although it is 2.5 mm. broad by 1.25 mm. high; it looks quite small alongside shells of 3.5 to 4 mm. in breadth; the shell is more loosely coiled, more helicoid, though depressed, and has a smooth protoconch, the succeeding sculpture being very fine and sigmoid, over one hundred riblets on the last whorl, while the umbilicus is narrow. The type *stroudensis*, from Stroud, is still unique, but from Byron Bay are similar shells save that the umbilicus is wider and the sculpture still finer, the measurements being the same. This is here called *Cralopa intensa* sp. nov. The genus *Elsothera* has a southern distribution, ranging from Tasmania and South Australia, through Victoria to northern New South Wales. The species are easily recognised by their lack of umbilicus or very small one, and their flat spire and very fine sculpture; four species have been described, *sericatula* from Port Jackson, 5 mm. broad by 2 mm. high, quite imperforate and grey with a silky appearance; *biretracta*, from Wollongong, 5 mm. by 3 mm., yellowish and minutely perforate; *funerea*, from Mudgee, 6 mm. by 2.5 mm., blackish-brown, with a small umbilicus, and *inusta*, from the Clarence River, 6 mm. by 3 mm., brown, with a minute umbilical chink.

The two species of *Allocharopa* are separated by size and sculpture, *brazieri* being over 3 mm. and very finely sculptured, while *belli* is only 2 mm. and comparatively much more coarsely sculptured, both living in the Sydney district. Species of the genus *Egilomen* are characterised by their bold sculpture, the form being similar to that of the preceding. The type *cochlidium*, from the Clarence River, is a very handsome little shell of only a little over 2 mm. broad but white and boldly sculptured. The other three members occur around Sydney, *liratum*, *pexum* and *saturni*, and must be actually compared for distinction, though size will assist, the first-named being 2.5 mm. broad, the second 2 mm. and the last 3.5 mm. Hedley recorded *Endodonta tasmaniae* from Mount Kosciusko, and the shells so named prove to be near *Egilomen*, and are here named *Egilomen altior* sp. nov., being of pallid coloration with a flatter spire and finer sculpture, measuring 3 mm. in breadth by 1.5 mm. high. By a curious lapsus the species *tasmaniae* appears in the Basic List under the genus *Paralaoma*, in the wrong family even.

(To Be Continued)

[Species of the genera *Pernagera*, *Pillomena*, *Roblinella*, *Setomeda*, *Rhophodon* and *Letomola*, figures of which are given on page 268, will be discussed in a subsequent paper.]

NOTES ON THE BENT-WING MOTH  
(*LETO STACYI* SCOTT).

By DR. B. L. MIDDLETON.

This magnificent moth, which measures up to nearly 10 inches across the wings, was first taken by J. E. Stacy between Port Macquarie and Newcastle. Only one other species of *Leto* is known, viz., *L. Venus*, from South Africa, which is smaller than *L. Stacyi*.

Until comparatively recently, the Bent-wing moth has been taken only in the coastal area of New South Wales, between Taree and Gosford, but the late Mr. Luke Gallard has recorded it from Cattai Creek. Mr. G. M. Goldfinch saw two on the wing on Cambewarra Mountain, capturing one of them at light. Mr. W. B. Barnard found them in small numbers near the Queensland border; and a few years ago I located a small colony near Tyringham (Dorrigo plateau), at 3,500 feet.

It is, therefore, not improbable that it will be found in other districts, where the smooth-barked grey gum, *Eucalyptus tereticornis*, occurs, in the trunks of which the larvae feed.

Gallard published an interesting account of this moth in the Australian Museum Magazine, October-December, 1932, p. 408, and, thanks to his kind assistance, I was able, later, to collect about 50 sections of saplings containing the pupae, most of which were successfully bred out at Murrurundi, in February and March.

The process of emergence was interesting and as follows:—A day or two before the event, the pupa would at intervals ascend its bore, appearing with startling suddenness at the upper end and dropping out of sight again, just as abruptly, which resulted in the pushing out of the protecting "wad" at the exit. When, however, the time of emergence was near, the pupa would bend forward into the horizontal opening, but again drop back out of sight, repeating this several times, but at each ascent coming forward a little further, until it finally projected about an inch from the opening. When this stage was reached it returned no more, for the moth would then emerge in a matter of a few minutes. The anterior surface of the pupa always faces upward, so that the furry forelegs at once get a grip on the upper edge of the opening, quickly drawing the moist body from its case. It is a fascinating sight

to watch the rapid expansion of the wings of such a large moth. Emergence almost invariably takes place between 3.30 and 5.30 p.m., nor was it unusual to have a few visitors around about "afternoon tea" time to watch the performance.

Gallard (A.M. Magazine) gives the period of larval development as from two to three years, which from my own observation appears to be correct. Speaking of the eggs, however, which are scattered about in great profusion soon after emergence, he says: "When infertile, they are white in colour, but after fertilization they assume a black velvety appearance". This is not altogether correct, for I have noted that unfertilized eggs when first laid are white, but always change to black in half an hour or so, possibly due to the action of light. I have had no experience of the fertile eggs of this moth, but it is well known that the eggs of many moths darken shortly before they hatch out, owing to the larva showing through the transparent shell, which is quite a different thing.

None of the moths bred out by me was parasited by wasps or flies, but occasionally the long white stem of the *Cordiceps* fungus was found growing out of the bore-hole from the dead pupa, resembling the New Zealand "vegetable caterpillar", which also belongs to the Order *Hepialidac*, but feeds underground. A species of long-horned grasshopper (some of which are carnivorous) is sometimes found in a bore in place of the rightful owner, which has probably been devoured by the new tenant. Another parasite, but by no means a harmful one to its host, which I have found under cover of the protecting web, is the larva of the moth *Tirathaba parasitica*, Lucas. It probably acts as a scavenger, feeding on the excreta of the larger moth, and pupating on the inner surface of the web. This web, which is composed of wood fibres, held together by silk, is spread over the exit hole of the Bent-wing, and is entirely removed just before pupation. It may be that it is used in the manufacture of the "wad" which plugs the bore. *T. parasitica*, however, emerges some time before the removal of this web.

In the Tyringham district, but not at Gosford, the larvae and pupae of *Leto* are not infrequently attacked by the black cockatoo, which also preys upon the smaller wood-boring species of caterpillars. Their method of attack has been described to me by a timber worker at Tyringham, who has seen them at work.

The bird first of all applies its ear to the tree trunk in order to locate the exact position of the grub; then, cutting well above and below this spot with its beak, tears out the strips of wood between, repeating this until a wedge with the apex directly over the grub has been removed and the grub extracted.

I am afraid that the cockatoos may eventually exterminate this little colony, for I noticed quite a number attacked in this way.

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#### REVIEW.

The Fishes of Australia. Part I. Sharks, Rays, etc. By G. P. Whitley, F.R.Z.S. Royal Zoological Society of New South Wales, 1940. 280 pp. 303 figs. 7/6.

This is the first of a series of handbooks dealing with the Fishes of Australia and is complete in itself.

The author has given to the ordinary reader a most informative and fascinating story, told in a lucid and interesting manner, and has combined with this the accuracy required by science for the scientific reader.

It is excellently illustrated and gives in detail the structure and habits of sharks, together with other aspects, including history, mythology, commercial uses, classification, their attacks on human beings, etc., and what will interest many readers are the record sizes and local range of every known Australian species.

An extensive list of Australian shark tragedies and attacks, and a helpful glossary of technical terms are also included.

It is the most comprehensive work on this group in Australia that has ever appeared, and is a very valuable addition to our knowledge of the Australian fauna. One looks forward to the author's Part II, now in course of preparation, which will tell of the true fishes, those which have skeletons of bone instead of cartilage.—E. H. ZECK.

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#### THE SOCIETY'S BADGE.

The Society's Badge may be obtained from the Hon. Secretary or the Hon. Assistant Secretary. Price, 2/- (postage and package extra).

## OBITUARY.

HERBERT JAMES CARTER.

1858—1940.

H. J. Carter was born in Wiltshire, England, in 1858, and died at his home at Wahroonga, New South Wales, on April 16, 1940. Carter was a member of the Council of this Society during 1905-1907 and from 1907-1909 was a Vice-President. He was, at the time of his death, a member of the Society.

He was educated at Aldenham School, and later graduated B.A. at Cambridge University.

From 1881-1902 he was second mathematical master at Sydney Grammar School, and then became Principal of Ascham until 1914.

He was a Fellow of the Royal Entomological Society of London and a Fellow of the Royal Zoological Society of New South Wales. He was President of the Linnean Society of New South Wales, 1925-1926, and was an Honorary Entomologist to the Australian Museum.

He was one of the foremost authorities on many families of Australian beetles, including the *Buprestidae*, *Tenebrionidae*, *Cistelidae*, etc., and his name and work are known throughout the world.

The writer had the pleasure and privilege of working in association and collaboration with him on a Monograph of the Australian *Dryopidae* and a number of other papers on this family of aquatic beetles, and on a Monograph of the Australian *Colydiidae*, and it was always a delight to discuss with him the various aspects of problems which arose during the progress of these papers.

He published more than sixty scientific papers in the Proceedings of various scientific Societies, and a number of interesting articles have appeared in the "Australian Naturalist", the first being published in 1906 (Vol. I., pp. 17-23).

His name is well-known to a wide circle of readers as co-Editor, with the late Arthur Wilberforce Jose, of the "Illustrated Australian Encyclopaedia", published by Angus & Robertson, and as author of "Gulliver in the Bush".

Not only will his loss be felt by his colleagues in science and his numerous personal friends throughout Australia,

but the many "embryos" in entomology, to whom he so willingly gave interesting and welcome advice and encouragement, will also regret his passing. He was also extremely generous to students and others interested in Coleoptera, and his duplicate specimens of named beetles have enriched many collections.

There are those, too, who recall enjoyable days of field excursions spent in his company and many discussions of scientific interest with him, or discourses on the arts, including music.

Australia is poorer, having suffered the loss of one of her all too few, group of systematic entomologists.—E. H. ZECK.

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EXTRACTS FROM THE ANNUAL REPORT OF THE  
HON. SECRETARY (MISS DOLCE DOBBIN).

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The Society has now reached its fortieth year and, although affected to some extent by the international situation, has managed to carry on its work of aiding and endeavouring to stimulate the study of natural history.

During the past year 21 new members were elected and 13 resigned. Four have passed away. These include Mr. H. J. Carter, one of our original members; Right Rev. Dr. J. W. Dwyer, Bishop of Wagga and a noted botanist; Sir Hubert Murray, who did such great work in Papua, and Mr. R. M. Houston.

Our membership is now 234, but we would like to double that number, for only with a large membership can we obtain funds to continue to print our Journal. (Vol. 10, parts 6 and 7), copies of which were forwarded to the leading Universities and libraries of England and America, as well as New Zealand and Australia, and we have had several letters recently from members congratulating the Hon. Editor on recent issues of the Journal, which we much appreciate.

During the past year the lectures have been very varied and most interesting, and we are very grateful to the lecturers who so generously gave their services to the Society.

The following lectures were delivered:—

September (1939).—"Leptospermums," by Edwin Cheel.

October.—"Yarrangobilly Caves," by J. C. Wiburd.



- November.—Members' Night.
- December.—"Marine Collecting in Australia," by G. P. Whitley, F.R.Z.S.
- February (1940).—Members' Night.
- March.—"Some Common Plants of Victoria," by Thistle Y. Harris, B.Sc.
- April.—"Wild Life in Central Africa," by E. J. Bryce, F.R.G.S.
- May.—"Grass Lands and their Improvement in Overseas Countries," by J. N. Whittet, H.D.A.
- June.—Members' Night.
- July.—"Glimpses of Tree Life in New South Wales," by R. H. Anderson, B.Sc. Agr.

Excursions: The two outings a month have been very successful and are being continued. During the year, the places visited were:—Science Students' Cottage at Narrabeen; Castlecrag; Railway Assembly Works, Chullora, on August 26, where the planting of an avenue of jacarandas was completed, at the invitation of the works manager (Mr. White); Janalli to Como; Taronga Park; Brick Pits at Mortdale; Middle Harbour; Hornsby; National Park; Gymea Bay; Lane Cove River; Kurnell to Boat Harbour, thence Cronulla; Botanic Gardens; Forestry Department's Arboretum, Pennant Hills; Bradley's Head; Cooper Park, Woollahra; Northbridge; Mount Kuring-gai to Kuring-gai Chase; Oatley Park; Ball's Head and Dobroyd Head. The 9th annual tree-planting at Ball's head was held in conjunction with the North Sydney Council, and over 100 trees were planted.

The mid-monthly meetings have come to be a feature of our Society, and it is difficult to understand why more members do not take advantage of attending, for under the leadership of Mr. Watson, Mr. Zeck and Mr. Hasemer, we have been helped greatly towards a better knowledge of our plant and insect world. On behalf of those attending, I would thank those leaders for the time they have spent in preparing the material and the interesting manner in which they have helped us.

I would like to thank, on behalf of the Council, our Hon. Editor (Mr. E. H. Zeck) for his continued good work, and Mr. G. White for his help at all our meetings, for our Hon. Lanternist plays a very important part. We are greatly indebted to the Department of Education for the use of the hall for our meetings, and for the use of the library for our mid-monthly meetings, and we much appreciate their assistance to us.

## NATURALISTS' SOCIETY OF NEW SOUTH WALES.

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Proceedings.

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MARCH, 1940.

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The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, March 5, 1940, at 8 p.m.

The President (Mr. A. E. Watson), in the chair, with about 40 members and visitors present.

Correspondence.—The correspondence was dealt with at the Council meeting.

Election of Members.—Mr. T. McCarthy, Mr. Tom Iredale, Mr. Errol Johnstone, and Miss Hilda Butler were unanimously elected members of the Society.

Announcements.—The President announced that news had been received of the death of Mrs. Linton, of Somersby, Mangrove Mountain, and recalled the several happy days some members had spent at the home of Mr. and Mrs. Linton. Members asked that a letter expressing sympathy be sent to Mr. Linton by the Secretary.

Mr. Watson also announced the death of Sir Hubert Murray, and a motion of sympathy with his relatives was passed.

Exhibition of Specimens.—Mr. Frank Hasemer: Specimens of the beetles *Arthropterus westwoodi* and *A. puncticollis*, collected at Euston, N.S.W., by W. W. Froggatt.

Mr. David G. Stead.—Specimen of the little red-bellied snake, *Pseudelaps squamulosus*, which had been captured in Pacific Street, Watson's Bay.

Mr. A. E. Watson.—Specimens of fossils from Jamberoo, New South Wales, and sisal hemp with very strong fibres.

Miss Hilda Butler.—Collection of pressed specimens of plants from the Sydney district, which were being sent to Tasmania by Mr. Watson in exchange.

Mr. M. S. Barnett.—Mentioned having found a snake of the same species as exhibited by Mr. Stead.

Mr. C. S. Ashley.—Specimens of brush forest plants, including *Tristania*, *Eugenia*, *Acacia*, *Ficus*, etc.

Miss T. Y. Harris.—Seedlings of plants, of from 2 to 4 months' growth, including *Angophora Bakeri*, *Casuarina torulosa*, several species of *Acacia* and *Eucalyptus eximia*.

Lecture.—Miss T. Y. Harris, B.Sc., delivered an extremely interesting address on "Some Common Plants of Victoria", illustrated with numerous lantern slides, photographed and coloured by Mr. H. T. Reeves, a member of the Field Naturalists' Club of Victoria. The slides represented a collection of Victorian wild flowers. In moving a vote of thanks to the lecturer, Mr. David G. Stead suggested that the Society send a note of appreciation to Mr. Reeves for his work in connection with the photography and coloration of the slides, and for the privilege of allowing members to see them. In conclusion, the lecturer was accorded a hearty vote of thanks.

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APRIL, 1940.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, April 2, 1940, at 8 p.m.

The President (Mr. A. E. Watson), in the chair, with about 40 members and visitors present.

Correspondence.—The correspondence was dealt with at the Council meeting.

Exhibition of Specimens.—Mr. John Powell: Specimens of stoneless dates, from a palm, grown from seed, that fruited after fifteen years.

Mr. E. C. Bailey.—Specimen of Arabian coffee plant.

Mr. J. Hawley.—Specimen of the blue-berry ash, *Eleocarpus*, and a species of *Solanum*.

Mr. A. E. Watson.—Specimen of *Dioscorea transversa* raised from seed brought to a meeting several months ago by Mr. C. S. Ashley.

Lecture.—Mr. E. J. Bryce, F.R.G.S., delivered an extremely interesting lecture on "Wild Life in Central Africa", illustrated with numerous lantern slides from photographs taken by Mr. and Mrs. Bryce on their tour from the Cape to Cairo. The scenes depicted various phases of life amongst the natives and the wild animals. The lecturer was accorded a very hearty vote of thanks.

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MAY, 1940.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, May 7, 1940, at 8 p.m.

The President (Mr. A. E. Watson), in the chair, with about 25 members and visitors present.

Correspondence.—The correspondence was dealt with at the Council meeting.

Nomination of Members.—Miss J. R. White, 3 Keys Avenue, Dulwich Hill. Nominated by Mrs. A. E. Watson, seconded by Miss Dolce Dobbin.

Exhibition of Specimens.—Miss D. Dobbin: Specimen of a hawk moth, *Chromis erotus*, captured at Greenwich.

Lecture.—Mr. J. N. Whittet, H.D.A. (Chief Agrostologist, Department of Agriculture, N.S.W.), delivered an extremely interesting and informative address on "Grass Lands and Their Improvement in Overseas Countries", illustrated with numerous lantern slides from photographs taken in England, America and various European countries. The lecturer was accorded a very hearty vote of thanks.

#### JUNE, 1940.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, June 4, 1940, at 8 p.m.

The President (Mr. A. E. Watson), in the chair, with about 30 members and visitors present.

Correspondence.—The correspondence was dealt with at the Council meeting.

Election of Members.—Miss J. R. White was unanimously elected a member of the Society.

Nomination of Members.—Miss Hope Ewart, 4 Violet Street, Chatswood. Nominated by Miss D. Dobbin, seconded by Miss M. Davidson. Miss D. Howie, 24 Dudley Street, Coogee. Nominated by Miss Jordan, seconded by Miss Ross. Miss E. Hurrell, 146 Bland Street, Haberfield. Nominated by Miss Jordan, seconded by Miss Ross.

Announcements.—The President (Mr. A. E. Watson), announced that Miss T. Y. Harris had generously offered to donate 100 trees for planting at Ball's Head, to augment the funds of the Society, and that the tree planting would take place on June 29, 1940.

The President also stated that arrangements had been made for members to view Mr. Marshall's film, "Roving Coral Seas", at the Teachers' Federation Hall, Phillip Street, on July 13, 1940, the proceeds going to a war fund.

The President also told members of the proposed tree-planting at the new cemetery at French's Forest, and that he and Mr. Hamilton had been elected by the Council to

represent the Society at any meeting in connection therewith.

Mr. Watson also told members about the camp he had attended on the Lachlan River, and of the work done and excursions to surrounding districts.

The President also mentioned that the Journal just issued was a very fine one, and congratulated the Hon. Editor (Mr. E. H. Zeck) and contributors on same.

Members' Evening.—Mr. A. E. Hamilton: Collection of coloured photographs of orchids.

Mr. W. F. Blakely.—Described as new a number of plants collected by Mrs. B. A. Dale, in Central Australia, for Miss Jean Buckingham. Mr. Blakely also exhibited for Miss Buckingham a very rare and imperfectly known Flannel flower, *Actinotus schwarzii* F. v. M., from Central Australia.

Miss Gina Ballantyne.—Specimens of local varieties of *Acacia* and *Callistemon*.

Mr. A. E. Watson.—Plants collected at Euabalong and district, including the rare *Eucalyptus bicolor* with red and white flowers, *Bossiaea*, *Acacia*, *Hakea*, etc. Mr. Blakely stated that *Eucalyptus bicolor* was first collected by Allan Cunningham. He said also that although he had examined great numbers of specimens, Mr. Watson's specimen showing both types of flowers was one of the best he had seen.

Mrs. Pring.—Collection of various seeds which were described by Mr. Blakely.

Miss Ewart.—Specimens of various insects, including a pupa of *Papilio sarpedon* (Blue Fanny butterfly), a hawk-moth, wasps and beetles.

Mr. John Hawley.—Described the excursion to National Park.

#### JULY, 1940.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, July 2, 1940, at 8 p.m.

The President (Mr. A. E. Watson), in the chair, with about 35 members and visitors present.

Correspondence.—The correspondence was dealt with at the Council meeting.

Election of Members.—Miss Hope Ewart, Miss D. Howie, and Miss E. Hurrell were unanimously elected members of the Society.

Nomination of Members.—Miss Florence E. Tweedie, 42 Bland Street, Ashfield. Nominated by Miss T. Y. Harris, seconded by Miss D. Dobbin.

Announcements.—The President (Mr. A. E. Watson), announced that the annual tree-planting at Ball's Head was held on June 29, 1940, and that the trees had been donated to the Society by Miss T. Y. Harris.

Exhibition of Specimens.—Mr. H. Doherty: Specimen of a *Protea*, a native plant of South Africa.

Miss Winifred Rosling.—Specimen of the inner bark of a Kurrajong tree, *Sterculia* sp., from the North Coast brush forests.

Mr. A. E. Hamilton.—Parasites of a "curl grub" or Scarab beetle larva.

Mr. C. S. Ashley.—Botanical specimens from Queensland and a species of *Banksia* from Millthorpe (N.S.W.).

Miss Gina Ballantyne.—Botanical specimens sent by Dr. Webster from Woodstock.

Lecture.—Mr. R. H. Anderson, B.Sc. Agr. (Government Botanist), delivered an extremely interesting lecture, entitled, "Glimpses of Tree Life in New South Wales", which was illustrated with numerous lantern slides. The lecturer was accorded a very hearty vote of thanks.

#### AUGUST, 1940.

The annual meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, August 6, 1940, at 8 p.m.

Mr. G. A. McKenzie, B.A., Director of Education, was in the chair. The President (Mr. A. E. Watson), and about 50 members and visitors were present.

Apologies were received from Mr. J. Powell, Miss L. Kaylock, Miss W. Rosling, Miss T. Y. Harris, Miss Cromnelyn, and Mr. Embury.

Mr. Fifield and Miss Irby (country members), wrote, wishing the meeting every success.

Announcements.—The President announced the death of Mrs. Powell (wife of the Hon. Treasurer), which occurred on August 3, 1940, and also that Mr. J. C. Wiburd was seriously ill.

New Members.—Miss F. E. Tweedie was unanimously elected a member of the Society.

Nomination of Members.—Miss M. I. Hinde, c/o G.P.O.,

Sydney. Nominated by Miss T. Y. Harris, seconded by Miss D. Dobbin.

Secretary's Report.—The report of the activities of the Society for the past year was read by the Hon. Secretary (Miss D. Dobbin).

Treasurer's Report.—In the absence of the Hon. Treasurer (Mr. John Powell), the treasurer's report was read by the Hon. Secretary.

Presidential Address.—The President (Mr. A. E. Watson) delivered his address, which was entitled "Broken Bridges".

Amendment of Rule 8.—It was moved by the President that Rule 8 be amended to read after the words "Hon. Assistant Librarian", "and twelve other members as herein provided". This amendment was carried unanimously.

Election of office-bearers for the year 1940-1941:—

President: Mr. A. E. Watson.

Vice-Presidents: Messrs. M. S. Barnett, E. H. Zeck, A. E. Hamilton.

Hon. Treasurer: Mr. John Powell.

Hon. Assistant Treasurer: Miss L. Kaylock.

Hon. Secretary: Miss Dolce Dobbin.

Hon. Assistant Secretary: Miss L. Halloran.

Hon. Editor: Mr. E. H. Zeck.

Hon. Librarian: Mr. A. Booth.

Hon. Assistant Librarian: Miss Dorothy Booth.

Hon. Lanternist: Mr. Geoffrey White.

Hon. Assistant Lanternist: Mr. E. C. Bailey.

Other Members of Council: Mrs. A. E. Watson, Misses Marjorie Davidson, Thistle Y. Harris, Winifred Rosling and D. Ross, Messrs. C. S. Ashley, H. Doherty, J. W. Hawley, F. J. Ludowici, S. T. Turner, and J. C. Wiburd.

Publication Committee: The President, Hon. Editor and Hon. Secretary.

Exhibition of Specimens.—Mr. David G. Stead: Lantern slides, demonstrating special peculiarities of various animals, fish and birds.

Mr. A. Booth.—A display of various books and periodicals from the library of the Society, available to members.

Mr. E. Gostelow.—Original water colour paintings of a large number of Australian birds.

Mr. Edwin Cheel.—A large collection of various species of *Myrtaceae* grown in his garden at Ashfield, and numbers of other botanical specimens.

Mr. A. E. Hamilton.—A collection of photographs of exquisite flowering orchids and a specimen of *Grevillea*.

Mr. M. S. Barnett.—A large collection of named native flowers in bloom at the present time (August) in the sandstone area near Sydney, and specimens of bauxite and magnetite.

Mr. A. E. Watson.—Collection of flowers indigenous to Tasmania.

Mr. J. Hawley.—Aboriginal carved walking sticks, from 450 miles from Perth, West Australia, also right-hand boomerang.

Mr. E. H. Zeck.—Collections of entomological specimens, including butterflies, coccid galls, etc.

Mr. C. S. Ashley.—Specimens of shells, quartz crystals, pipe-organ coral. Starfish and fresh-water mussels, ferns and a species of *Casuarina* from Queensland.

Mr. J. W. Hawley.—Botanical specimens from the Nullabor Plains.

Miss M. Davidson.—Collection of pressed indigenous flowers.

Miss Gina Ballantyne.—Pressed specimens of 60 varieties of indigenous flowers representing 7 orders.

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#### SEPTEMBER, 1940.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, September 3, 1940, at 8 p.m.

The President (Mr. A. E. Watson), in the chair, with about 35 members and visitors present.

Correspondence.—The correspondence was dealt with at the Council meeting.

New Member.—Miss M. Hinde was unanimously elected a member of the Society.

Exhibition of Specimens.—Mr. M. S. Barnett: Specimen of a lizard, *Amphibolurus barbatus*.

Mr. Frank Hasemer.—Specimens of lizards from Broken Hill and larvae of buprestid beetles.

Mr. E. J. Bryce.—Specimen of an introduced weed.

Lecture.—Mr. Melbourne Ward, F.Z.S., F.R.Z.S., delivered an extremely interesting address on "The Marine Fauna of New South Wales". The lecture was illustrated with many beautiful lantern slides, made from photographs



taken in the coastal area from Bateman's Bay to Brisbane. The lecturer was accorded a very hearty vote of thanks.

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OCTOBER, 1940.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, October 1, 1940, at 8 p.m.

The President (Mr. A. E. Watson), in the chair, with about 30 members and visitors present.

Correspondence.—Letter from Chief Secretary's Department, asking for suggestions re new Act for Protection of Fauna and Flora. Trustees of French's Forest thanking the Society for the gift of trees and co-operation in the recent tree-planting at the cemetery. Other correspondence dealt with at Council meeting.

Exhibition of Specimens.—Miss Gina Ballantyne: Specimens of *Eucalyptus* and *Angophora*.

Mr. J. Hawley.—Seed-pods of Moreton Bay Chestnut, *Castanospermum australe*; also seed pods of Sugar-tree, which resembled an Acacia.

Mr. C. S. Ashley.—Seed pods of the Illawarra Flame Tree, *Brachychiton acerifolius*, and native plants from Brighton Beach.

Lecture.—Dr. A. B. Walkom (Secretary Linnean Society, N.S.W.), delivered an extremely interesting and informative address, the title of which was "What is *Glossopteris*?" The address was illustrated with lantern slides, showing specimens of the fossil plant known as *Glossopteris*. Dr. Walkom asked that any fossils found of this particular plant, which at present seems only known from leaves, be preserved and handed to a specialist for examination. The lecturer was accorded a very hearty vote of thanks.

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NOVEMBER, 1940.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, November 5, 1940, at 8 p.m.

The President (Mr. A. E. Watson), in the chair, with about 45 members and visitors present.

Correspondence.—Letter from Chief Secretary's Department re proposed Act for preservation of Fauna and Flora was discussed. A committee, comprising Mr. M. S. Barnett, Mr. J. W. Hawley, Mr. J. C. Wiburd, Mr. A. E. Hamilton and the President (Mr. A. E. Watson), with power to add to the number, was formed to discuss the matter.

Members' Night.—Miss Winifred Rosling: Lantern slides, illustrating various types of native flowers.

Mr. John Hawley.—Lantern slides, illustrating the growth of trees at Ball's Head, and also trees of interest growing in the suburbs of Sydney.

Mr. M. S. Barnett.—Specimens of a liverwort.

Mr. S. Herriott.—Specimens of a gall insect, *Cylindrococcus spiniferus*, found on *Casuarina*.

Mr. E. C. Bailey.—Specimens of various plants—succulents.

Mr. C. S. Ashley.—Fossils showing *Glossopteris*, pressed plants from North Queensland and *Casuarina* from the Barrier Reef district.

Mrs. C. J. Rudder.—Specimens of leaves from Woy Woy.

#### THE PAPER NAUTILUS (ARGONAUTA).

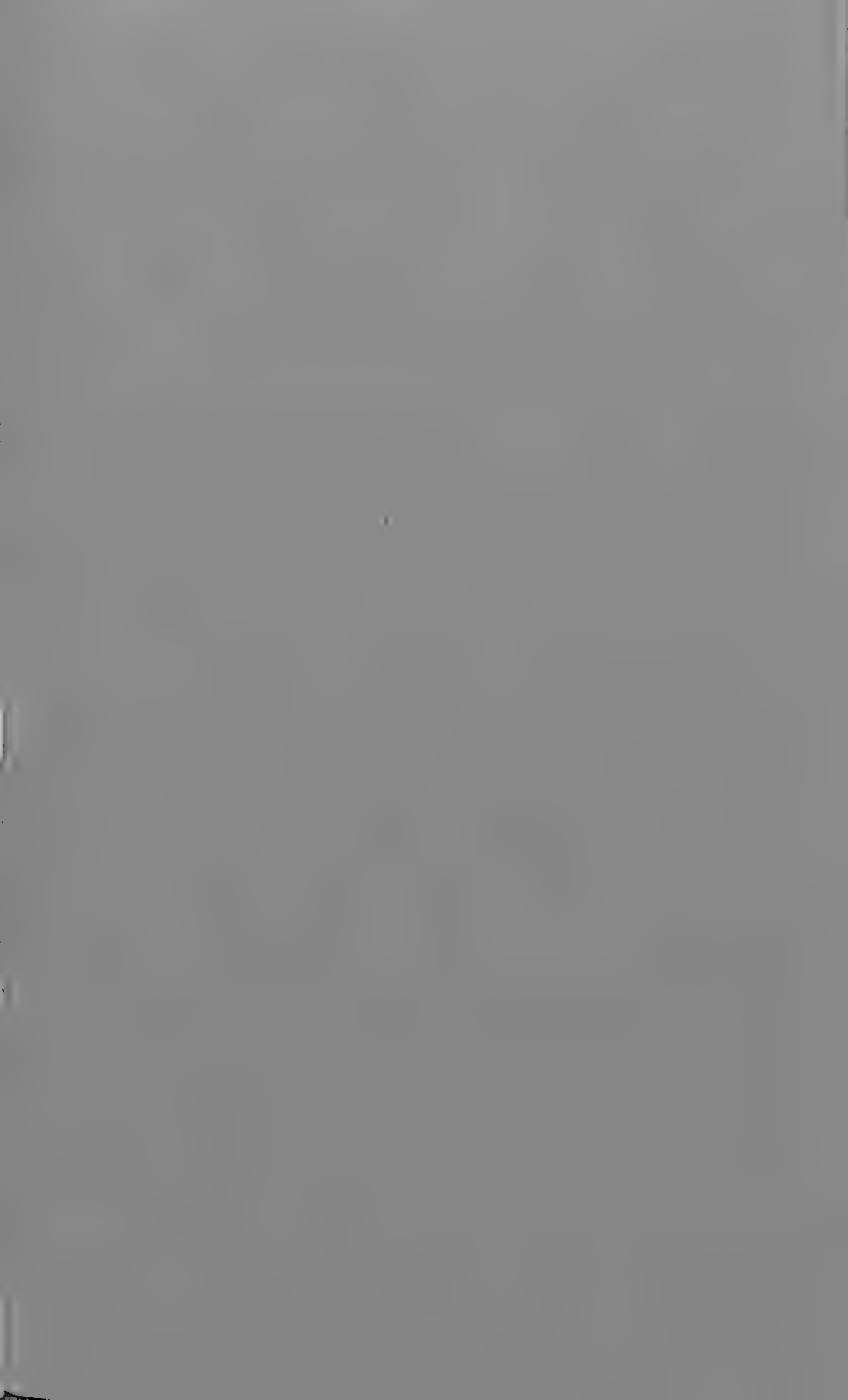
Light as a flake of foam upon the winds,  
Keel upward from the deep emerged a shell,  
Shaped like the moon ere half her horn is filled  
Fraught with young-life, it righted as it rose,  
And moved at will along the yielding water.  
The native pilot of this little bark,  
Put out a tier of oars on either side;  
Spread to the wafting breeze a twofold sail,  
And mounted up and glided down the billow  
In happy freedom pleased to feel the air  
And wandered in the luxury of light.

—Author: JAMES MONTGOMERY.

(The author has been allowed latitude and extended liberty to misconstrue facts.—J. W. Hawley.)

#### CORRECTIONS.

- p. 12.—First line should appear as footnote to p. 11.  
p. 30.—11 lines from bottom, for "*staceyi*" read "*stacyi*."  
p. 86.—21 lines from top, for "Cockatos, *Calyptrorhynchus*"  
read "Cockatoos, *Calyptrorhynchus*."  
p. 101.—12 lines from bottom, for "expreience" read "ex-  
perience."  
p. 104.—6 lines from bottom, for "heighth" read "height."  
p. 108.—Transpose lines 25 and 26 from top.  
p. 221.—7 lines from bottom delete "to."  
p. 225.—15 lines from bottom, for "Blakeley" read "Blakely."  
p. 256.—5 lines from top, for "*Discorea*" read "*Dioscorea*."





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## NORTH ON SOME WINTER-FLOWERING WATTLE.

Owing to the very dry and rather warm winter, several species of wattle, both wild and cultivated, in the district between Roseville and Hawkesbury River, have flowered earlier this year than during the previous 32 years. Those under cultivation are—*Acacia pedicularifolia*, May, June, July, 30 days earlier; *A. Baillyana*, June, July, 29 days earlier; *A. decurrens*, July, 15 days earlier.

Specimens in their native setting:—*A. fulcata*, May, June, July, 29 days earlier; *A. hispida*, June, July, 16 days earlier; *A. juniperina*, April to July, 29 days earlier; *A. longissima*, Wendi (*A. linearis*), April to July. This species flowers every month in the year; its slender branchlets make a charming setting for Iceland Poppy blooms. *A. myrtifolia*, June, July, 17 days earlier; *A. stricta*, mid-April to July, 15 days earlier; *A. sancticola*, May to July, 29 days earlier. All the above species were still in flower on July 30th, 1941.—W. P. BRADLEY.

## NATURALISTS' SOCIETY OF NEW SOUTH WALES.

### FINANCIAL STATEMENT, 31st JULY, 1941.

Receipts.		Expenditure.	
	£ s. d.		£ s. d.
Subscriptions . . . . .	53 17 6	Balance Due to Treasurer . . . . .	8 16 1
Sales . . . . .	4 0 0	Education Department . . . . .	19 3
Badges . . . . .	1 2 0	Postage . . . . .	1 14 0
Donations . . . . .	4 16 0	Circulars . . . . .	12 9 6
		Journal . . . . .	17 16 1
		Balance in Hand . . . . .	8 4 7
	£49 19 6		£49 19 6

JOHN POWELL, Hon. Treasurer.

Audited and found correct.

STANLEY P. ALLEN, F.C.A. (Aust.),

31/7/1941.

Hon. Auditor.

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THE AUSTRALIAN NATURALIST.

from the North Coast, which had 3 to 4 flowering periods in a season.

Miss Gma Ballantyne.—Specimens of Fennel and *Clerodendron tomentosum* from the Colo River.

Miss M. Davidson.—Specimens of plants showing fasciation, a flannel flower, *Actinotus*, and an everlasting flower, *Helichrysum*.

Lecture.—Mr. J. C. Wiburd delivered a very interesting and instructive address, entitled, "Old Slides of Jenolan and Wombeyan Caves". Slides of old Sydney were also exhibited. The lecturer was accorded a very hearty vote of thanks.

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CHICAGO, ILLINOIS 60637

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# The Australian Naturalist

Vol. XI.

SEPTEMBER, 1941.

Part 1.

GUIDE TO THE LAND SHELLS OF NEW SOUTH WALES.

By TOM IREDALE.

(Contribution from the Australian Museum.)

PART III.

(Continued from Vol. X., Pt. 8, p. 269.\*)

Continuing with the members of the family *Charopidae*, the genus *Pernagera* is of southern distribution, ranging across from Tasmania to West Australia, reaching into New South Wales along the mountain tops. Two species have been recorded from Mount Kosciusko, the Western Australian *albanensis* and the North Tasmanian *tamarensis*; apparently only one species is there found, smaller and less boldly sculptured than *stanleyensis* which represents *albanensis* in North Tasmania, and recalling *tamarensis*, but it is a little more elevated and with finer sculpture and is therefore here named *Pernagera monticola* sp. nov. *Pillomena* is another southern group, the only named species in New South Wales being the Mount Kosciusko *nivea*, but immature specimens have been seen from the Blue Mountains. Another group of southern origin, *Roblinella*, seems to range into Southern Queensland, and a species from Byron Bay is here named *Roblinella conjuncta* sp. nov., measuring 4 mm. broad by 2 mm. high, the spire scarcely sunken, the umbilicus wide, sculpture of about eighty spaced riblets on the last whorl, the interstices finely threaded.

The genus *Setomedea* was founded upon a striking shell from the Dorrigo, named *seticostata*, nearly 4 mm. in

\**Pernagera*, *Pillomena*, *Roblinella*, *Setomedea*, *Rhophodon* and *Letomola* were figured in the previous part, p. 268.

breadth and 2 mm. high, the bristly riblets being very noticeable. A species tentatively allotted here was named *aculeata* from Wollongong, and is much smaller, less than 2.5 mm. across, the spire flatter and the umbilicus wider.

This leaves three species which have the aperture furnished with lamellae, all from the northern coastal district. All are minute, flattened, and the two called *Rhophodon peregrinus* and *R. consobrinus* are found on the Tweed River, the former measuring 2 mm. in breadth, with more than ten lamellae, the other 2.5 mm. with only seven lamellae. The genus *Letomola* is founded on *R. contortus* from the Macleay River, measuring 2 mm. across with the characters above given.

The succeeding twenty odd species are most confusing and troublesome to separate and determine, showing little distinction in their small shells of thin glassy texture. Anatomical examination of the animals has, however, shown much distinction in many features, but still their classification is very difficult. There are few specialists in snail dissection, and even the few have differed as to the valuation of the characters recognised. Thus the radula or teeth bearing ribbon shows many similar teeth, and the number varies considerably, while sometimes the teeth can be differentiated. Little has been done in connection with Australian forms, so we are compelled to use that little in conjunction with the shell features associated with it. However, at once, there are difficulties, as it is found that the anatomists utilised shells without accurate determination, and thus have recorded data not applicable to the shell named. Firstly, *Mussonula verax* was recently described (Austr. Zool., Vol. ix., p. 13, pl. 1, fig. 11, November 12, 1937) from the North Pine River, South Queensland, and there are specimens in this Museum labelled Richmond River, N.S.W. I am mentioning this so that search can be made for it as the locality may be incorrect. It is a striking looking little shell, and was referred to the family Paralaomidae, but it might be better to allow it a family of its own until the animal is thoroughly examined.

Next come what are known as the Zonitid molluscs, as contrasted with the solid coloured Helicoid forms to be later dealt with.

#### Family NITORIDAE.

This family includes the larger glassy shells from half to one inch across, depressedly conical and minutely um-

bilicated, the outer lip being thin. Sculpture is scarcely noticeable, being sometimes microscopic spiral lines and faint radial wrinkles, no ribs nor nodules ever being produced. The first one, *Nitor subrugatus*, is about half an inch across, half that in height, thin, whorls flattened, last whorl rather strongly keeled, buff in colour and showing radial plications above, but the base is smooth. The umbilicus is very narrow, but open, the columella not reflected across it. It was described from the Clarence River, and specimens from Wollongbar, Richmond River, are smaller, more elevated, darker, plications less marked, and the umbilicus narrower, and was figured by Cox under the name *moretonensis*; it may represent a distinct subspecies, *N. s. helmsianus* subsp. nov., after the collector, Richard Helms, who collected many land shells at different



Fig. 7.—*Nitor pudibundus*, *Nitor subrugatus*, *Melocystis circumcinctus*, *Nitor medioximus*, *Alienitor lyndhurstensis*, *Expocystis exclusus*.

times. The type measures 11.5 mm. in breadth by 7.5 mm. in height.

Mr. S. W. Jackson collected a large series of a different species "crawling on a small creeper on the ground known as Buttonweed" in the Dorrigo Scrubs. This shell is of a honey colour, smaller than the preceding, measuring 10 mm. by 5.5 mm., less keeled, and with the upper plications obsolete, a very fine spiral striation present, the umbilical characters as above, and this is here named *Nitor medioximus* sp. nov.

It may be noted here that Reeve's *moretonensis*, a name commonly associated with the preceding species, proves to have nothing to do with this group, and was probably given to a juvenile specimen of *Meridolum morosum*. There is a larger *Nitor*, described from the Richmond River, which almost reaches an inch across, and is easily recognised by its paler colour, its more solid shell, and its smooth upper surface, while the umbilicus is narrower, the columella more thickened and reflected, while the keel on the last whorl is almost or completely missing. It was called *pudibundus*, and while the type measured 16 mm. by 9 mm., the one here figured is 19 mm. by 10 mm.

Under the name *jacksoniensis*, the species described by Cox as *circumcincta* was placed, and a generic name, *Melocystis*, introduced as the shell features were different and the radula had been described by Odhner as very different from that of the similar shells, *Expocystis* and *Tarocystis*, referred to the family Microcystidae. Apparently Odhner's radular data belong to the Queensland form of *Nitor subrugatus*, whose shell is very similar to that of *circumcincta*. The name *jacksoniensis*, purporting to be given to a shell collected near Port Jackson, collected by Allan Cunningham, has nothing to do with this species, and appears to be referable to a foreign shell, mixed, perhaps in London, with Cunningham's collection, and must be entirely rejected from our fauna. The name to be used for the Sydney shell must then be *circumcinctus*, described from Kiama, and it may be placed alongside *Nitor* for the present, the generic name *Melocystis* being preserved. The shell is smaller than any of the preceding, measuring 10 mm. by 5 mm., fawnish, upper surface smooth, keel on the last whorl obsolete, the umbilicus very narrow, spirally striate within, the columella reflected across it.

#### Family MICROCYSTIDAE.

Smaller Zonitid shells with more flattened spire and rounded periphery, showing different animal features are classed tentatively in this family. Although *Melocystis circumcinctus* is removed to the previous family there are representatives in this State, maybe a number, as they are very difficult to deal with. One is here named to keep this matter in front, the shell being of a darker brown, more solid, though still thin texture, the mouth smaller, the columella thickened and reflected, the umbilicus narrow and engraved with fine spiral lines within. The type from Broken Bay measures 8 mm. by 4 mm. and is named *Expocystis exclusus* sp. nov.

A much smaller, glassy shell, of a different appearance, was called *Alienitor lyndhurstensis*, with the doubt that it might be an introduced alien. It is whitish, with the upper surface a little radially wrinkled, the columella not reflected and the umbilicus more open than in any of the preceding. It only measures 6 mm. in breadth by 2.5 mm. in height, and the specimen figured is from the Urara River, in the north, among ferns in the bush.



## Family HELICARIONIDAE.

Now we come to the slug-like snails. It may be explained that slugs are only snails that have lost their shells through being able to manage without them, having adopted carnivorous habits. There is only one native slug in New South Wales, the large green, brown, or pink one with a red-lined triangle on its back. A full account of this has been given by Miss Allan in the Australian Museum Magazine, Vol. v., p. 3, 1933, with illustrations. It can always be recognised as it has only two tentacles. The common destructive ones met with in the gardens have four tentacles and are all European species, accidentally introduced. Our native slug, whose name is *Triboniophorus graeffei*, is a night feeder which does not attack our vegetables, living among native refuse. The slug-like snails recall the slugs in their long elongate crawling bodies, but they have a very delicate simple shell on their backs. The animal has a curious square cut end to its tail and the sole of the foot shows three distinct divisions. The shell is very frail and flattened, sometimes a little globose, with scarcely any calcification, the base being even weaker than the upper surface and the shells can scarcely be handled

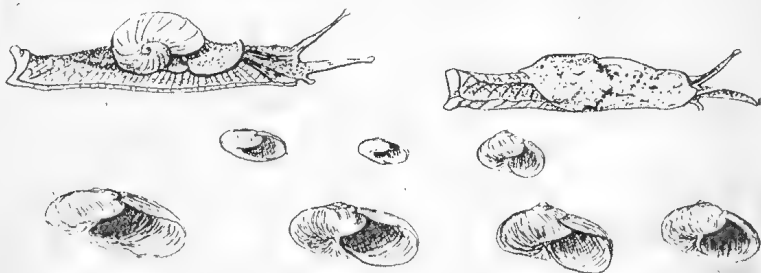


Fig. 8.—*Helicarion* animal, *Cystopelta* animal, *Helicarion leopardinus*, *Peloparion submissus*, *Mysticarion leucospira insuetus*, *Desidarian dispositus*, *Parmavitrina planilabris*, *Vercularion aquila*, *Vercularion freycineti*.

with safety. While there is not much character in the shell the animals differ anatomically and sometimes superficially, and are of different styles of coloration, which make them recognisable at sight. That excellent observer, Mr. Sidney W. Jackson, collected a number of species, and made coloured paintings of the animals, but unfortunately these have not been published. The name *Helicarion* was given by the Frenchmen, who noted their half-way step from *Helix*, the snail, to *Arion*, the slug. The typical one was found in South Tasmania, and has a thin flattened

shell with a weaker base and a black animal. This has been recorded by Hedley from Mount Kosciusko, and as far north as Blackheath. The northern species seems to differ as Mr. Melbourne Ward collected specimens at Mount Irvine, and the animal was pale grey with pink eye stalks, the shell smaller, greenish in colour, and more excentrically coiled, measuring 8.5 mm. in breadth and 4 mm. in height, and may be called *Helicarion porrectus* sp. nov.

A similarly formed shell of a bright golden colour was named *H. mastersi* from Kiama, and this apparently extends along the coast as far south as Twofold Bay, where Mr. Ward also collected it, stating that the animal was uniform dark grey. The animal of *mastersi* was recorded as whitish, and, as the shell of the Twofold Bay animal is more tightly coiled, measuring 10.5 mm. in greatest breadth by 9 mm. in less breadth, it is named as a subspecies *H. mastersi callidus* subsp. nov., the typical form measuring 11 mm. by 7.5 mm.

Another species which may tentatively be allotted to *Helicarion* was collected by Mr. S. W. Jackson in the Ourimbah Scrubs, and named *leopardina* on account of the spotted animal. The shell is greenish, tightly coiled similar to the Twofold Bay shell, but thinner and mouth less expanded, measuring 10 mm. by 8 mm. The common shell round Sydney has been called *robustus*, but must bear the name *freycineti*, which was given many years earlier, but was unfortunately confused with the true *Helicarion*. The shell is more solid and less membranous though still very thin, and belongs to the genus *Vercularion*, proposed for a Queensland shell, but here again the shells are so similar that the local form was recorded from Cape York. The radula shows a similar number of major teeth but has almost twice as many laterals. This species ranges as far southward as the Shcalhaven, but in the north of the State is represented by *virens*, described from Moreton Bay. The animal of *virens* is grey similar to that of *freycineti*, but the latter has the sides of the foot red, a noticeable feature. The shell in each case is bright green, but the northern ones have the apex whitish, in which state they have been confounded with *leucospira*. The spire is scarcely elevated, and the last whorl is well expanded, but deep, not flattened, measuring 18 mm. by 13 mm. broad by 12 mm. in height.

Living alongside in the north is the Queensland *aquila*, a similar shell, more brownish in colour, with the apex

elevated, a little papillate, the spire more tightly wound and therefore the mouth less expanded. The animal is brown with black spots, according to Mr. S. W. Jackson. It measures 16 mm. by 13 mm. by 10.5 mm.

It had better be mentioned that *strangei* appears to be a synonym of *virens*, and that *aquila* is the correct name for the second species. This species is referable to *Vericularion* at present, but it may be separated later and associated with the species known as *leucospira*. This was described from "Australia" as very globose and was re-introduced to literature for a small globose shell found living on trees at Scone. Upon referring specimens for confirmation to the British Museum authorities the identity was accepted, but it was noted that the local shells were only half the size of the type. As our specimens show a very small animal, I am introducing a new genus, *Mysticarion*, basing it on the Scone shell, which is here described as *Mysticarion leucospira insuetus* subsp. nov. The shell is small, globose, spire elevated, very thin, golden green, columella straight, measuring 9 mm. by 7.5 mm. broad and 5 mm. high.

Other tree-living forms are the very opposite in shape—small, under 10 mm. in length, being flattened, mouth expansive and base membranous. A species from Elizabeth Bay, Sydney, was anatomically examined by Godwin Austen, who found it very different from the typical *Helicarion*. Superficially, the animal was black, with a long neck, longer than the tail, and the radula had only a small number of lateral teeth. It was called *helenae*, but someone later asserted it was the Queensland *hyalinus*, and had been imported into the Sydney habitat. While there is a similar shell living in Moreton Bay it cannot bear the name *hyalinus*, as that species was described as globose, which this is not. Cox noted that the small species lived at the Richmond River, and it has also been found at Scone, while Mr. S. W. Jackson collected similar shells at Randwick, but has recorded the animals as "yellowish". The generic name *Peloparion* was proposed for the local shell, being based on the anatomical features. The Scone shell does not agree with paratypes of *helenae*, being much smaller, 6-7 mm. by 4.5 mm., the spire shorter, the mouth less expanded and may be called *Peloparion submissus* sp. nov., while the northern ones are larger, 9 by 5 mm., with the mouth less expanded and the spire similarly short. It may be that these cover animals distinct from the true

*Peloparion*. The base in all the species is so thin that it is generally missing in dead shells; and the shells can scarcely be handled at all without fracture. At the other end are the large very flattened shells, somewhat more solid above but with a membrane basally, the mouth very expanded, which have been called *Parmavitrina*. The type was called *planilabris*, and reaches nearly an inch (23.5 mm.) in length, with up to 18 mm. in breadth, pale olive green, the spire fairly regularly coiled, but the last whorl much expanded. Cox stated that the animal exuded a purple stain, but this action belongs to *megastoma*, a similar shell, measuring 16.5 mm. by 11 mm., but darker in colour, with the mouth more expansive still and the spire whorls smaller and more excentric.

A shell, recalling *Parmavitrina*, lives at Barrington Tops, but the spire is not so flattened, and the base is not replaced by a membrane. It is large, measuring up to an inch in length, 18 mm. broad, and 10 mm. high, the spire whorls regularly wound. Fortunately, the animal features superficially distinguish it as the right shell lobe nearly covers the spire, while the left is also notable. In other Australian members of the family the left shell lobe is obsolete and the right one only appears as a small tongue. This extraordinary form is therefore named *Desidarion dispositus* gen. sp. nov. It may be noted that the spire whorls of most, if not all, of the species are very finely microscopically spirally engraved. This sculpture may be seen in the largest species with a good lens, but it appears to be always present, and is not diagnostic.

#### Family CYSTOPELTIDAE.

A Tasmanian slug was named *Cystopelta* and later recorded from Victoria, then Mount Kosciusko, Blackheath and Barrington Tops, New South Wales. It has been anatomically examined, but there is still a lot to learn, though it appears to be a shell-less relation of the preceding family. A figure is here given of the Tasmanian *petterdi*, drawn by C. Hedley, from life, but the local animals may differ, the Mount Kosciusko form having been called *C. astra*, the northern ones not yet studied.

(To be continued.)

## ADDITIONS TO THE FLORA OF CENTRAL AUSTRALIA.\*

By W. F. BLAKELY.

## LEGUMINOSAE.

*Acacia Basedowi* Maiden, var. *viridis* var. nov.

A forma specifica phyllodiis viridibus, glabris, stipulis minoribus et deciduissime, capitulis minoribus, floribus paucioribus, omnino glabris, differt.

A small, glabrous, slightly spinescent shrub, with pale green, substrate and minutely scurfy branches when young, greenish-brown when old, stipules minute, deciduous. Phyllodia linear-spathulate, slightly concave, very finely 3-nerved and somewhat longitudinally wrinkled, 10-12 mm. long, 1.5 mm. broad, with a small circular gland at the apex. Peduncles 4-6 mm. long, glabrous, bearing each a globular head of 9-15, 5-merous flowers. Floral bracts numerous, concave, ciliate, as long as the flowers. Calyx slightly lobed, united, but easily separated into distinct sepals. Petals glabrous, lanceolate, broader than the sepals. Ovary obliquely oblong, quite glabrous. Only immature pods seen, much curved and very narrow. Standly Chasm, 40 miles west of Alice Springs, Central Australia, Mrs. B. A. Dale, per Jean Buckingham, 17/7/1939. It differs from the species in the green and glabrous phyllodia, smaller and very deciduous stipules, smaller heads, with few and perfectly glabrous flowers.

## MYRTACEAE.

*Melaleuca Daleana*, sp. nov.

Frutex grandis, ramulis minute pubescentibus. Folia numerosa, alterna, sessilia, concava, uninervia, tenuiter pubescentia, acuminato-lanceolata, 5-8 mm. longa, 1-2 mm. lata. Spicae primo terminales jam infraterminales, pubescentes, 1-2 cm. longae. Flores albi, distantes, raro folia oppositi; calyx globosus; sepala triangularia, acuta, venulosa, calycis tubo aequilonga; petala hyalina, orbicularia, concava, 2 x 2 mm.; fasciculi staminales multo petala excedentes; stamina haud minora quam 20; stylus gracilis, staminibus brevior; stigma parvum; fructus immaturus globosus.

\*Received for publication, April 17, 1941. This article and the short notes by Mr. Blakely included in this issue are the last received from him for publication. It is with great regret that we have to announce that he died suddenly at his home on September 1, 1941.—[Ed.]

A large shrub, the branchlets minutely pubescent. Leaves numerous, sessile, alternate, acuminate lanceolate, concave, 1-nerved, thinly pubescent with soft, spreading hairs, 5-8 mm. long, 1-2 mm. broad. Spikes terminal, but soon infraterminal, pubescent, 1-2 cm. long. Flowers white, distant, rarely leaf opposed. Calyx globose, the very acute triangular lobes venulose or strongly 3-nerved, about as long as the tube, the whole 3-4 mm. long. Petals hyaline, orbicular, concave, 2 x 2 mm. Staminal bundles on a broad claw, much exceeding the petals; stamens 20 or more. Style slender, shorter than the stamens; stigma small. "A large shrub with sweetly scented flowers; a picture when out". Connor's Well, 60 miles north of Alice Springs, Central Australia, Mrs. B. A. Dale, October, 1939, per Jean Buckingham, the type. A specimen from Cloncurry, Queensland, Captain S. A. White, is in immature fruit, the calyx tube is distinctly globular, and the short, triangular lobes erect and faintly 3-nerved.

The species name is in compliment to Mrs. B. A. Dale, of Alice Springs, who discovered this and other interesting plants which are noteworthy additions to the flora of Central Australia. Near the composite *M. pubescens* Schauer, from which it differs in the sessile acuminate-lanceolate 1-nerved erect or curved leaves, pubescent, leafless spikes, globular, pubescent calyx tube, acute, triangular venulose sepals, orbicular petals and longer staminal bundles.

It should make a very handsome garden shrub for dry areas; and flowers profusely during October and November.

#### UMBELLIFERAE.

##### *Actinotus Schwarzii* F. Muell.

Grows in the cracks of high cliffs at Standly Chasm, also found at Glen Helen, 100 miles west of Alice Springs, Mrs. B. A. Dale, per Jean Buckingham, 7/1939.

Imperfect material of this tropical Flannel Flower was collected on Mount Sonder, Macdonnell Ranges, Central Australia, by the Rev. W. F. Schwarz in 1886 and 1888.

According to Mueller, it is the only species that reaches the tropics of Capricorn, and is also the only one which extends to Central Australia.

It resembles our common Flannel Flower in habit, attaining a height and expansion of about 2 feet, but the petioles are round, not strap-shaped and channelled like

those of the Port Jackson plant. The bracts are 5-nerved, whereas in our plant they are pennernerved or branch from the midrib.

## GOODENIACEAE.

*Scaevola Daleana*, sp. nov.

Suffretex 15-34 cm., ramosissimus, valde hirsutus, nodis inferioribus dense lanatis; folia infima adhuc non visa; folia caulina sessilia, angusto-lanceolata cordatave, crassa, 1-3 cm. longa, 2-6 mm. lata; folia floralia parva, bracteosa. Flores breviter pedicellati, ramulis brevibus terminalibus dispositi; sepala lanceolata, rigida, multo breviora quam dense hirsutum receptaculum; corolla venulis pullis multis, caerulea jam alba, 15 mm. longa, intus extusque dense hirsuta; stylus compressus, glaber; indusium dorso dense hirsutum. Fructus immaturus ovatus, muricatus, parum hirsutus, 6 x 5 mm.

A much branched, rigid undershrub of 15-34 cm., the stems apparently arising from a persistent rootstock, the lower portion densely woolly at the nodes, the rest of the stemmy branchlets, leaves and flowers very hirsute, with erect, rigid hairs. Basal leaves not seen; stem leaves sessile, cordate to narrow lanceolate, thick, 1-3 cm. long, 2-6 mm. broad, the floral leaves much smaller and bract-like. Flowers shortly pedicellate, on short terminal branchlets, sepals lanceolate, rigid, much shorter than the ovate, densely hirsute receptacle. Corolla blue, but soon turning white, with numerous darker veins, 15 mm. long, densely hirsute inside and outside. Style compressed, glabrous; indusium densely hairy on the back. Fruit ovate, muricate, slightly hirsute, 6 x 5 mm., but not seen in a mature state. Ovary 2-celled.

Connors Well, Central Australia, Mrs. B. A. Dale, per Jean Buckingham, October, 1939, the type; Victoria Desert, Camp 53 and 59, Elder Exploring Expedition, R. Helms, 15th and 23rd September, 1891. It has almost the general appearance of *S. ramosissima*, but the habit is different, leaves and flowers smaller, and the fruit is more globular.

*Goodenia Armitiana* F. v. M., var. *multicaulis* var. nov.

A forma specifica caulibus pluribus, rigidis, resinosis, foliis brevioribus, floribus majoribus differt.

Erect glabrous, slightly viscid perennial, with numerous, slender, wiry stems, 20-30 cm. high, stem leaves linear-terete, obtuse, sessile or decurrent, 10-20 mm. long, 0.5 mm. in diameter. Floral leaves terete, solitary or in clusters,

3-5 mm. long. Peduncles 1-flowered, axillary, usually solitary, 10-12 mm. long; pedicels 3-4 mm. long; bracteoles absent; sepals scurfy, linear-lanceolate, acute, 3-4 mm. long; corolla yellowish, minutely glandular-pubescent outside, 10-12 mm. long, the 2 upper lobes auriculate, with a tuft of white hairs on the lower margin of the auricles; style long, partly hairy, the indusium densely ciliate. Capsule compressed ovoid, 7 x 7 mm. the dissepiment ciliate, nearly reaching to the top of the capsule; seeds numerous, orbicular, including the broad wing, 6 mm. in diameter. It is remarkable for its numerous stems, over 150 were counted on a single rootstock. Connors Well, Central Australia, Mrs. B. A. Dale, per Jean Buckingham, October, 1939, the type.

It differs from the species in the more rigid, viscid, wiry branches, much smaller stem leaves, linear floral leaves, larger flowers, compressed capsule, larger, ciliate dissepiment, and more numerous seeds.

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#### NOTES ON *ASTEROLASIA*.

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*Asterolasia Buckinghamii* (Blakely) Blakely, n. comb.; recorded in error as *Phebalium Buckinghamii*, Blakely, in Aust. Nat., x., 246, 1940. Its nearest affinity is *A. asteriophora* (F. Muell.) Druce (*Phebalium asteriophora*, F. Muell.), which it resembles in general appearance, but is readily distinguished from it by the uniformly spathulate leaves and smaller solitary sessile terminal flowers. According to Mueller's original description of *P. asteriophora*, the umbels are generally three-flowered, axillary and terminal. Since the species was described, *A. Buckinghamii* has been found, by W.J. and Jean Buckingham, and the author, 2 miles S.E. of Wingello Railway Station, or 6 miles south of the previous record, and it in no way differs from the type.

*Asterolasia asteriophora* (F. Muell.) Druce, in 2nd supp. Soc. & Exc. Club Rept., 1916, 606 (1917). (*Phebalium asteriophora* F. Muell.) *A. Muelleri* Benth. This species extends from Mount Disappointment in Victoria to gullies around Lobbs Hole, N.S.W.—W. F. BLAKELY.



## NATURALISTS' SOCIETY OF NEW SOUTH WALES.

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Proceedings.

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DECEMBER, 1940.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, December 3, 1940, at 8 p.m.

The President (Mr. A. E. Watson), in the chair, with about 35 members and visitors present.

Correspondence.—The correspondence was dealt with at the Council meeting.

Nomination of Members.—Miss Ivy Wright, Grove Street, Marrickville. Nominated by Mr. John Hawley, seconded by Miss D. Dobbin. Mr. G. Susmilch, 32 Liverpool Road, Summer Hill. Nominated by Mr. John Hawley, seconded by Miss D. Dobbin. Mr. H. Aubrey, Arthur Street, French's Forest. Nominated by Miss D. Dobbin, seconded by Mr. A. E. Watson. Mr. H. S. Deed, 294 Moore Park Road, Paddington. Nominated by Mr. S. T. Turner, seconded by Mr. A. E. Watson. Reverend A. Satchell, Mountford Avenue, Guildford. Nominated by Mr. S. T. Turner, seconded by Mr. A. E. Watson.

Announcements.—The President (Mr. A. E. Watson), announced that the Ball's Head Reserve would not be affected by the removal of stone and soil from near that area being used for filling elsewhere.

Mr. John Hawley described the outing to Ball's Head.

Exhibition of Specimens.—Mr. C. S. Ashley: Seed pod of Devil's Burr and Queensland fish.

Mrs. C. J. Rudder.—Emu's egg and a buffalo's tusk from Timor.

Mr. A. E. Watson.—Specimens of *Stephania hernandi-folia*.

Lecture.—The Revd. A. J. Dyer, Rector of Carlingford, delivered an extremely interesting and informative address on his "Peace trip to Caledon Bay". The Revd. Dyer is well-known by his mission work in the Northern Territory amongst the aborigines. The lecture was illustrated by many fine lantern slides, made from photographs taken during his trip. The lecturer was accorded a very hearty vote of thanks.

FEBRUARY, 1941.

The ordinary monthly meeting of the Society was held in the Annexe, Teachers' Federation Building, on Tuesday, February 4, 1941, at 8 p.m.

The President (Mr. A. E. Watson), in the chair, with about 24 members and visitors present.

Correspondence.—The correspondence was dealt with at the Council meeting.

Election of Members.—Miss Ivy Wright, Mr. G. Sussmilch, Mr. H. Aubrey, Mr. H. S. Deed and Revd. A. Satchell were unanimously elected members of the Society.

Nomination of Members.—Mrs. F. E. Burton, "34 Franconia", 25 Macleay Street, Pott's Point. Nominated by Mr. Clark Chambers, seconded by Miss D. Dobbin. Miss Beatrice Watts, Inglethorpe Avenue, Kensington. Nominated by Miss D. Dobbin, seconded by Miss Luckie.

Announcement.—The Secretary (Miss D. Dobbin), announced the death of Mr. Buckingham, father of Jean Buckingham, and was instructed to write a letter of sympathy to her.

Mr. John Hawley described the outing to Heathcote Creek, held on Anniversary Day.

Members' Night.—Mr. John Hawley: Collection of seeds of various trees, which he described, and later distributed to members.

Master Lionel Orton.—Exhibited specimens on behalf of Mrs. C. J. Rudder. These included a star-shaped cactus flower, piece of pudding stone, clay from near Katoomba, and a large shell of the Pearl Oyster, which had contained a pearl.

Mr. Clark Chambers.—A collection of plants from the Nullabor Plains and miniatures of native weapons from Ooldea Soak Mission, sent to his father by Revd. Noel Chambers, a former member.

Miss Gina Ballantyne.—Specimens of *Angophora* and other native plants forwarded by Dr. Clarke Webster (East Gresford), and two specimens of spiders. Specimen of canary creeper, *Billardiera scandens*, showing transparent seed-pod and arrangement of seeds.

Mr. J. C. Wiburd.—Exhibited a curiosity, a door-step made from tobacco tins.

Mr. A. Booth.—Specimens of New Zealand shells and barnacles.

Mr. C. K. Ingram.—A large collection of pressed plants from the North Coast and Tablelands. These included a number of *Eucalyptus* showing the difference between juvenile and adult leaves and the diversity of their fruits, *Angophora* and *Callistemon*.

Mr. F. J. Ludowici.—Forwarded a list of native plants found at Ball's Head, which had been particularly noticed by members. These included *Melaleuca styphelioides*, *Clerodendron tomentosum*, *Notelaea longifolia*, *Eriostemon Crowei* and *Choretrum lateriflorum*.

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MARCH, 1941.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, March 4, 1941, at 8 p.m.

The President (Mr. A. E. Watson), in the chair, with about 65 members and visitors, including about 30 girls and their teacher (Miss Golding), from Riverside Domestic Science School, present.

Election of Members.—Mrs. F. E. Burton and Miss Beatrice Watts were unanimously elected members of the Society.

Nomination of Members.—Rev. Father Wilfred, Mary's Mount, Goulburn. Nominated by Mr. A. E. Watson, seconded by Miss D. Dobbin.

Announcements.—Mr. J. C. Wiburd discussed the outing to East Lindfield.

Exhibition of Specimens.—Mr. John Hawley: Exhibited a collection of various seeds, which included those of *Cassia occidentalis*, Japanese hawthorn, *Dracaena australis* and *Bauhinia*.

Mr. C. S. Ashley.—Specimen of oyster and a tussock moth.

Mr. A. E. Watson.—Two specimens of *Cassia*, one from Africa and a local species and specimen of the family *Euphorbiaceae*.

Lecture.—Miss Marie B. Byles, B.A., LL.B., F.R.G.S., delivered an extremely interesting lecture entitled "Through Burma and South West China", illustrated with numerous lantern slides, which depicted various phases of life

amongst the inhabitants and showed the character of the countries traversed. The lecturer was accorded a very hearty vote of thanks.

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APRIL, 1941.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, April 1, 1941, at 8 p.m.

The President (Mr. A. E. Watson), in the chair, with about 30 members and visitors present.

In the absence of the Hon. Secretary (Miss D. Dobbin), Miss Winifred Rosling read the minutes of the previous meeting.

Correspondence.—The correspondence was dealt with at the Council meeting.

Election of Members.—The Revd. Father Wilfred was unanimously elected a member of the Society.

Nomination of Members.—Mrs. Dunn, 82 Upper Pitt Street, Kirribilli. Nominated by Miss E. Wright, seconded by Miss B. Coxhead.

Exhibition of Specimens.—Mr. H. Aubrey: Specimens of *Grevillea buxifolia*.

Miss Peterson.—Bunch of Choko vine showing both male and female flowers.

Mr. A. E. Watson.—Collection of botanical specimens, including a fruiting specimen of *Eugenia myrtifolia*.

Mr. C. S. Ashley.—Specimen of an insect larva which ringbarks Eucalyptus trees.

Lecture.—Mr. Allan Colefax, B.Sc., Lecturer in Zoology, Sydney University, delivered a most informative and instructive address, entitled, "Poisonous Animals". The lecture was illustrated with numerous lantern slides, and a very hearty vote of thanks was accorded the lecturer.

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MAY, 1941.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, May 6, 1941, at 8 p.m.

The President (Mr. A. E. Watson), in the chair, with about 45 members and visitors present.

Correspondence.—The correspondence was dealt with at the Council meeting.

Election of Members.—Mrs. Dunn was unanimously elected a member of the Society.

Nomination of Members.—Mr. W. H. Davidson, Inglethorpe Avenue, Kensington. Nominated by Miss Marjorie Davidson, seconded by Miss Gina Ballantyne.

Exhibition of Specimens.—Miss R. Suttor: Specimens of "Kapok" plant, *Asclepias*, one of the food-plants of the Brown wanderer butterfly, *Danaida plexippus*.

Mr. S. T. Turner.—Specimen of *Eucalyptus* attacked by the Scale insect *Eriococcus coriaceus*.

Miss Gina Ballantyne.—Seed-pod of *Brachychiton* and various plant specimens forwarded by Dr. Webster from East Gresford, also specimens of *Acacia longifolia*, *Acacia discolor*, *Epacris pulchella* and *Ricinocarpus* collected at Port Stephens.

Mr. A. E. Watson.—Specimen of *Podocarpus elata* and a West Australian *Pittosporum*.

Mr. C. S. Ashley.—Specimen of silk made from Kauri gum, young kangaroo and eggs of fish.

Mr. John Hawley gave an account of the outing to Kurnell.

Lecture.—Mr. T. C. Roughley, B.Sc., F.R.Z.S. (Superintendent of Fisheries), delivered an extremely interesting and informative address, entitled, "Australian Fisheries". In the course of his address he discussed the various methods employed in the capture of fish and their preservation after capture, and also spoke of the very necessary protective measures which should be exercised to allow their proper development and to prevent their depletion. The lecturer was accorded a very hearty vote of thanks.

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#### JUNE, 1941.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on June 3, 1941.

The President (Mr. A. E. Watson), in the chair, with about 25 members and visitors present.

Correspondence.—Letter from Mr. Gapp, Secretary, Burragorang Protection League, was read by the Hon.

Secretary (Miss D. Dobbin), and the President (Mr. A. E. Watson), asked members to express their views on the matter, and mentioned that it would be only in one respect (that of interest in the loss of a sanctuary and preservation of natural beauty) that the Society would join in any protest to the Government in the proposed completion of the Warragamba Dam. Mrs. Gapp spoke in regard to same, and Mr. Doherty said we should be represented at meetings.

The Hon. Secretary suggested that Mr. Watson and Mr. Wiburd, both of whom knew Burragorang Valley well, be appointed to attend the meeting called by the Burragorang Protection League as observers and for them to report to the Society at the next meeting. Mr. Ashley proposed that Mr. Watson and Mr. Wiburd represent the Society. Miss Ross seconded, and after further discussion it was carried.

Election of Members.—Mr. W. H. Davidson was unanimously elected a member of the Society.

Members' Night.—Mr. C. S. Ashley: Specimen of volcanic rock from Maitland district which was described by Mr. Doherty. Specimen of a mantis from Tuncurry.

Miss Marjorie Davidson.—Specimen of gold from Dunolly, Victoria.

Dr. Clarke Webster.—Specimen of spider from East Gresford. Seeds and plant specimens and beetles from Jamberoo. The plants were described by Mr. Ingram.

Mr. John Hawley.—Dried specimen of flowers of the golden chain tree from England.

Miss D. Ross.—Fruit of avocado pear or alligator pear, native of America, which has been introduced into and is now growing commercially in Australia.

Mr. A. E. Watson.—Specimens of native grapes: *Vitis hypoglauca*, *Celastrus*, *Elaeodendron australe*, *Atriplex nummularium* (old man salt bush), *Banksia spinulosa*, *Casuarina suberosa*, *Bossiaea*, *Acacia* and *Grevillea*.

Miss Gina Ballantyne.—Specimens of various species of *Grevillea* which were described by Mr. Ingram.

Mr. C. K. Ingram.—Exhibited a large collection of pressed specimens of various grasses and sedges.

Mrs. Clark Chambers.—Specimen of nose of anti-aircraft plane and 2 pieces of shrapnel dated 1917.

Mr. John Hawley.—Lantern slides, showing Wilson's Glen, Blue Mountains; specimens of *Angophora*; a Bech

forest in the Cotswolds, England; various scenes in Gloucestershire, England; London and on the shores of the Mediterranean.

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JULY, 1941.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, July 1, 1941, at 8 p.m.

The President (Mr. A. E. Watson), in the chair, with about 35 members and visitors present.

Nomination of Members.—Miss Alma Burgess, Singleton. Nominated by Mr. M. E. Gray, seconded by Miss D. Dobbin. Mr. T. H. Pincombe, Northbridge. Nominated by Mr. A. E. Watson, seconded by Miss D. Dobbin. Dr. Kate Pariser, Frances Street, Bondi. Nominated by Miss D. Dobbin, seconded by Mr. A. E. Watson.

Announcements.—The President (Mr. A. E. Watson), discussed the Burratorang Valley scheme and gave his report on the meeting of the Burratorang Valley Protection League. Miss T. Y. Harris moved that the chairman's report be accepted, and that the Society could enter a protest, only in the matter of spoliation of the natural beauty of the valley. She thought the Society should not co-operate with the League. Mrs. Matthews moved that the Society should take part. Miss Ballantyne seconded Mrs. Matthews' motion. Miss Harris asked for a seconder for her motion, and Mr. Ludowici seconded same. The Chairman then put the motion to the meeting, asking for a show of hands as to whether the Society co-operate with the Burratorang Valley Protection League or not. Members voted for co-operation with the League 11, against 7.

Exhibition of Specimens.—Mr. C. S. Ashley: Specimens of Blade mangrove from Avoca and New Zealand Christmas bush.

Miss Ivy Wright.—Seeds of tung oil tree, the oil from which is largely used in the manufacture of varnishes.

Miss Gina Ballantyne.—Collection of various species of *Grevillea*.

Lecture.—Dr. Kate Pariser delivered a very interesting address, entitled, "Men and Nature in Spain", illustrated with lantern slides. The lecturer was accorded a very hearty vote of thanks.

AUGUST, 1941.

The annual meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, August 5, 1941, at 8 p.m.

Mr. B. C. Harkness, Chief Inspector of Schools, was in the chair. The President (Mr. A. E. Watson), and about 75 members and visitors, were present. Mr. Harkness apologised for the unavoidable absence of the Director of Education, Mr. G. A. McKenzie, who was away in the country.

New Members.—Miss Alma Burgess, Mr. T. H. Pincombe and Dr. Kate Pariser were unanimously elected members of the Society.

Nomination of Members.—Miss Lilian Whiting, c/o Messrs. Stevenson and Turner, 16 Barrack Street, Sydney. Nominated by Miss D. Dobbin, seconded by Miss M. Davidson. Miss Myra White, 84a Concord Road, North Strathfield. Nominated by Mr. G. White, seconded by Mrs. Froggatt. Mr. B. C. Harkness, Department of Education, Sydney. Nominated by Mr. S. T. Turner, seconded by Mr. A. E. Watson. Mr. A. R. Hetherington, 143 Forest Road, Arncliffe. Nominated by Mr. H. S. Deed, seconded by Mr. S. T. Turner.

Secretary's Report.—The report of the activities of the Society was presented by the Hon. Secretary (Miss D. Dobbin).

Presidential Address.—The President (Mr. A. E. Watson), delivered a short presidential address.

Election of office-bearers for the year, 1941-1942:—

President: Mr. S. T. Turner.

Vice-Presidents: Messrs. A. E. Watson, E. H. Zeck, A. E. Hamilton.

Hon. Treasurer: Mr. John Powell.

Hon. Assistant Treasurer: Miss L. Kaylock.

Hon. Secretary: Miss Dolce Dobbin.

Hon. Assistant Secretary: Miss L. Halloran.

Hon. Editor: Mr. E. H. Zeck.

Hon. Librarian: Mr. Albert Booth.

Hon. Assistant Librarian: Miss Dorothy Booth.

Hon. Lanternist: Mr. Geoffrey White.

Hon. Assistant Lanternist: Mr. A. Booth.

Other Members of Council: Mrs. A. E. Watson, Misses Marjorie Davidson, Thistle Y. Harris, Winifred Rosling and



D. Ross, Messrs. C. S. Ashley, H. S. Deed, H. Doherty, J. W. Hawley, C. K. Ingram, F. J. Ludowici, and J. C. Wiburd.

Publication Committee: The President, Hon. Editor and Hon. Secretary.

Exhibition of Specimens.—The special features of the evening were the exhibits of apparatus and materials used in the teaching of nature study to school children. Miss T. Y. Harris, B.Sc., gave an introductory talk on the exhibits and on the aims of teaching nature study to school children. The exhibitors in this section were then asked to discuss their exhibits and methods of teaching.

Mr. J. Denham, Demonstration School, Forest Lodge.—This exhibit demonstrated the parts played by trees as hosts for insects. The materials had been collected by the school children, and these included a collection of bark and timbers showing insect invasion. The exhibit also indicated how each type of bark sheltered different insects.

Mr. H. V. Doherty, Public School, Kingsgrove.—The exhibits, which were described by Mr. Doherty, illustrated his method of teaching nature study with special reference to botanical and geological associations.

Miss T. Y. Harris, Teachers' College, Sydney.—Spoke of seed germination as a basis of nature study teaching, classification of plants and insects, potting seedlings, composition of soil and demonstrated simple soil analysis and germination of seeds in different ways, showing the beginning of plant life. Miss Harris also exhibited childrens' nature study books and drawings.

Mr. C. K. Ingram, Demonstration School, Haberfield.—Described his method of teaching nature study and showed his system of tabulating the insect collections of the children. The diagrams illustrated the periods of occurrence of the various insects.

Mr. S. T. Turner, Public School, South Granville.—Described his treatment of nature study and the planting of trees grown in the school nursery. As the trees grew, birds and insects arrived, indicating that each had its place in the study of nature. Mr. Turner also exhibited pupils' books containing drawings from nature.

Mr. A. Booth.—Display of various books and magazines, and illustrated periodicals from the Library of the Society, available to members.

Mr. A. E. Watson.—A very fine collection of some 48 species of Tasmanian plants. Of these some 8 species were

indigenous to Tasmania alone. Mr. Watson also exhibited metal flower pots for seedlings and a home-made altimeter for determining approximate latitude of any place.

Mr. E. H. Zeck.—Collection of insects showing protective colouration or mimicry and collection of gall insects.

Mr. E. Gostellow.—Exhibited a collection of his excellent water colour drawings of native wild flowers and plants.

Miss Gina Ballantyne.—Collection native flowers, including 10 species of *Grevillea*, 14 species of *Acacia* and 19 species of pea flowers (*Leguminosae*).

Mr. C. S. Ashley.—Collection of interesting types of shells and specimens of various types of minerals.

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### THE BAOBAB TREE.

(A COMMENT AND A REPLY.)

Following on a short note on the baobab tree (*Adansonia Gregorii*), given in this Journal by Mr. J. W. Hawley (Vol. 10, pt. 8, cov. iii.), Dr. L. Clarke Webster, now at East Gresford, has written that he was very interested in Mr. Hawley's remarks and submitted the following comments (May 30, 1941), which he thought may prove of interest to members. "Mr. Hawley says:—'The trees are indigenous to tropical Africa, and exotic to Australia—how, when and whence they came is a puzzle to students—land bridges and lost and drifting continents, to solve and to explain'.

"I do not think we have far to seek for the cause of its presence in Australia.

"1st.—If we take a map of the world (Mercator's projection), we will notice several remarkable examples of drifting continents plus subsidences. Let us take the east coast of South America which fits into the opposite West African coast; Papua will fit into the Gulf of Carpentaria and the remainder lie along the Queensland coast inside the Great Barrier Reef; the east coast of England from above the Thames Estuary and along the South Coast fit into the opposite French coast. Tasmania and Victoria offer very conclusive proof of subsidence, giving us Bass Strait, with its very numerous islands, islets, shoals and reefs and shallow waters nowhere more than 40 fathoms deep.

"2nd.—Certain flora are to be found in southern Tasmania, southern New Zealand, and the very southern portion of South America and nowhere else. Why? Re the Baobab Tree: I have 6 varieties of Asters collected by me on the Coolgardie Goldfields, which the late Mr. Reuhmann, then Curator of the Melbourne Botanical Gardens, asserted strongly to me never came from Coolgardie, but from South Africa. He asked—'How did they get to Australia?'

"3rd.—In Western Australia there are two big belts of very ancient granite, outcropping here and there, running parallel (but widely separated from the south coast of W.A.) right up to the southern bank of the Fitzroy River, and ceasing abruptly. The same granite formation occurs, I am told, in tropical Africa. Another strange thing is that this river is the southern limit of the Alligator, as it is with its namesake in Queensland.

"4th.—Our aborigines have the same numerals as the ancient Egyptians had, and have some of the same legends and stories—e.g., Hathor and Thuthu—both are supposed to have come originally from the Land of Punt, in tropical Africa, and both had the same boomerang.

"5th.—An old friend of mine, years ago, Dr. Victor Streich, a member of the Elder Expedition to the Kimberlies, and also Professor Sir Ray Lancaster, of the British Museum, whom I also knew, said that a great part of Western Australia was under water (the sea) at one time. This was their explanation of the presence of Obsidian Bombs which I had discovered there and given them samples. These I found on Lake Goongarrie (90 Mile) in West Australia."

#### DRIFTING CONTINENTS.

The following note on "drifting continents" has been offered by Mr. J. W. Hawley (July, 1941), in reply to Dr. Clarke Webster:—

"If we make Africa the fixed anchorite of the drifting continents and Australia the juvenile migrant with its elevated geological horizons of recent history, we still find a semblance between the concave coast of East Africa and the convex west coast of Australia. We also find that all continents and islands have similar contours on the lee and windward coastal shores.

"If we allow the ancient granite bands tending south to north to act as girders, we must take into consideration

the plain of Nullabor with its extensive area of limestone caves, tropical shells and remnants of a cretaceous age. The granite waistbands existing, consist of a conglomerate of pre-existing irregular fragments of minerals, quartz, felspar and mica, held together with a combination of vari-coloured ingredients, red, black or grey, neutralising or destroying one another.

"Now we turn eastward to a meridional line, Spencer Gulf to the Gulf of Carpentaria, where we find evidence of an ancient sea, which divided Australia into two or more islands, evidence of which we have in Lake Eyre and the other salt lakes, which are still below the present day sea level, together with the fossil coral reefs, estimated to have existed and lived 3,000 million years ago. Similar fossil coral reefs are found in Yorkshire, England, and also in China, which students at Cambridge are now studying, to interpret and to solve the paradoxical history and events of this our planet earth."

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EXTRACTS FROM THE ANNUAL REPORT OF THE  
HON. SECRETARY (MISS DOLCE DOBBIN).

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The Society has now reached its forty-first year and, although affected by the international situation, has managed to carry on its work of aiding and endeavouring to stimulate the study of natural history.

Our membership is now 222, but we would like to double that number. Fifteen new members were elected during the year, 6 resigned, and 2 died. The total membership does not balance with that of last year, as some members have been removed from the list, having neglected to advise their change of address, the letters forwarded to them being continuously returned.

During the past year the lectures have been very varied and extremely interesting, and we tender our thanks to the lecturers, who so generously gave up their time to address the Society.

The following lectures were delivered:—

September (1940).—"The Marine Fauna of New South Wales", by Melbourne Ward.

October.—"What is Glossopteris?", by Dr. A. B. Walkom.

November.—Members' Night.

December.—“A Peace Trip to Caledon Bay”, by Rev. A. J. Dyer.

February (1941).—Members' Night.

March.—“A Trip Through Burma and South-eastern China”, by Miss Marie Byles, B.A., LL.B., F.R.G.S.

April.—“Poisonous Animals”, by Alan Colefax, B.Sc.

May.—“Australian Fisheries”, by T. C. Roughley, B.Sc., F.R.Z.S.

June.—Members' Night.

July.—“Men and Nature in Spain”, by Dr. Kate Pariser.

Excursions.—The two outings a month have been very successful and are being continued. During the year, the following places were visited:—Dobroyd Head, Janalli and Como, Engadine, Tambourine Bay, Castle Cove, Ball's Head, Aqua Flora Park, Connell Point, East Lindfield, Green Point, near the Spit, Woronora River, near Sutherland, La Perouse, Roseville Bridge, North Ryde Park, Centennial Park, Rockdale (Mr. Ashley's), and Taronga Park. All day outings were held on public holidays, and these included a walk from Terry's Creek, Epping, to Turramurra, Lane Cove, National Park, Woodford, Blue Mountains, the quarry at Brookvale, and Gordon.

The annual tree-planting at Ball's Head was held, and over 70 trees (donated by Miss T. Y. Harris) were planted. The Mayor of North Sydney and most of the aldermen were present.

I would like to thank, on behalf of the Council, our Hon. Editor (Mr. E. H. Zeck) and Mr. G. White for their good work on behalf of the Society, and the Department of Education for the use of the hall for our meetings, and for the use of the library for our mid-monthly meetings.

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#### EARLY FLOWERING OF *CALLITRIS PROPINQUA*, R.Br.

Female catkins were noted on 9 to 12 inch seedlings of this species in the Botanic Gardens, Sydney, which were known to be two years old, but no male catkins could be detected. I have seen plants of *C. Muelleri* Benth., in the Hawkesbury and Blue Mountain districts less than 12 inches high bearing mature cones, and at the time they were regarded as being very old and depauperate, but it now appears that in most cases they may not have been as old as surmised.—W. F. BLAKELY.

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# The Australian Naturalist

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Part 2.

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## GUIDE TO THE LAND SHELLS OF NEW SOUTH WALES.

By TOM IREDALE.

(Contribution from the Australian Museum.)

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### PART IV.

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(Continued from Vol. XI., p. 8.)

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#### Family DURGELLINIDAE.

A few very small glassy shells, occurring along the coastal area of Queensland, and reaching as far south as the Sydney district, are arranged under the above family name. The type of *Durgellina* is a shell from the islands north of New Guinea, superficially very like the local form, *Turrisitala parramattensis*, but somewhat unlike the geographically closer Queensland forms, associated in this family at present. The extralimital animals are somewhat curious, being of the Helicarionid style, though the shell is very different. The radular features are also distinctive, so that the elucidation of their affinities must be left to the anatomical students, and so far these have not been very successful in their efforts. Dealing with such minute animals, each investigator, comparatively unskilled, has disagreed with his predecessor, leaving the conchologist in a maze. So that local workers could determine their shell finds correctly a genus *Sodaleta* was introduced for the North Queensland *russelli*, and the New South Wales shells *umbraculorum* (long known as *wilcoxi*) *kempseyensis*, *microcosmos* and *scandens* (also called *pudica*) were placed thereunder. Two other genera, *Turrisitala* with type *normalis* (a new name for *turriculata*) from North Queensland, and *Nevelasta* with a South Queensland type, *pampini*, have also been made use of for local shells, but without a great deal of confidence.

To particularise, *parramattensis*, allotted to *Turrisitala*, is a small conical glassy shell measuring 4 mm. in breadth by  $3\frac{1}{2}$  mm. in height, the whorls rounded, the base convex, the reflected columella almost concealing the very minute umbilicus. The other three, placed previously under *Sodaleta*, differ more among themselves than from some extralimital species, suggesting that the resemblances are due to convergence only, and do not mean real relationships. The largest, *umbraculorum*, is more broadly conical than the preceding, with more convex whorls, and a little larger, about  $4\frac{1}{2} \times 4\frac{1}{2}$  mm., the last whorl more swollen, the base more convex, and a slight peripheral keel present. On the other hand, *scandens* is about 4 mm. in breadth, but only  $2\frac{1}{2}$  mm. in length, being thus more flattened, and probably not closely related, while *kempseyensis* seems to



Fig 9.—*Hedleyoconcha duona*, *Sodaleta scandens*, *Sodaleta umbraculorum*, *Turrisitala parramattensis*.

be related to *microcosmos*, which has been already transferred to another family, Paralaomidae, under a new genus, *Iotula* (see Vol. x., p. 264). The type of *kempseyensis* is not available, and the small size and description recall those of *Iotula*, but the shell is apparently more depressed. Specimens from Kempsey appear to be young of *Paralaoma*, the adult shells recalling the Byron Bay *sincesta*. Another mystery shell is *liardeti*, described from Picton by Brazier as collected by Liardet and retained by the collector. It was not figured, and has not since been recognised, the description reading "depressedly globose", with height and breadth each 1.5 mm., and is tentatively referred to *Nevelasta*. These minute glassy shells are not easily discovered, so there may be many more to be revealed. The only sculpture is fine radial growth lines, which, in some cases, e.g., *parramattensis*, develop into well marked striae.

#### Family HEDLEYOCONCHIDAE.

Hedley examined the anatomy (superficially) of a strange little snail which lived on the trunks of trees in

South Queensland, and, as at that time there was little knowledge of small snail anatomy, he allotted it to the Neozelanic genus *Flammulina*. Pilsbry accepted this location, but, noting the great differences, introduced a new subgenus, *Hedleyoconcha*. Obviously it has no real relationship with the Flammulinid snails, and is more closely related to the preceding group, but as there are still discordant features, a family is provided for this genus alone. The shell is trochoidal in form, thin, 7 mm. in height and 9 mm. in breadth, strongly keeled peripherally, base convex, mouth large, oval, outer lip thin, columella reflected, almost concealing the very small umbilicus, while there is a distinctive sculpture, the distinct radial striae being crossed on the earlier whorls by pronounced spiral lirae. The genus only occurs in South Queensland, whence the type, *delta*, came, ranging as far south as Gosford in this State, the type locality of *duona*, the local shell being broader than the more northern one.

#### Superfamily PEDINOGYROIDEA.

This superfamily covers one family, Pedinogyridae, only, whose evolution is, at present, enigmatic. The name means "wound on the flat", which is descriptive as the species are all large flattened and discoidal in shell form. The snail has been anatomically examined with little result, save that archaic features have been recorded, facts suggested by the nature and habitat of the group. It is restricted to the Oxleyan Sub-Area, and this is regarded as one of the oldest land masses of Australia. A single genus, *Pedinogyra*, is known, with at present five species, four of which occur in South Queensland, and one in northern New South Wales. The last-named also enters South Queensland, and is separated from the others by its peripheral keel, generally smaller size and less thickened lips. The shell is coiled on the flat, about 2 inches across, and one inch in height, coloration brown, umbilicus very wide, mouth small, oblique, and lips not expanded. The regular peripheral keel is median and well pronounced. Although long known as *P. muhlfeldtiana*, the correct name is *Pedinogyra rotabilis*. The animal lays large eggs with a calcareous covering.

#### Superfamily HEDLEYELLOIDEA.

As a contrast to the preceding we find a series of Bulimoid Helices, that is, snails belonging to the normal *Helix* (or typical snail) group, with a covering shell in

form approaching that of *Bulimus*, elongate rather than depressed. This series has been associated with the preceding, because some anatomists have claimed to recognise archaic features similar to those accredited to the former, and more especially because it lays large eggs with a calcareous covering. Only one family, Hedleyellidae, is included, but in this case the family is represented by four genera, ranging from the Mackay district in mid-Queensland to Victoria, but none of the genera has such a great range. The typical *Hedleyella* is a huge shell, thin, subglobose, reaching to a breadth of nearly four inches, with a height of three inches. This large form lives on the Richmond River, and is called *Hedleyella falconeri* jack-

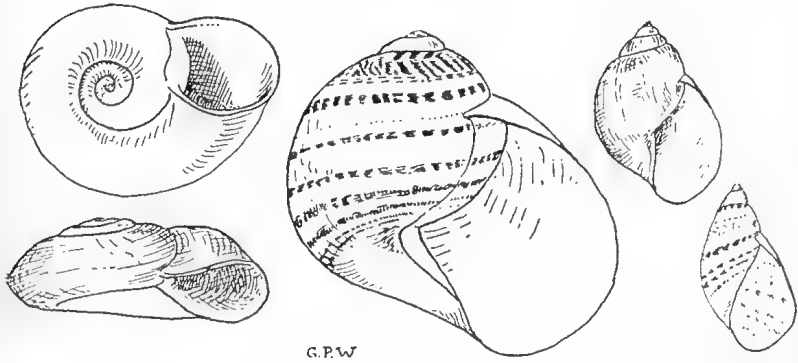


Fig. 10.—*Pedinogyra rotabilis* (lower and side views), *Hedleyella falconeri*, *Pygmipanda kershawi divulsa*, *Brazieresta larreyi*.

*soniana*. The typical *falconeri* is a smaller shell, more conical, with the umbilicus narrower, and the mouth less expanded, and Clarence River has been selected as the type locality, the southern limit being the Hunter River, where the shells are similarly small. In South Queensland a similar small shell is found, but also a large shell, which has lost its umbilicus, but otherwise almost identical, and bearing the name *maconelli*. The coloration is worthy of remark, as it is of a yellow ground colour, with spiral rows of black squarish markings; these markings may sometimes become confluent and form almost continuous bars, and at others link up with the succeeding row, producing a striped pattern, while unicolor yellowish shells are not uncommon. This style of coloration, more or less modified, persists



throughout the entire group, though the shell becomes greatly differentiated in size and form.

Thus the second (in size) genus is *Pygmipanda*, which may reach two and a half inches in height by one inch and a quarter in breadth, and is represented by two species at each end of the State. The northern one, *atomata*, extends from Hunter River to the Manning River, and is imperforate, and more or less coloured as above given for the family. Then, in the south, in the Kosciusko district and Gippsland occurs a second species, smaller, stouter, and less boldly colour-marked, the New South Wales form, which has been named *P. kershawi divulgata*, being about one and a half inches in height and a little more than an inch in breadth. At present there is no known cause of this apparent discontinuous distribution, and, even if the Tasmanian *Tasmanembryon* be admitted as a relation, the differences between it and *Pygmipanda* are still noticeable, although, be it noted, the apical features are somewhat similar.

On the Bellinger River, a little north of the preceding northern range, Brazier discovered a very beautiful relative, which he called *larreyi* after his aboriginal guide, King Larrey, and which is now named *Brazieresta larreyi*. This shell is very thin, an inch and a half long and three-quarters of an inch broad, brightly coloured with the same style of markings, rows of red brown marks and blotches on a rich creamy ground, the spire being short and pointed, the whorls flattened, the body whorl large, and the mouth large and elongate, the outer lip very thin.

The last member of the group to be found is extralimital, but it must be mentioned here to complete the tale. It was discovered by Mr. S. W. Jackson in the Mackay district, and, while retaining the characteristic colouring, the shell has degenerated to a small ear-shaped, thin, very thin, adjunct on the snail's back. It consists of one apical whorl and one adult whorl only, measuring about three-quarters of an inch in length and half an inch in breadth, and bears the name *Pandofella whitei*. We have thus a series, varying in size from a huge well-formed shell, subglobose in form, some four inches in breadth by three inches in height, to a small tenuous scrap, about three-quarters of an inch by half an inch, yet preserving the general style of coloration. An accurate comparison of the morphology of the animals should be instructive.

## Superfamily HELICOIDEA.

This group is an immense one as it covers most of the common snails throughout the world, some thousands of species being conservatively included. Of course, no true species of *Helix* occur in Australia, save as introduced pests, but many comparable shells occur, referable to a family, Hadridae. The type of this family, *Hadra*, is a very large North Queensland shell, but the majority of the Queensland members are somewhat similar to one which is found in northern New South Wales, the type of the genus *Sphaerospira*. The shell is solid, subglobose, imperforate, whorls convex, sutures lightly impressed, mouth large, roundish, outer lip reflected all round, broadly expanded at the columella sealing the umbilicus, which can be seen in young shells. The coloration is pale fawn with spiral bands of red brown, and the shell measures about an inch and three-quarters in breadth, about an inch and a half in height, and the Clarence River shell is named *Sphaerospira fraseri permuta*, the typical *fraseri* being from Toowoomba, South Queensland.

A curious series, almost comparable with the Hedleyellid complex, consists of a small number of shells classed under *Annakelea*, the type of which is the well known *richmondiana*. This shell appears to be the culmination of development from a normal Helicoid to the quaint form presented. Thus *richmondiana* is a large triangulate shell with flattened whorls, very sharp peripheral keel, flattened base, somewhat triangular mouth, imperforate, upper lip thickened, but little reflected; lower lip, however, strongly reflected, covering the umbilicus, while extending across the body whorl is a thick glaze. The coloration is generally uniform deep chestnut red, but sometimes a yellow form with a dark subsutural band is found. In size it reaches two inches across by an inch and a half in height. At the other extreme is the comparatively small flattened shell, with only a faint suggestion of a peripheral keel, called *novae-hollandiae*. It is less than an inch and a half across and less than an inch in height, the whorls are rounded, the mouth subrotund, the lip thin, little reflected, imperforate, the coloration yellowish with brownish red bands. This species occurs on the Hunter River district, reaching to the Bellinger River, while from the Clarence River, *mitchellae* was described as similar, angulate, about an inch in height and width and little is known about it. A different shell from Byron Bay has been commonly ac-

cepted as *mitchellae*, but this is now named *peragrans*, as it differs very greatly, being as large as *richmondiana*, but with rounded whorls, rounded periphery, rounded base and rounded mouth. The coloration is the same as that of *novaehollandiae*, but broad darker red bands contrast against paler yellowish to white narrow bands. Two species penetrate into South Queensland, typical *richmondiana*, and a large shell recalling *novaehollandiae* in all features, collected at Mount Tambourine, and named *tympanum*, a very recent discovery.

The commonest snails on the New South Wales coastal area have gone under the blanket name of *Helix* (or *Thersites*) *jervisensis*. A figure is given of a typical shell for reference, but many species, separated geographically, occur, and many more will later be named, although the early conchologists provided a useful number of names.



Fig. 11.—*Annakelea richmondiana*, *Sphaerospira fraseri* *permuta*, *Annakelea peragrans*, *Annakelea novaehollandiae*, *Meridolum jervisensis*.

The typical *jervisensis* from Jervis Bay is a normal looking helicoid, about an inch across and three-quarters of an inch high, and pale brown with a subsutural red line, and a red umbilical patch, the umbilicus very small and half hidden by the reflected columella. The sculpture is very fine zig-zag lines over-run by rude growth lines, and developing from a pustulose beginning. The range of the genus, called *Meridolum*, is from Twofold Bay to South Queensland, restricted to the coastal area and coastal ranges. Sometimes the umbilicus is open, sometimes it is completely closed, the shell may be very elevated or somewhat flattened, while even a peripheral keel may be present. The coloration varies from pale greenish to dark brown, the red umbilical patch being commonly present, but sometimes absent. The above factors provide many combinations, and these have been produced by geographical segregation, so that while nine or ten named forms have been recognised, there are many more existing in nature.

It is difficult to indicate in a few words the differences between the named forms, which are, however, easily separable. The locality will assist in indicating what to look for, as most are restricted in their distribution. As extremes may be cited, *ascensum* from the Lower Richmond River, over an inch in breadth and equally as tall, all the others being broader than the height, with a completely pustulose sculpture, and pale coloration recalling that of the type; *depressum*, with a low spire and rather a marked peripheral keel from Jenolan Caves with the umbilicus clearly open, coloration uniform dark brown and measuring an inch across but only half an inch in height. From the southern limit, Merimbula to Twofold Bay, comes a small dark shell with a faint peripheral keel, thin and imperforate, named *mastersi*, yet from the Illawarra Ranges as far north as the National Park, the shell is the largest and darkest, though banded and showing an umbilical patch, the umbilicus closed, measuring an inch and a half across and just over an inch in height. This bears the name *gulosum* Gould. A small, thin, rather flattened, yellowish-brown umbilicate form from Mudgee, measuring three-quarters of an inch in breadth by half that in height was called *exocarpus*. From Wiseman's Ferry on the Hawkesbury River, a shell was named *duralensis*, small, depressed, thin, umbilicate with rather a noticeable peripheral sub-keeling. It measured a little over three-quarters of an inch in breadth by a little over half an inch in height, and may be related to *depressum*, while it recalls the genus *Ventopelita*, to be treated later. A rather bright unicolor greenish shell was named *corneovirens* from Mulgoa; it measures almost an inch across with more than three-quarters in height, and is thin, almost transparent, with a faint keeling, the umbilicus a little open, the sculpture weak. It may be remarked that the sculpture varies a little in the species, but not sufficiently to use as a diagnostic character. From Jennings, on the Queensland border, Cockerell named a shell *ianthostoma*, but it proves to be the Darling Downs *gilberti*, extending that far down. It is similar to *ascensum*, but less elevated. In the Basic List I placed *marcescens* under *Galadistes*, the interior representative of *Meridolum*, but as the species was named from South Grafton, re-examination has shown it to be a small degenerate *Meridolum*. It is small, flattened, thin, subkeeled, umbilicate, less than two-thirds of an inch across and one-third inch high, and with the sculpture of the present genus.

(To be continued.)

## A TRIP TO CENTRAL AUSTRALIA.

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By JOHN POWELL, F.R.Ec.S.

I have recently returned from a very interesting trip to Central Australia, having made Alice Springs the centre of the tour, and working on a radius of about 100 miles. Alice Springs is very nearly the centre of Australia, the actual centre being about 100 miles north by west. It is about 70 miles south of the tropics, 2,000 feet above sea level and situated between two mountain ranges, the Gregory on the north and McDonnell on the south. The climate is dry, cold at night, but warm during the day. The town is approached from the south through the Heavitree Gap in the McDonnell Range, through which the Todd River runs. The town has a memorial to John McDowall Stuart, who discovered the range and passed through the district on his expedition in 1860-1862.

I made the journey by joining a conducted party, arranged by Bond's Tourist Company, which is the only way satisfactorily to see the district, owing to there being only tracks through very rough country. The tour was full of interest. We left Adelaide by car for Quorn and returned from Alice Springs to Adelaide by rail, passing through a great deal of the Flinders Range with its beautiful mountain scenery.

On route from Quorn to Alice Springs one passes through some of the driest and most barren parts of Australia. One gets a view of Lake Eyre, passes through the Gibber Country, Marree, Coward Springs, seeing also a hot water bore, where date palms are being grown. Oodnadatta, 660 miles from Adelaide, was once a large cattle centre, with its camels and Afghans. It is now quite a small place, with one hotel and one store, and less than a dozen houses. As the train often stops for considerable periods at stations there is plenty of time to look round and make oneself acquainted with the local desert flora, geology, natives, etc.

The greatest attraction of the district is the McDonnell Range, stretching for about 150 miles east and west, with a varying height of from 3,000 to 4,000 feet, and a width of about 12 miles. They consist of crystalline quartzite and conglomerate rocks; at the western end is sandstone containing fossils. The light on the coloration of the rocks is a most fascinating sight, changing from various shades of

violet to red, making it a dreamland, and at various places there are rugged gaps through which the water rushes during the brief tropical rains. These rivers are for the most time quite dry, but when the torrential rains come they rise for a little while to a great height, and have very swift currents. The principal gap is the Heavitree, through which the train runs, and this is the gateway from the south to the north. Another is Simpson's Gap, with its rugged cliff, which rises about 750 feet from the plain.

Perhaps the most remarkable is the Standly Chasm, to enter which one climbs over huge rocks, finally reaching a perpendicular passage, only 15 feet wide, with walls over 100 feet in height. Another is the Emily Gap, with aboriginal paintings, which belong to the Witchetty Grub, *totem* of the Aranda tribe. On the western end of the range is the Palm Valley, situated about 16 miles from Hermannsburg. It is a delightful oasis. The palms are unique as they are the sole representatives of a very archaic type, *Livistona Mariae*. On the way from Hermannsburg to the Palm Valley we passed along the picturesque valley of the Finke River with its rugged red sandstone rocks, well covered with flora and deep ravines, and on the way out we visited the house of the famous native artist, Albert Manatjina, who has painted a great deal of the grand scenery of the ranges and has a wide reputation as an artist. On the eastern side of the ranges we rode out to the Hart's Range, which is reminiscent of the gold digging days, but now, only represented by the derelict, government battery and the mica mines.

I visited the various missions. The Inland Mission, which has its centre in Alice Springs, is concerned with the white people out back, supplying medical aid and nurses. The other missions are the Roman Catholic Mission to the natives and the Government Mission to the half-castes, which is situated about 3 miles from Alice Springs, on the site of the old telegraph station, and near the spring, from which Alice Springs derives its name. This mission has a reserve of 40 acres, and houses and cares for about 160 half-caste children. The education given is the same as in all government elementary schools, and they are also taught a variety of handicrafts.

I stayed at the large Lutheran Mission at Hermannsburg, about 80 miles from Alice Springs. This mission is doing a great work, in fitting the primitive natives, gradually, to find their place in our civilisation. They are

taught work of various kinds, such as cattle rearing, tanning of hides, engineering and carpentering, and they turn out some very fine specimens of ornamental mulga. The women are taught needle work, etc., and also produce beautiful kangaroo skin rugs. The children are given a primary education. The mission house held about 300 natives, who looked happy and well. The health at the mission was exceedingly good, and the birth-rate higher than the death-rate. The mission also sends out its members to the wild blacks, and good work is being done to help them.

The flora, owing to the aridness of the country (the rainfall being under 10 inches a year), is very sparse, yet there are some very interesting specimens to be found.

On the plain country there is the spinifex, spear grass, a little kangaroo grass, and a few small flowers. In the mountain gaps one finds cycads, and in the western part of the range, palms. There are several species of eucalypts, the river gum being a fine tree. Although the timber is not first-grade, it supplies, largely, the local needs. A beautiful gum is the ghost tree, *Eucalyptus papuana*. It has a white trunk; its foliage is fine and grows very symmetrical. There are several acacias; also *Casuarina* and the cork tree, *Hakea*. The gidyea is found round Coward Springs. In the Hart's Range there is a bean tree, *Erythrina vespertilio*, which grows to a height of about 40 feet, and bears a bright red bean, which has a fascination, and one cannot resist picking up a few. Children and women collect and use them as beads. The timber is very light in weight.

Alice Springs has great potentialities as a health resort and attraction for tourists. One feels the thrill of adventure in these wild and rugged mountains. The climate is dry and attractive, and in the spring the temperature makes the air delightful, and it has a beneficial effect. I was away for about a month and had a most interesting trip, one that will live in my memory, and I returned better in health and mentally invigorated.

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Contributions from members to "The Australian Naturalist" will be welcomed, particularly manuscript of lectures delivered at monthly meetings of the Society, as well as descriptions of exhibits.

## QUILL PENS.

Metallic pens are manufactured in vast quantities and in an immense variety of forms, but although they have superseded, almost wholly, the use of quills and have some peculiar advantages, it does not appear possible to give them the elasticity of the quill, nor to fit them so well for quick and easy writing.

A century back, the annual requirement of quill pens in England amounted to 40,000,000.

The hard and strong wing feathers from geese, ostriches, swans, turkeys and crows are suitable for quill pens and can easily be made to suit the requirements of the person using them.—JOHN HAWLEY.

[The original MSS. of this note was written with a pen made from a swan quill picked up outside Taronga Park. Ed.]

## A CORRECTION.

Since the last issue of our Journal was published, a communication from Dr. L. Clarke Webster, of East Gresford, under date of December 3, 1941, has been received, and from this the following information has been extracted:—By a slip, in his previous comment on "The Baobab tree" (*Aust. Nat.*, Vol. II., pt. 1, p. 22), Papua was given instead of New Guinea. Line 9 from bottom of p. 22, therefore, should read "New Guinea" instead of "Papua" (which is only a small piece of land). On page 23, "Mr. Beuhmann", line 5 from top, should read "Mr. Leuhmann" and, beginning at the end of line 10, it should read, "running parallel—but widely separated—", etc.

—[Editor.]

## NOTICE TO COUNTRY MEMBERS.

Country members may obtain reliable information about any specimens of natural history they may collect and forward, addressed to the Hon. Secretary of the Society, Box 2178 LL., G.P.O., Sydney.

No member should be afraid to forward specimens because they are common to their district; they may be rare and interesting examples of our flora or fauna not found elsewhere, and, if of general interest, notes on such specimens could be published from time to time in "The Australian Naturalist".



NOTES ON NEW SOUTH WALES ORCHIDS: ADDITIONS  
AND ALTERATIONS TO PREVIOUSLY PUBLISHED LISTS.

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By the REV. H. M. R. RUPP, Northbridge, N.S.W.

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Moore and Betcher's Handbook of the Flora of N.S.W., published in 1893, listed 173 species of Orchids for this State. In Maiden and Betcher's Census of N.S.W. Plants, issued 23 years later, only four species had been added. But four of the total number then recorded must be deleted, viz.:—

*Thelymitra longifolia* Forst., is apparently restricted to New Zealand and New Caledonia. (See Nicholls in *Vict. Nat.*, June, 1936.)

*Thelymitra megalyptra* Fitzg., is a form of *T. aristata* Lindl.

*Pterostylis striata* Fitzg., is conspecific with *P. alata* Rchb. f.

*Pterostylis cucullata* R.Br., is not known in this State, *P. falcata* Rogers, having been wrongly determined as Brown's species.

By 1930, when Rupp's "Guide to the Orchids of N.S.W." was published, the number of species had been increased to 201; but three of the four just cited were included in these, and subsequent research showed that several other species must either be deleted or have their names altered in conformity with international rules. In 1937, the Linnean Society of N.S.W. (*Proc.*, lxii., Parts 1-2, p. 27) published a Census of N.S.W. Orchids, by Rupp, which gave the total number of species as 218, and which included one new genus (*Cryptanthemisa*). During the succeeding period of over four years, further additions and alterations have been made, and the total number of recognised species is now (1942) 222, an increase of almost 50 since Moore and Betcher's date, or 38 since the publication of the "Guide".

In placing these additions and alterations on record, it will be convenient to make three lists: (i) Orchids actually described as new species; (ii) Orchids new for this State, but previously described from other States; and (iii) Orchids the nomenclature of which has been altered either to conform with international rules, or because

their identity had previously been mistaken. The period over which these changes have been effected will be taken as that since the publication of the "Guide" in 1930.

## NEW GENUS:

*Cryptanthemis* Rupp, in *Proc. Linn. Soc. N.S.W.*, lvii., 1-2, 1932.

## NEW SPECIES:

*Diuris Colemanae* Rupp, in *Vict. Nat.*, July, 1940. A plant of the western slopes and plains, extending into south-west Queensland.

*Diuris rhomboidalis* Rupp, in *Contrib. fr. Nat. Herb. N.S.W.*, I., 3, 1941. Western slopes of New England.

*Microtis magnadenia* Rogers, in *Trans. Roy. Soc. S. Austr.*, liv., 1930. South Coast.

*Prasophyllum trifidum* Rupp, in *Vict. Nat.*, lviii., June, 1941. Middle Harbour.

*Prasophyllum aureoviride* Rupp, *loc. cit.* Middle Harbour; French's Forest.

*Caleana Nublingii* Nicholls, in *Vict. Nat.*, May, 1931. Blue Mountains.

*Calochilus grandiflorus* Rupp, in *Vict. Nat.*, February, 1934. North Coast.

*Caladenia alpina* Rogers, in *Trans. Roy. Soc. S. Austr.*, li., 1927. Queanbeyan; Kosciusko.

*Corysanthes Fordhamii* Rupp, in *Vict. Nat.*, October, 1941 (illustr. by Nicholls). Brunswick Heads.

*Pterostylis Hildae* Nicholls, in *Q'land Nat.*, x., 2, pp. 39, 40. Far North Coast.

*Pterostylis furcillata* Rupp, in *Proc. Linn. Soc. N.S.W.*, lv., 4, 1930. South Maitland Coalfields.

*Pterostylis pulchella* Messmer, in *Proc. Linn. Soc. N.S.W.*, lviii., 5-6, 1933. Fitzroy Falls.

*Pterostylis longicurva* Rupp, in *Contrib. fr. Nat. Herb. N.S.W.*, I., 3, 1941. Western slopes of New England.

*Cryptanthemis Slateri* Rupp, in *Proc. Linn. Soc. N.S.W.*, lvii., 1-2, 1932; *ibid.* lviii., 3-4, 1933 and lix., 3-4, 1934; *Austr. Orch. Review*, June, 1938. Alum Mountain, Bullahdelah.

*Dendrobium Kestevenii* Rupp, in *Proc. Linn. Soc. N.S.W.*, lvi., 2, 1931, p. 137; *Austr. Orch. Review*, December, 1939. Alum Mountain, Bullahdelah.

*Bulbophyllum Weinthalii* Rogers, in *Trans. Roy. Soc. S. Austr.*, lvii., 1933. Dorriggo; Kyogle. (See illustr. by Weinthal in *Austr. Orch. Review*, June, 1939.)

*Bulbophyllum globuliforme* Nicholls, in *Orchidologia*

*Zeylanica* ref. (To be published also in Australia.) Southern slopes of the Macpherson Range.

*Sarcochilus Harriganæ* Rupp., in *Proc. Linn. Soc. N.S.W.*, lxxiii, 3-4, 1938. Dorrigo.

*Sarcanthus purpuratus* Rupp, in *Vict. Nat.*, December, 1937 (*Cleisostoma gemmatum*); *ibid.*, April, 1938 (*C. purpuratum*); *ibid.*, April, 1941 (*Sarcanthus gemmatum*); *ibid.*, July, 1941.

SPECIES NEW FOR N.S.W. BUT PREVIOUSLY KNOWN IN  
OTHER STATES:

*Thelymitra flexuosa* Endl. Brunswick River.

*Thelymitra chasmogama* Rogers. Kurri Kurri; Killara; Woodford.

*Diuris longifolia* R.Br. Extreme S.E. of State.

*Diuris brevissima* Fitzg. Woodford. (This species does not strictly belong to this list, as it is only known in N.S.W. by an unpublished plate of Fitzg.'s; but Nicholls has described it for Victoria.)

*Prasophyllum gracile* Rogers. Bell, and a few other localities.

*Prasophyllum alpinum* R.Br. Southern Highlands.

*Prasophyllum Archeri* Hook. f. Coastal areas, chiefly in the north.

*Prasophyllum Morrisii* Nich. Braidwood; Mt. Irvine; Oxford Falls.

*Caladenia cardiochila* Tate. Extreme S.E.

*Caladenia reticulata* Fitzg. Wyalong.

*Caladenia angustata* Lindl. New England; Bowral; Paterson.

*Caladenia praecox* Nich. Extreme S.E.

*Caladenia iridescens* Rogers. Yass.

*Zeuxine attenuata* Rogers & White. Clarence and Richmond Rivers.

*Liparis habenarina* F. Muell. North Coast.

*Liparis Simmondsii* Bail. Head of Brunswick River.

*Dendrobium Schneiderae* Bail. Kyogle.

*Sarcochilus Hartmanii* F. Muell. Nimbin; Kyogle.

*Sarcochilus Weinthalii* Bail. & White. Kyogle.

ALTERATIONS IN NOMENCLATURE:

*Thelymitra megalyptra* Fitzg. is now *T. aristata* var. *megalyptra*.

*Microtis porrifolia* Spreng. is now *M. unifolia* (Forst.) Rchb. f.

*Spiranthes australis* Lindl. is now *S. sinensis* (Pers.) Ames.

*Epipogum nutans* Rchb. f. is now *E. roseum* (Don.) Lindl.

*Galeola Ledgeriana* F. Muell. is now *G. foliata* F. Muell.

*Cleisostoma tridentatum* Lindl. is now *Sarcanthus tridentatus*.

*Cleisostoma Beckleri* F. Muell. is now *Sarcanthus Beckleri*.

*Adelopetalum bracteatum* Fitzg. is now *Bulbophyllum bracteatum* Bail.

*Bulbophyllum Shepherdii* F. Muell. is now *B. crassulaefolium* Cunn.

*Dendrobium gracilicaule* F. Muell. is now *D. elongatum* Cunn.

*Cymbidium albuciflorum* F. Muell. is now *C. iridifolium* Cunn.

For particulars of the transfer of several Australian species of *Cleisostoma* to *Sarcanthus*, see Rupp, in *Vict. Nat.*, April, 1941, "The Breaking up of the Genus *Cleisostoma* in Australia".

*Cheirostylis grandiflora* Bl., should be deleted from all lists of N.S.W. orchids, the specimens so determined being really *Zeuxine attenuata* Rogers & White.

Fitzgerald's interpretation of *Caladenia clavigera* Cunn., is incorrect. Nicholls has demonstrated (*Vict. Nat.*, December, 1941), that Cunningham's species is identical with *C. cordiformis* Rogers, which is quite irreconcilable with Fitzgerald's plate. Rupp (*Vict. Nat.*, April, 1942) proposes to retain Fitzgerald's plant under the name *C. Fitzgeraldii*.

In the same issue of this journal Rupp also proposes the recognition of *Lyperanthus ellipticus* R.Br., as the type of a distinct genus to be known as *Rimacola*. If this be accepted it will become *Rimacola elliptica*.

Fitzgerald's interpretation of *Prasophyllum intricatum* Stuart, is also unacceptable in the light of further research. Nicholls has shown in *Vict. Nat.*, October, 1931, that Stuart's name is invalid, his plant being identical with Hooker's *P. Archeri*. Fitzgerald's plant differs considerably from all other descriptions of this species; see the plate in Hooker's *Flora Tasmaniae*, Vol. II., t. 113 B. It is now under consideration with a view to another name, specimens which appear to be identical having been found at Mt. Irvine.

## OBSERVATIONS ON A VISIT TO THE OBSERVATORY.

The night was calm and mild, but nearly all the stars were hidden by a film of cloud, through which the half-moon shone rarely. We walked along Bradfield Highway in a "crocodile", and shared an eagerness like that of school children, for the expedition.

Ancient fig trees were dark and dominant, against pearly skies, in the mellow precincts of the Observatory. Old trees and old stones, and time spun back a century.

But we entered the building, where a visitors' book dated November 27, 1941, awaited our signatures, and a typical "post-office" pen sputtered star-clusters round our names! We inspected a tiny golden model of this mighty earth, which with other planets illustrated the comparative size of the sun. Then we climbed several flights of narrow stairs, and under the metal dome the big telescope was set. A panel in the roof slid open by means of pulleys; then the whole dome revolved round us (our most exciting moment) until the opening revealed that portion of the sky chosen for our observation. With the telescope set towards it, we waited for the clouds to part. Then, in turn, we looked at the moon—a cold white surface with "craters" like the rims of bubbles that have burst. The mechanism of the telescope was explained to us—most wonderful feature its accurate adjustment to the revolution of the earth itself. Through the smaller lens we examined one small blue star, and, as no others were visible owing to the cloudy atmosphere, we trooped down stairs to be shown slides of the moon and the Milky Way; gaining further knowledge in the very absorbing lecture which accompanied them, and gave us glimpses of other worlds.

As we departed, we saw through a window the lights of city and harbour, set like a familiar stage-scene. And, in spite of their theatrical appearance, these man-made stars, controlled by a turn of switches, seemed stronger and more permanent than those others we had come to contemplate.

We had been told that it took, say, 20,000 "light years" for the radiance of a certain star to reach the earth. A fantastic query was in my mind—perhaps worthy of an answer—or only very foolish: are we looking at that star as it was 20,000 years ago, even though it may be there no longer?

—GINA BALLANTYNE.

## THE DEAD HEART OF AUSTRALIA.

By DR. L. CLARKE WEBSTER.

As Mr. J. W. Hawley has stated, in his reply to my notes (*Aust. Nat.*, Vol. II., pt. 1, p. 23), that "we find evidence of an ancient sea", of this, there can be no doubt from the evidence available to us. Mr. Hawley states that this ancient sea and the fossil coral reefs existed probably 3,000 million years ago.

If this is so, then at what former period of world history was this same vast area covered with dense tropical forests through which and through the abundant waters huge monsters roamed or swam?

According to Prof. Gregory, "The Dead Heart of Australia", quoting the traditions of certain aboriginal tribes inhabiting those regions and including western New South Wales and western Queensland, these regions were once covered with fertile, well-watered plains. Instead of the present brazen sky, the heavens were covered with a vault of clouds so dense that it appeared solid; where to-day the only vegetation is a thin scrub; there were giant gum trees, which formed pillars to support the sky; the air now coated with blinding, salt-covered dust, was washed by soft, cooling rains, and the present deserts round Lake Eyre were one continuous garden. The rich soil of the country, washed by the abundant rains, supported a luxuriant vegetation, which spread from the lake shores and the river banks far out across the plains. The trunks of lofty gum trees rose through the dense undergrowth and upheld a canopy of vegetation that protected the country beneath from the direct rays of the sun. In this roof vegetation dwelt the strange monsters known as Kadimakara or Kadimerkera.

The legend still goes on:—"Once while many Kadimakara were revelling in the rich foods of the lower world their retreat was cut off by the destruction of the three (sic) gum trees which were the pillars of the sky. They were thus obliged to roam on earth and wallow in the marshes of Lake Eyre till they died. After the destruction of the gum trees, the small holes in the forest roof (the spaces between the trees) increased in numbers and size until they touched each other, and all the sky became one continuous hole; wherefore the sky is called Puri Wilpannina, which means 'the great hole'.

"The aborigines still make pilgrimages to these Lakes to the bones of these monsters, and hold corroborees there to them."

That these monsters lived there in that country in the dim past we know, for Prof. Gregory and his party found plenty of skeletons of the diprotodon, huge crocodiles and other huge extinct monsters.

In 1930, I wrote a long essay on a programme of Works for Australia, in order to place many millions more people here. One scheme I suggested was to let the sea into Lake Torrens through the old mud and water channel which still exists, from the head of Spencer's Gulf. This lake system is 39 feet below sea level.

Dr. Bradfield has now suggested a better idea—that is, to build a huge series of water conservation schemes for the whole area. An account of this was given in the "Daily Mirror" on December 1, 1941. With such a scheme as Dr. Bradfield's the Dead Heart would soon "blossom as the rose" again and add enormously to Australia's wealth and safety.

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#### REMARKABLE TREES.

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When located at Bulli, N.S.W., a large blackbutt, *Eucalyptus pilularis*, won my admiration; its circumference, three feet above ground level, was 43 feet 10 inches. I usually went alone in the evening to view it, but sometimes induced others to gaze at its majestic form. At one time picture postcards of this tree were obtainable at stationers' shops.

Pliny, A.D. 23, tells us of a plane tree, growing in his time, which was in itself a forest. The Governor of Lucia gave an entertainment to his friends in the hollow trunk, which was 80 feet in circumference.

In Norfolkshire, England, a famous pine tree measures 48 feet in circumference.

The cedar of Lebanon or great cedar, *Cedrus Libani*, is famous in Scripture.—JOHN HAWLEY.

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## REVIEWS.

"Victorian Fungi."—By JAMES H. WILLIS.

This publication is illustrated with three excellent coloured plates and many beautiful photographs and drawings. It contains 72 pages and there are 13 plates and 18 figures. Descriptions of the various species, their habitats, their taste, etc., are given, and their edible or poisonous qualities are discussed. The meaning of the scientific generic name of each group has also been explained. A key to the genera and 120 species of common and noteworthy Victorian gilled fungi is also included.

It is an excellent publication and gives a very informative account of the fungi known as mushrooms, toadstools, puffballs, vegetable caterpillars, etc., and should prove of great value, not only to naturalists and students, but to the general public as well.

Victorian Fungi has been issued as a Handbook by the Field Naturalists' Club of Victoria. The price is 2/6.—[Ed.]

"Songs for Young Australians."—Words by Bronnie Taylor. Music by Edith Harrhy.

This publication will have a direct appeal to children, as almost all the songs introduce favourite native and some exotic animals or birds, and it should have greater appeal to those developing a liking for nature.

It should be of great interest also to teachers on account of its direct Australian natural history outlook for the younger children. The music is melodious, simple and distinctive.

The words are by Bronnie Taylor, writer of well-known Australian verses, and winner of the Masfield Prize for Poetry. The music is by Edith Harrhy, composer of many successful songs, and the coloured cover and black and white illustrations are the work of Ida Rentoul Outhwaite, famed for her imaginative drawings of children, elves and fairies.

It is an entirely Australian publication and contains 40 pages and 12 songs. The publishers are Allen & Co., Pty., Ltd., Melbourne. The price is 3/6.—N.Z.

## THE SOCIETY'S BADGE.

The Society's Badge may be obtained from the Hon. Secretary or the Hon. Assistant Secretary. Price, 2/- (postage and package extra).



## OBITUARY.

ALEXANDER GREENLAW HAMILTON.  
1852-1941.

The passing of Mr. A. G. Hamilton will be deeply regretted by all nature-lovers. Born at Baillieborough, Northern Ireland, Mr. Hamilton came to Australia, where, at the early age of fourteen years, he entered the teaching service.

As teacher at Deep Creek, Guntawang, Mount Kembla and Willoughby, he was favourably known for his inspired work in nature study.

In 1905, Mr. Hamilton's work received recognition, when he was appointed Lecturer in Botany and Nature Study at the Teachers' College, which position he occupied with distinction until his retirement in 1919, after completing fifty-three years of service with the Education Department.

A born naturalist, and a keen observer, his versatility was amazing. Every branch of natural history came alike to him, for he was an authority on many phases of the study. Many of the outstanding teachers of nature study can claim to have received inspiration from Mr. Hamilton, who was the most modest and gentlemanly of men. His work will be remembered always.

Although an active member of the Linnean Society, Royal Society, Microscopical Society, Gould League of Bird Lovers, and a prolific contributor of authoritative papers, it is regretted that the results of deep research were never published in book form. Because of this science is the poorer.

The late Mr. Hamilton had a tender and abiding love for everything that lives. His nature could be summed up by the quotation:—

"He prayeth best who loveth best  
All things both great and small."

Gentle, big-hearted Alexander Greenlaw Hamilton has left an undying name which time can never efface. Our Society will always remember him.—S.T.T.

A. G. Hamilton, whose death occurred at Chatswood, on October 21, 1941, was one of the older members of our

Society, and was President for the year 1913-1914 and again for 1920-1921.

He published a number of his papers in our Journal, and amongst these was one giving a list of some 89 papers and books on, or containing references to, the pollination of Australian plants. (Aust. Nat., Vol. IV., pt. 6, pp. 81-86, 1919.)

He contributed numerous papers to the Proceedings of the Linnean Society of N.S.W., the first of which, "On the fertilisation of *Goodenia hederacea*", appeared in 1885. He wrote many other botanical papers and numbers on the pollination of various Australian plants. He was associated with J. J. Fletcher in a paper on "Australian Land Planarians" (1887), and in another paper with J. D. Cox on "The Birds of the Mudgee District" (1889), also in the Proceedings of the Linnean Society.

He was President of the Linnean Society for the years 1915 and 1916.

The older members of our Society will remember the interesting and informative addresses he delivered and the generous assistance he so readily gave to younger members who sought knowledge. It is with great regret we have to record the passing of this keen observer and great lover of nature.—E. H. ZECK.

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WILLIAM FARIS BLAKELY,  
1875-1941.

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William Faris Blakely was born at Tenterfield, N.S.W., in November, 1875. He died suddenly at his home in Hornsby on September 1, 1941.

He spent a considerable part of his youth in rural surroundings and became interested in botany at an early age, and made extensive collections of plants. After spending some years in the Bowan Park district, near Orange, he was appointed in 1898 to the staff of the Jenolan Caves. He continued his botanical observations and made many valuable collections of the flora of that district.

In 1900 he was transferred to the Botanic Gardens, Sydney, and in 1913 was appointed a botanical assistant in the National Herbarium, where he remained until he retired in 1940. After his retirement he undertook the duties

of honorary custodian of the eucalyptus collection. He was keenly interested in systematic botany and his interest in eucalypts was such that he published, at his own expense, a detailed "Key to the Eucalypts". He contributed various scientific papers, including a Revision of the *Loranthaceae* or mistletoes of Australia, to the Proceedings of the Linnean Society of N.S.W.; the first paper appearing in 1917. A number of his papers on weeds of economic importance to agriculture were published in the Agricultural Gazette of N.S.W. He described a number of new species of *Myrtaceae* and other plants in the Australian Naturalist, the last paper received being "Additions to the Flora of Central Australia", published after his death, in Vol. XI., pt. 1, p. 9.

Although he was only elected a member of our Society, in August, 1938, he was well-known to a number of members for many years.

Many members who accompanied him on field excursions will remember the enthusiasm and interest he displayed when discussing or explaining the flora under observation. He was a keen naturalist, and always generous with his knowledge. His death will be deeply regretted by his many friends.—E. H. ZECK.

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#### THE PORCUPINE FISH.

Porcupine fish are fairly common on the Sydney beaches. The air bladder exhibited is from the Manning River district. This fish has the curious habit of inflating its body until it becomes bloated almost ready to burst. In this condition there are numbers of spines rising from the skin which stand erect, like the quills of a porcupine. It is a poisonous fish that few enemies care to tackle, although sharks will sometimes include it in their menu.

The skins are dried and converted into lanterns, electric bulb shades, etc. It is also useful for making glue and gelatine.—J. W. HAWLEY.

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#### NOTICE TO MEMBERS.

Members are reminded of rule 4 of the Society which reads: "All subscriptions shall become due on the first day of August and shall be payable in advance."

## NATURALISTS' SOCIETY OF NEW SOUTH WALES.

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Proceedings.

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SEPTEMBER, 1941.

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The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, September 2, 1941, at 8 p.m.

The President (Mr. S. T. Turner), in the chair, with about 35 members and visitors present.

Correspondence.—The correspondence was dealt with at the Council meeting.

Announcements.—The President announced the sudden death of Mr. W. F. Blakely, and members stood in silence as a mark of respect. Mr. F. J. Ludowici announced that Miss Jean Buckingham had been elected a life member of the Society. Mr. A. E. Watson gave a brief description of the tree-planting at French's Forest, held on the previous Saturday. Mr. J. Hawley also discussed the tree-planting.

At the Council meeting it was moved by Mr. H. Doherty, and seconded by Mr. H. S. Deed, that the subscriptions of members with the A.I.F. stand in abeyance during their absence. Council unanimously agreed.

Election of Members.—Miss Lillian Whiting, Miss Myra White, Mr. B. C. Harkness, and Mr. A. R. Hetherington were unanimously elected members of the Society.

Exhibition of Specimens.—Miss T. Y. Harris: Described a specimen of gum tree, *Eucalyptus leuhmanniana*, exhibited by Mr. Ludowici.

Mr. H. Doherty.—Specimens of pressed plants, including *Bauera*, *Hovea* and *Glossodia*, and leaves attacked by the larvae of the saw-fly, *Phylacteophaga eucalypti*.

Miss Myra White.—Specimen of a case-moth of the family *Psychidae*, found on a pine tree.

Mr. A. E. Watson.—Specimens of *Boronia pinnata*. The differences between *B. pinnata* and *B. floribunda* were explained. Specimens of *Daviesia ulicina*.

Mr. S. T. Turner.—Specimens of *Acacia buxifolia* and other plants.

Miss D. Dobbin.—Specimens of *Acacia stricta* and *Logania floribunda*.

Mr. C. S. Ashley.—Specimens of rosewood and piece of petrified wood. Specimen of plant forwarded by Dr. Clarke Webster from East Gresford, several beetles and spiders.

Miss Peterson.—Specimens of small larvae of a butterfly.

Lecture.—Miss Thistle Y. Harris, B.Sc., delivered a most interesting and informative address, entitled, "Australian Plants". In the course of her address, which dealt with cultivated Australian trees, both here and abroad, she indicated how much they were appreciated outside of Australia. The slide accompanying the lecture depicted their growth where cultivated for beautification and commercial purposes. The lecturer was accorded a very hearty vote of thanks.

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OCTOBER, 1941.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, October 7, 1941, at 8 p.m.

The President (Mr. S. T. Turner), in the chair, with about 40 members and visitors present.

Nomination of Members.—The Rev. H. M. R. Rupp, Northbridge, N.S.W. Nominated by Mrs. P. Messmer, seconded by Mr. A. E. Watson.

Exhibition of Specimens.—Mr. A. E. Watson: Specimens of *Darwinia floribunda*, *Pultenaea deanei* and *Xanthosia pilsoa*. Twig of *Tristania*, showing natural graft and gum of the grass-tree.

Mr. John Powell.—Specimen of mulga wood, seeds of bean tree, *Erythrina vespertilio*, from Central Australia.

Miss L. Whiting.—Specimen of *Hakea dactyloides*, which was described by Mr. Watson.

Mr. A. E. Watson.—Described the specimens forwarded by Mr. J. W. Hawley from Woodford, Blue Mountains. These included *Eriostemon hispidulus*, *Boronia floribunda*, *Daviesia*, *Epacris* and *Grevillea*.

Mr. J. Hawley.—Seeds of the Moreton Bay Chestnut.

Mr. G. White.—Specimen of large blue-tongued lizard.

Lecture.—Dr. R. N. Robertson, of the Botany School, Sydney University, delivered a most informative and instructive address, entitled, "Upwards or Downwards, What

Controls the Growth of Plants?" The lecture was illustrated with numerous lantern slides and specimens. After the address, Dr. Robertson was asked many questions by members. A very hearty vote of thanks was accorded the lecturer.

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NOVEMBER, 1941.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, November 4, 1941, at 8 p.m.

The President (Mr. S. T. Turner), in the chair, with about 65 members and visitors present.

Announcements.—The President announced the death of Mr. A. G. Hamilton, and members stood in silence as a mark of respect. The President also announced that Mr. Edwin Cheel and Mr. A. E. Hamilton, Miss Gray and Miss Halloran had been very ill, but were then recovering.

Correspondence.—Letter from Mrs. Blakely acknowledging Society's expression of sympathy. Miss Gray and Mr. Cheel thanking for enquiries.

Election of Members.—The Rev. H. M. R. Rupp was unanimously elected a member of the Society.

Nomination of Members.—Miss W. Uscinski, 41 Cavendish Road, Cooparoo, Brisbane. Nominated by John Hawley, seconded by Miss D. Dobbin. Mrs. Hallie Pace, 8 Arthursleigh Street, Burwood. Nominated by Mr. C. S. Ashley, seconded by Mr. A. E. Watson.

Exhibition of Specimens.—Mr. A. E. Watson: Specimen of mallee, *Acacia* sp., and *Passiflora hibbertiana*.

Mr. J. C. Wiburd.—Specimens of plants, including *Pultenaea*, *Leptospermum*, *Goodenia*, *Sowerbaea*, *Calythrix*, and specimens of galls resembling seeds.

Mr. C. S. Ashley.—Specimens of flowers of *Actinotus helianthi*, *Leptospermum flavescens*, etc.

Mr. J. Hawley.—Specimen of gigantic lily, *Doryanthes excelsa*.

Mr. Edwin Cheel.—Flowering specimens of *Callistemon*, raised from seed obtained in Berlin in 1913, labelled *Callistemon amoensa* (illustrated in *Illustratione Horticole* as having a pale yellow flower) which appeared similar to *C. saligna*. The flowers of the specimens exhibited were of a rich garnet colour and appear to have been un-

described. Mr. Cheel proposed to describe it as a new species and to name it *C. hortensis*. Mr. Cheel also exhibited various others specimens of *Callistemon*, including *C. acuminatus*, *C. hybridus*, etc., all from cultivated plants.

Dr. Clarke Webster.—Specimens from East Gresford: Collection of dried plants, a water plant, a large gall and a number of unnamed specimens.

Lecture.—In conjunction with the Gould League of Bird Lovers, a series of motion pictures, obtained by the League, was shown. A Commonwealth Government film of lyre-birds in their native haunts, koala bears and pictures of London were exhibited, and were much appreciated by members. A hearty vote of thanks was proposed to the exhibitor.

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DECEMBER, 1941.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on December 2, 1941, at 8 p.m.

The President (Mr. S. T. Turner), in the chair, with about 40 members and visitors present.

Correspondence.—Letter from Miss McAnene thanking members for her election as an honorary life member of the Society.

Election of Members.—Mrs. Hallie Pace and Miss Uscinsky were unanimously elected members of the Society.

Nomination of Members.—Mr. J. A. Berney, 25 Clanalpine Street, Mosman. Nominated by Dr. Kate Pariser, seconded by Miss D. Dobbin. Mr. E. A. Davies, Homebush Road, Strathfield. Nominated by Mr. J. Hawley, seconded by Mr. S. T. Turner.

Exhibition of Specimens.—Mr. A. E. Watson: Specimens of stick insects, *Phasmidae*, from Taree; Tree-fern spores; specimen of pine, which grows at an altitude of 5,000 feet on the west coast of Tasmania. The trees reach a height of 15 to 20 feet and are very long-lived. Mr. Watson also exhibited a specimen of *Casuarina* in its "infant stage" and a specimen of *Callistemon* or bottle brush.

Mr. J. C. Wiburd.—Specimens of *Grevillea robusta*, native currant *Leptomeria* and *Leptospermum*.

Mr. J. W. Hawley.—Specimens of *Angophora lanceolata* and *Acacia linearis*, *Kunzea* and *Grevillea* from Woodford.

Mr. J. Hawley.—Specimen of the "spotted pink orchid" *Dipodium punctatum* and the seeds of *Acacia linearis*.

Mr. C. S. Ashley.—Seed-case of coastal leopard-wood and specimen of New Zealand tree.

Mrs. F. E. Burton.—Specimen of tamarind. Specimen of blue rose forwarded from Carcoar by Mr. Preston.

Lecture.—The Rev. H. M. R. Rupp delivered a most informative and instructive address, entitled, "Recent orchid discoveries in New South Wales". The lecture was illustrated with drawings and sketches and many live specimens. The lecturer was accorded a very hearty vote of thanks.

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#### FEBRUARY, 1942.

The ordinary monthly meeting of the Society was held in the Annexe, Teachers' Federation Building, on Tuesday, February 3, 1942, at 8 p.m.

The President (Mr. S. T. Turner), in the chair, with about 30 members and visitors present.

Election of Members.—Mr. E. A. Davies and Mr. J. A. Berney were unanimously elected members of the Society.

Nomination of Members.—Mr. W. Shirt, Parsonage Lane, Castle Hill. Nominated by Mr. A. Booth, seconded by Miss Halloran. Mrs. J. C. Wiburd and Miss Hazel Wiburd, Maroubin Road, Mosman. Nominated by Mr. C. S. Ashley, seconded by Miss N. Luckie.

Exhibition of specimens.—Mr. J. Hawley: Specimens of the flowers of *Banksia serrata* from Woodford.

Mr. A. E. Watson.—Specimen of a large snail-shell from Queensland. Collection of diamond associates from Copeland, Brighties and Garnets. He also described their differences and uses.

Mr. J. W. Hawley.—Flowers, fruit and leaves of *Banksia serrata*.

Mr. J. Powell.—Described a visit to the diamond mines in Johannesburg.

Mr. J. C. Ludowici.—Specimen of *Crotolaria cunninghami*, popularly known as Rattle-pod.

Mr. C. S. Ashley.—Various plant specimens and specimens from mines at Broken Hill.

Rev. H. M. R. Rupp.—Specimens of *Dendrobium mortii*,



# The Australian Naturalist

Vol. XI.

APRIL, 1943.

Part 3.

## GUIDE TO THE LAND SHELLS OF NEW SOUTH WALES.

By TOM IREDALE,

(Contribution from the Australian Museum.)

PART V.

(Continued from Vol. XI., p. 40.)

Family HADRIDAE (continued).

Next comes the genus *Galadistes*, looking like small thin relatives of *Meridolum*, through lack of good food, as they replace the larger shells inland, intervening between the coastal *Meridolum* and the true interior dwelling *Sinumelon*, which belongs to another family. Another small, but very interesting, group lives concurrent with *Meridolum* in the northern part of this State. This group comprises four species, in a very limited range, of a genus *Ventopelita*. A comparatively recent discovery of Mr. S. W. Jackson is the puzzling *Discomelon*, and this completes the Hadrid family.

First, the type of *Galadistes*, *liverpoolensis*, is about half an inch across, subglobose in form, very thin, greenish horn, the mouth also large, subglobose, outer lip thin, columella reflected, leaving an umbilical chink, the sculpture of small granules running sometimes into wrinkly lines. As the name suggests, it was described from the Liverpool Range district. A second species, *bourkensis*, from Bourke, is larger, broader, banded, sculpture fine, but coarse radials and umbilicus more closed, while a third was named from Collarenebri, *intervenens*, as being smaller and thinner than the preceding with coarser granulation but less definite radials. Mr. Elkington Allen has just

brought in a fourth from Dubbo, similar in sculpture, texture and form, but with the spire more depressed, the granulation fine, radials only on last whorl. This may be called *alleni* sp. nov.

A recent swarm of snails, after the heavy rains, at Parkes, suggests this group, but unfortunately no specimens have yet been seen.

A very different group is that named *Ventopelita*, first species named *mariae*, from the Clarence River. The shell is small, about half an inch across, with a flattened conical spire, a marked peripheral keel, oval mouth, narrow open umbilicus, shallow rounded base, lip reflected all round, the sculpture being minute wrinkles overlying radials. Seven years after this had been named the form



Fig. 1.—*Galadistes liverpoolensis*, *Ventopelita bellengerensis*, *Meracamelon extensum*, *Discomelon intricatum*.

from the Bellenger River was twice described as *bellengerensis* as it was smaller, dull yellow brown, while the former was apparently very different as it was greyish-white with a red colour line above periphery and another around the umbilicus. Then another was named *lismorensis* from Lismore on the Richmond River, as though it had the same coloration as *mariae*, it was larger with a more elevated conical spire, weaker radial sculpture and narrower umbilicus. Recently it was noted that Reeve, ten years before *mariae* was named, had described a shell from the Manning River as *cumulus*, and that this was a fourth species, being the smallest of the series, yellowish brown unicolour with the lip white. So far no intermediates have been found so that the named forms must stand as species, a differentiation almost unique among local snails. However, we know comparatively little about our forms, as was proved when Mr. S. W. Jackson discovered a shell at Collarenebri, nearly an inch across and half that in height, which could not be placed in any of the known groups. The shell is thin, flattened with the spine scarcely raised, the surface glossy, the mouth round, open, lip thin

and with a wide open umbilicus. In coloration it is pale honey, obscurely red-banded below the suture and above the periphery. As it did not fit in with either the inland or coastal groups it was named *Discomelon intricatum* and placed near the end of this family tentatively.

In South Australia there is a large series of flattened Helicoid shells which have been classed under a genus *Meracomelon*. Members of this group may occur extensively in the unknown (conchologically) western part of this State, but one is definitely known to enter about Broken Hill. The shell, named *extensum* from South Australia, flattened, spire elevated, about an inch across, mouth large open with small umbilicus almost hidden and pale fawn banded with darker, sculpture of small regular granules.

Thirty years ago shells were collected near Lake Cudgellico, and these are referred to *Meracomelon*, as *marcidum*, though they are a little unlike. The shell is about three-quarters of an inch broad with short spire, small umbilicus, small mouth and granulose sculpture, but with a well pronounced peripheral keel; the mouth separates it from the preceding, but otherwise it is nearest *Meracomelon*.

As indicating the varied forms met with in this State, the next shells to be discussed are two relatives of the Papuan tree-living snails of bright coloration and conical form, named after their birthplace, *Papuina*, and though ours are degenerate relations they are still classed in the family Papuinidae. Both are rare and quite unlike each other.

The first *Papuxul bidwilli* was described from Wide Bay, Queensland, but the local shells seem inseparable. The shell is tall, smooth, almost shining, sculpture of fine growth lines only; conical whorls flattened, last whorl keeled, base scarcely convex, mouth oblique, lips cramped, columella straight, inner lip as a deep brown glaze crossing the base. The coloration is distinctive, a pink ground being mottled with purplish brown. It is about three-quarters of an inch in height by half an inch in breadth.

The second, *Posorites conscendens*, is conical, thin, whorls rounded, keel missing, base well rounded, mouth open, lip thin, columella vertical, slightly reflected, but no glaze, and the coloration is white with a red-brown peripheral narrow band, which is sometimes pale and measures about half an inch in height and breadth.

Another series of intruders from the north may be regarded as settlers as they have acquired an Australian facies. These are referred to the family Chloritidae, the extralimital members being large, while most local species are very small. The chief characteristic is their periostracum which is covered more or less thickly with bristles or hairs. However, some forms allotted to the family do not show these hairs so that the general facies is used (perhaps incorrectly) as a guide. However, the genus *Austrochloritis* includes a number of small shells with bristly periostracum generally deep brown, with low spires, small half concealed umbilicus and open oval mouth. Apparently many species occur, varying in size, form and the density of the bristly covering. These bristles are regularly arranged and similar looking species can easily be separated by means of the microscope as so far the bristle density has been found to be constant. Every specimen should be collected as so little is known about them, and the local Sydney shells may provide a novelty by diligent search. The largest, about three-quarters of an inch across, was named *porteri* from the Clarence River; this has a low spire, mouth very large, umbilicus small, the lip reflected with a slight ditch behind, the hairs short and close, visible to the naked eyes. Its exact range is unknown, but from Nundle comes a similar shell which has the spire flatter and the hairs more densely set. This may be called *nundinalis* sp. nov. The first Australian member of this group was named *brevipila*, and Bellenger River has been selected as the type locality. The shell is about half an inch across with the spire a little more elevated than in *porteri*, the mouth smaller, the umbilicus narrower and the bristles more closely set and not remarkably short. From the Nambucca River a similar shell has the spire lower, the umbilicus still smaller, but the bristles still denser and definitely shorter, and it may be called *nambucca* sp. nov. A smaller shell from Port Stephens called *disjuncta* is still more densely bristly, but the periostracum seems deciduous but can be seen in the juvenile. From Barrington Tops comes a larger, more elevated shell with very closely set bristles, umbilicus small, almost concealed, the lip of the mouth white, with a marked ditch behind it, measuring  $\frac{2}{3}$ rd in. broad by  $\frac{1}{2}$  in. high. This may be called *Austrochloritis ascensa* sp. nov. At the base of the mountain the shells are smaller, with lower spire, and may later be named, but at present they are referred to

*novocambrica*, described from the Bellenger River, while around Sydney specimens do not agree, but sufficient material has not been received to name them accurately so there is plenty of work to be done even close at hand. The species from Illawarra, named *metuenda*, is more like *brevipila*, but is larger, with a larger mouth. From the Clarence River there also comes a shell almost indistinguishable from *porteri* at the first glance, but upon close examination it is found to be covered with a short velvety periostracum, without any bristles, and is called *Ramogenia challengerii*. Again more inland in the Clarence River district lives the shell called *aridorum* which shows granules very similar to the root scars of the bristles of the hairy species. This granulation was thus mistaken, but the shell

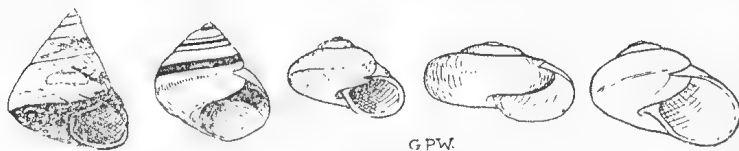


Fig. 2.—*Rhynchotrochus bidwilli*, *Posorites consensens*, *Austrochloritis nambucca*, *Ramogenia challengerii*, *Neveritis aridorum*.

never bears bristles, has no thick periostracum, is pale greenish in colour (all the hairy shells appear to be deep brown), and the shell is of a different form. For this group, which appears to have an inland habitat, the genus *Neveritis* has been introduced, and from Collarenebri, Mr. S. W. Jackson brought back specimens more globose with higher spires, channelled sutures, apex scarcely granulose, but rest of shell granulated, pale greenish, umbilicus small; the size is  $\frac{1}{2}$  in. broad, nearly  $\frac{1}{2}$  in. high, and this species may be called *Neveritis interna* sp. nov.

Throughout Central Australia a large series of subglobose shells occurs and some of these (how many we have no idea) enter western New South Wales, four different species so far being recorded, three from the Broken Hill district.

And one from Mossgiel. All are subglobose, about an inch across and very little less in height, varying in coloration, a little in form and sculpture. The genus *Sinumelon* is represented by *subfodinale*, of Broken Hill, pale fawn, with a median reddish band, showing radial growth lines over-run by a fine granulose network; the whorls are rounded, the mouth large and open, the outer lip thin, and the umbilicus small, hidden by the reflected

columella. The second species from the same place is larger, the spire higher, coloration pale greenish white, with rusty band, the radials coarser and the granulation more irregular. It is called *finitinum*, and may later be proved to belong to a different genus. A still larger shell was found at Mossgiel, and differs in lack of granulation and finer growth lines. It is of the pale greenish type, with the upper part of the whorl brownish and has the spire more elevated. It has been called *simulante*.

Another shell from the Broken Hill district has been named *Fatulabia hinsbyi*, a brown shell, two thirds of an inch across by half an inch high, that is comparatively



Fig. 3.—*Sinumelon subfodinale*, *Fatulabia hinsbyi*, *Trachiopsis mucosus*, *Saladelos helmsiana*.

broader and flatter than any of the three preceding. The sculpture is of rude radials without any granulation, although the early whorls are granulose. The chief feature, however, is the smaller more oval mouth with the outer lip expanded. Between Broken Hill and the Queensland border and eastwards there may be many new molluscs living, but owing to the desert conditions they will rarely be met with alive.

A quaint little shell just penetrating into northern New South Wales is allotted to the East Indian family Planispiridae, but it has little resemblance to the beautiful Moluccan typical species. Our species is only a quarter of an inch across and has the spire a little elevated, but the chief peculiarity is the mouth, which is small, oblique, with strong reflection of the outer lip and deep ditch behind. It recalls some of the hairy *Austrochloritis* at first, but differs in the possession of a median keel and sculpture of coarse granules. It is dull grey in coloration, and is quite unlike any other local shell and bears the name *Trachiopsis mucosa*.

This completes the typical Helicoid series, and we now come to the carnivorous snails. These can be recognised in life by the way they carry the shell, more towards to the tail than the Helices do. One has become well-known to

orchid lovers through the fact that it destroys the common snail that attacks the orchid and has been introduced into orchid houses with good results. This species has been known as *Rhytida strangei*, but the correct name, here used, is *Strangesta capillacea*. The family to which it belongs is known as *Paryphantidae*, based on the well-known "singing snail" of New Zealand, of very unlike form. However, no local species at all recalls that type, all ours recalling *capillacea*, being greenish to brown, the upper surface more or less radially sculptured, the under surface generally smooth and glossy. The larger species are mostly referred to *Strangesta*, and there is difficulty in separating them, save by means of geographical distribution. It is possible that many more species exist than are at present recognised, and that more collecting will solve the problems. Many very small forms occur down the east coast from Torres Straits as far as Mount Kosciusko. These are all less than half an inch broad, with height about half the breadth, flattened, whorls rounded, last whorl very large, mouth large, oval, umbilicus open, broad, upper sculpture of crude radial ribs closely set with indistinct concentric lines, lower surface glossy without radials, but few indistinct concentric lines visible. For these small shells *Saladelos* was introduced, and the northern form from the Clarence River district may bear the name *urarensis*.

The species described from Port Macquarie is about one-sixth of an inch across, smaller, with sculpture less pronounced and umbilicus wider. It was called *macquariensis*, but the species around Sydney is larger, about a quarter of an inch across, with the sculpture more marked and the umbilicus smaller. It is, however, much less than *urarensis* with the sculpture less defined and may be called *Saladelos dulcis* sp. nov.

A small species, a quarter of an inch across, was found 5,000 ft. up Mount Kosciusko and named *Saladelos helmsiana*, but was noted as recalling a miniature *Strangesta*. The more spreading mouth and stronger radials above and almost lack of concentric lines all served to distinguish it, and now from Barrington Tops comes a similarly formed shell reaching almost half an inch, and dark green, not honey as all the *Saladelos*, the typical rough radials showing concentric markings, the mouth large and oblique, the umbilicus deep and narrow. As this is obviously not congeneric with

*Saladelos*, the new generic name *Montidelos* is introduced, the specific name *orcadis* being allotted to the Barrington Tops species. A shell of similar size described from Moreton Bay but also occurring in northern New South Wales was named *Echotrifa strangeoides*, the shell being more regular in formation, the concentric lines more impressed and the radial sculpture absent.

We now come to the species of *Strangesta* which are all much larger. From the Richmond River *harriettae* was described and also *ramsayi*. The latter was assigned



Fig. 4.—*Echotrifa strangeoides*, *Strangesta maxima*, *Murphitella ramsayi*, *Namoitena namoiensis*.

to *Murphitella*, but the locality was so unsatisfactory that re-examination of the type with many specimens from the type locality forced the conclusion that *ramsayi* was based on an abnormal specimen of the adult of *harriettae*. The figure given of *ramsayi* is reproduced here alongside a normal shell which comes very near the Brisbane shell named *maxima*. From the Clarence River a smaller shell was named *assimilans*, and Dorrigo specimens seem to fall into this species. From the Barrington Tops comes a deep shell of dark-brown coloration with a broad yellow band round the base. The mouth is large and round, the columella vertical, the umbilicus deep, but comparatively narrow, and the sculpture above closely packed radial crude riblets. It is just over an inch across and three-quarters of an inch high and is here named *Strangesta alpica* sp. nov. From Leura in the Blue Mountains a very different form has been procured. It is as large across, but only half an inch in height, coloration unicolor greenish, the columella slanting, the mouth oblique, the umbilicus larger and more open, the sculpture above much finer. This is named *Strangesta revera* sp. nov. About Sydney the common species is *S. capillacea*, as abovementioned, but northwards is a different form called *walkeri*, probably a smaller, flatter shell, but range is not well defined. From Illawarra a species *fricata* was described and many shells are easily separated by their grey, instead of green coloration, their flattened spire and fine



sculpture. But from Comerong Is., in the Shoalhaven, shells more like the Sydney one have been collected. It may be that two groups live together throughout the State, probably with slightly different habitats.

Up Mount Kosciusko, 5,000 ft., a *Strangesta* was found, not unlike the lowland *fricata*, but with the sculpture less pronounced and the umbilicus wider. This was called *glaciamans*.

Lastly, from the Namoi River, a distinct form, being smooth above and below, and having a narrower umbilicus. It is about an inch across, and half an inch in height, and has been called *Namoitena namoiensis*.

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### GUMS.

By GINA BALLANTYNE.

Life-blood of this land, flowing in sap-channels;  
 Spirit in arboreal terms expressed,  
 Flaunted in forms fantastic-variant,  
 Not by one shape or twenty shapes assessed.

Root-clasping the creek's bank are bullock-trees,  
 Their bodies red and rampant as the sun;  
 Smoke-wisp-stems rise blue in the gully;  
 Leaf-patterns on the sky are cobweb-spun.

And slender trees that stand and drink the rain—  
 Deep languorous draughts in sensuous delight—  
 Are soft in memory, as the young trees  
 Whose dancing limbs are silk-smooth, milk-white.

And here is colour—skin-tight, satin-taut,  
 Sleekness of pink and amethyst unrolled;  
 From shredded wrappings, and an orange fire  
 Darts through the bush, the fierce angophora-gold.

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## FOREST AND JUNGLE LAWS, "WALES, 693 A.D."

"We of the twentieth century are particularly interested in the preservation of our forest trees and those of the jungle, seeing that denudation of both is taking place in this State. For that reason I am submitting the mode they dealt with such destruction in Wales centuries ago.

"In the year 693 A.D., West Saxon King Ine drew up a code of laws relating to forestry, and the welfare of Britons who had taken refuge and settled in the part of Wales that was included in his kingdom.

"In the 44th year of King Ine it was ordained if anyone cut down a tree under which 30 swine could take shelter he shall pay a fine of 30 shillings.

"Law 20.—Welshmen making their way Englandwards, 'cometh thou peaceably,' if the stranger would dispel suspicion he must either wind his horn, or shout at frequent intervals, otherwise the West Saxon would slay or capture him and hold him to ransom. In connection with this law some of the Welshmen used to manage to make their way through the very dense jungle and forest and resemble somewhat ogres penetrating England.

"Again, if a man burns a single tree in a forest and is convicted he shall pay 60 shillings, for fire is a thief, a secret furtive creature, that may do much mischief.

"If a man cuts down in the forest for his own use trees, 30 shillings for the first tree and so up to ninety shillings. It states that they presume the forester would hear his axe by the time he has cut down three trees, and did not provide punishment for more.

"The amount of forest land in the principality of Wales in 1887 was 163,000 acres, and work of reforestation to increase the acreage was in progress. Sometimes it is impossible to reforest with the same species of tree.—  
JOHN HAWLEY.

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## REVIEW.

THE POISON PLANTS OF NEW SOUTH WALES.—Compiled by Evelyn Hurst, B.Sc., Agr., under direction of the Poison Plants Committee of New South Wales. 1942. pp. i.xiv. + 1-498, figs.

This is a work which will prove of great value, not only to scientific workers, but to all naturalists and others interested in plant and animal life.

The plant species dealt with in the text are arranged alphabetically in botanical families. The botanical name of each species is given first, followed by the popular names, where available. The distribution of the species in New South Wales, and the country of origin of introduced species is also given.

It gives interesting and authoritative information concerning the plants, which are commonly found, as well as those, perhaps not so well known, of more or less restricted areas. It contains an extensive bibliography and a glossary of both botanical and medical terms, and includes numbers of figures.—E. H. ZECK.

## SPHERULITE.

The specimens exhibited were from the Stanwell district, about 30 miles from Rockhampton, on the road to Longreach, Queensland. These objects have been described by Dr. W. H. Bryan, Lecturer in Geology, Queensland University, in two papers—one in the *Geological Magazine*, Vol. lxxi., 1934, pp. 167-175, and the other in the *Proceedings of the Royal Society of Queensland*, Vol. liii., 1940, pp. 41-53.

Dr. Bryan considers that the ultimate shapes taken by spherulitic growths are largely controlled by the production of gases during the process of crystallisation, and by the disposal of these gases. If no vesicles are present in the lava, spherulites without internal cavities are formed; where vesicles are present in the lava, spherulitic crystallisation takes place around them, resulting in the formation of hollow spherulites and some compound spherulites. They consist of fibrous quartz and felspar and chalcedony.

Identification per favour of the Australian Museum.—  
J. W. HAWLEY.

EXTRACTS FROM THE REPORT OF THE  
HON. SECRETARY (MISS D. DOBBIN).

The Society has now reached its forty-second year, and, although affected by the international situation, has managed to carry on its work of endeavouring to aid and to stimulate the study of natural history.

The Society undertakes to identify specimens forwarded by country members, and we would be pleased to do more for them. Specimens from their districts, in addition, are often of great interest to Sydney members.

Until last July, mid-monthly meetings were held in the Library of the Department of Education, on the third Wednesday of each month, but unfortunately, these, through lack of attendance have lapsed. The talks prepared by the leaders of these meetings were of great help to those wishing to learn more of botany and entomology, and the Council regrets that members were unable to, or did not take advantage, of the opportunities offered. When opportune these meetings will again be held.

Our membership is now 220. Thirteen were elected during the year, and 4 resigned. During the year, Mr. W. F. Blakely, of the National Herbarium, well-known botanist and an enthusiastic member of the Society, died suddenly, and our old friend, Mr. A. G. Hamilton, who was so well-known to all members, was also called to rest.

The annual tree-planting ceremony at Ball's Head was again held, and this year about 60 trees were planted. The trees were donated by Miss Thistle Y. Harris, Mr. S. T. Turner, and Mr. A. E. Watson, and I am sure members appreciate the kindness of these donors, who so willingly, always provide trees of their own growing for tree-plantings. The Mayor and Council of North Sydney continue to take great interest in this function.

The avenue, at the general cemetery, French's Forest, which the Society undertook to plant, was added to again this year. Twelve trees of *Grevillea Banksii Fosterii* were planted, and this leaves, therefore, 17 more to be planted on the next occasion. Members will be pleased to know that the trees planted on previous occasions are growing well.

Lectures during the year have been very varied and extremely interesting, and we tender our thanks to the lecturers, who so generously gave up their time to address the Society.

The following lectures were delivered:—

- September (1941).—“Australian Trees at Home and Abroad,” by Miss Thistle Y. Harris, B.Sc.  
 October.—“Upwards or Downwards, What Controls the Growth of Plants?,” by Dr. R. N. Robertson.  
 November.—Members’ Night.  
 December.—“Some Recent Orchid Discoveries in New South Wales,” by Rev. H. M. R. Rupp.  
 February (1942).—Members’ Night.  
 March.—“A Trip Up the Hawkesbury River from Broken Bay to Richmond,” by Mr. P. W. Gledhill.  
 April.—“A Naturalist in Papua,” by Mr. Melbourne Ward.  
 May.—Members’ Night, with lantern slides shown by Mr. E. J. Bryce.  
 June.—Froggatt Memorial Lecture, entitled, “A Naturalist’s Wanderings in Northern New South Wales,” by Rev. H. M. R. Rupp.  
 July.—“Birds of the Sydney district,” by Mr. Keith Hindwood, F.R.Z.S.

Excursions.—The excursions have been well attended and, during the year, the following places were visited:—Engadine, Chelmsford, Gordon, Janalli, Berowra, Oatley Point, Ashton Park, Tambourine Bay, Bottle and Glass Point, Dobroyd Head, Middle Cove, East Hills, Caringbar, Pennant Hills (Miss McCulloch’s garden), Cooper Park, Woollahra, Lane Cove National Park, Ball’s Head, Oatley Park, and Castle Grove.

The library is growing, and during the past year several books and periodicals were added to it. Amongst recent additions being: “The Queensland Flora” (6 volumes and index), by Bailey; “A Comprehensive Catalogue of Queensland Plants,” by Bailey; “Principles of Botany for Queensland Farmers,” by C. T. White. These were received in exchange for our Journals. A book of beautiful coloured plates of Western Australian flowers was donated to the library by Miss Coxhead. Other books received were:—“Victorian Fungi,” by J. H. Willis, presented by the author; “Bibliography of Australian Entomology,” by A. Musgrave, presented by the Council Royal Zoological Society of New South Wales; and “Fishes of Australia, Pt. I.,” presented by the author, Mr. Gilbert P. Whitley (a member of the Society).

On behalf of the Council I again wish to thank the Department of Education for the use of the hall for our

meetings, for the use of the library for our mid-monthly meetings, and also for providing space in which to house our library.

Council, and I am sure members also, desire me to record in this report the fine service which has been given to the Society by our Hon. Treasurer, Mr. John Powell. Mr. Powell, from the records at my disposal, became treasurer on the resignation of Mr. E. H. Zeck (who resigned that office in March, 1926, to visit Mexico), and has held the office of treasurer ever since. He has been of great help to the Society for over 16 years, and it is with deep regret that the Council accepted his resignation.

We also wish to tender our thanks to the Hon. Editor, Mr. E. H. Zeck, for his fine work with the Journal, and to our Hon. Lanternist, Mr. Geoffrey White, who so capably attends to our lantern.

Members also desire me to express to Mr. A. E. Watson their sincere thanks for his unstinting help on all occasions.

### NATURALISTS' SOCIETY OF NEW SOUTH WALES.

#### BALANCE SHEET, 31st JULY, 1942.

Receipts.			Expenditure.		
	£	s. d.		£	s. d.
Cash in Hand . . . .	8	4 7	Education Department . . . . .	1	6 4
Subscriptions . . . .	47	17 1	Postage and Literature . . . . .	2	6 7
Sales . . . . .	7	0	Circulars . . . . .	17	17 3
Badges . . . . .	8	0	Journals . . . . .	34	5 7
Donations . . . . .	2	0 0	Secretary's Expenses . . . . .	2	8 0
			Cash in Hand . . . . .	12	11
	£58	16 8		£58	16 8

JOHN POWELL, Hon. Treasurer.

Audited and found correct.

31st July, 1942.

STANLEY F. ALLEN, F.C.A. (Aust.),  
Hon. Auditor.

## NATURALISTS' SOCIETY OF NEW SOUTH WALES.

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*Proceedings.*

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MARCH, 1942.

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The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, March 3, 1942, at 7.45 p.m.

The President (Mr. S. T. Turner), in the chair, with about 40 members and visitors present.

Election of Members.—Mr. W. Shirt, Mrs. J. C. Wiburd, and Miss Hazel Wiburd were unanimously elected members of the Society.

Exhibition of Specimens.—Mr. A. E. Watson: Specimen of a bird's nest fern which showed a tendency for the leaves to divide.

Mr. J. W. Hawley.—Specimens of plants and sea weeds collected at "Bottle and Glass," Neilsen Park, and specimens of flowering Eucalypts from Woodford.

Mr. Sussmilch.—Specimen of a fungus from Clairville, near Avalon. Mr. Sussmilch also discussed a trip to Port Kembla.

Mr. C. S. Ashley.—Specimen of a small lizard and leaves showing the damage caused by caterpillars.

Mr. C. K. Ingram.—Specimens of bladderwort, *Banksia serrata*, and *B. aemula*. Mr. Ingram also exhibited sketches, showing the botanical differences between the two species of Banksias, and a collection of pressed botanical specimens.

Mr. S. Herriott.—Specimen of sea hare from La Perouse.

Lecture.—Mr. P. W. Gledhill (President of the Manly Historical Society), delivered an extremely interesting address, entitled, "A Trip Up the Hawkesbury River from Broken Bay to Richmond." The lecture was illustrated with many lantern slides, and many places of historic interest were described. The lecturer was accorded a very hearty vote of thanks.

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APRIL, 1942.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, April 7, 1942, at 7.45 p.m.

The President (Mr. S. T. Turner), in the chair, with about 45 members and visitors present.

Correspondence.—Letter from Mr. Jacobs concerning a new series of lectures, arranged by the Workers' Education Association, to be held at the University. Other correspondence dealt with at Council meeting.

Exhibition of Specimens.—Mr. John Powell: Specimen of earth in which diamonds are found. Mr. Powell also read notes on his trip to the De Burgh mines at Kimberley.

The Rev. H. M. R. Rupp.—Specimens of orchids, *Prasophyllum fimbriatum* and *P. nigricans*. He also called attention to the recent death, in Adelaide, of Dr. Rogers, one of the foremost orchidologists.

Mrs. H. Pace.—Specimens of olives.

Mr. John Hawley.—Cones of the bunya pine, *Araucaria bidwilli*.

Mr. J. W. Hawley.—Specimen of *Banksia spinulosa* collected at Woodford.

Dr. K. Pariser.—Marine specimens collected at Bottle and Glass, Vacluse.

Miss Gina Ballantyne.—Botanical specimen forwarded from Gresford by Dr. Clarke Webster.

Lecture.—Mr. Melbourne Ward delivered an extremely interesting and informative address, entitled, "A Naturalist in Papua." The lecture was illustrated with a fine series of lantern slides, and the lecturer was accorded a hearty vote of thanks.

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#### MAY, 1942.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, May 5, 1942, at 7.45 p.m.

The President (Mr. S. T. Turner), in the chair, with about 30 members and visitors present.

Members' Night.—Exhibition of Specimens.—Mr. A. E. Watson: A small "oak" grown from seed brought from the Barrier Reef. Mr. Watson also explained the method of germination of Casuarinas. He also exhibited and described Mr. C. S. Ashley's specimen of Noogoora Burr, *Xanthium chinense*, and a specimen of *Pittosporum revolutum* with open fruit and sticky seeds, brought by Mr. E. J. Bryce.

Miss Peterson.—Specimen of *Arbutus unedo*, the Irish strawberry tree and seeds of *Phyllanthus* sp. and specimen of *Glochidion ferdinandi*, the cheese tree.



Mr. A. E. Hamilton.—Specimen of an orchid, *Prasophyllum* sp., which he described on behalf of Mr. J. C. Wiburd.

Mr. C. S. Ashley.—Specimens of marine pests of timber used for piles and other purposes. Specimens of stick or leaf insects.

Mr. S. T. Turner.—Specimens of seedlings of the Port Jackson or Middle Harbour Pine, *Callitris cupressiformis*, grown from seeds collected on one of the outings of the Society. Seedlings of *Pittosporum rhombifolium*, *Callistemon pinifolius*, *C. lilacinus* and specimens of various acacias.

Mr. E. J. Bryce.—Exhibited lantern slides showing types of architecture in various lands, the Burma Road, and the road from India, through Persia to Russia. The slides were made from photographs taken by Mr. Bryce on some of his many trips abroad.

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JUNE, 1942.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, June 2, 1942, at 7.45 p.m.

The President (Mr. S. T. Turner), in the chair, with about 20 members and visitors present.

Exhibition of Specimens.—Mr. A. E. Watson: Described the specimen of *Hakea laurina* exhibited by Mrs. H. Pace.

Mr. C. S. Ashley.—Specimens of a species of *Solanum*.

Mr. F. J. Ludowici.—Specimen of Blue berry ash, *Elaeocarpus cyaneus*, *Eugenia smithii*, *Glochidion ferdinandi* and *Grevillea floribunda*.

Mr. S. T. Turner.—Specimen of red-flowering yellow box, *Eucalyptus melliodora*. Seedling plant of Queensland gigantic lily, *Doryanthes palmeri*. Mr. Turner also exhibited a specimen of an Acacia sent from Queensland to Mrs. Pace.

Froggatt Memorial Lecture.—The Rev. H. M. R. Rupp delivered the Froggatt Memorial Lecture, which was entitled, "A Naturalist's Wanderings in Northern New South Wales." The lecture was illustrated by an excellent series of lantern slides, and was most informative and interesting. The lecturer was accorded a very hearty vote of thanks.

## JULY, 1942.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, July 7, 1942, at 7.45 p.m.

The President (Mr. S. T. Turner), in the chair, with about 45 members and visitors present.

Nomination of Member.—Miss Mavis Ashley, 22 McGowan Avenue, Marrickville. Nominated by Miss Wright, seconded by Mr. S. T. Turner.

Exhibition of Specimens.—Mr. A. E. Watson: Specimen of *Cupaniopsis* sp. This tree had been mentioned in a recent newspaper article as being graceful and symmetrical and having conspicuous fruits. It is a sub-tropical plant.

Lecture.—Mr. Keith A. Hindwood, F.R.Z.S., Hon. Ornithologist, Australian Museum, delivered a most informative and instructive address, entitled, "Birds of the Sydney district." The lecture was illustrated with many beautiful lantern slides, prepared from photographs, which he had taken himself. The lecturer was accorded a hearty vote of thanks.

## AUGUST, 1942.

The annual meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, August 4, 1942, at 7.30 p.m.

Mr. J. W. Hayes, Chief Inspector, Department of Education, was in the chair. Owing to the absence of the President (Mr. S. T. Turner), through illness, Mr. A. E. Watson (Senior Vice-President), acted in his stead. About 70 members and visitors were present.

New Member.—Miss Mavis Ashley was unanimously elected a member of the Society.

Nomination of Members.—Miss K. Deasey, 71 Cameron Street, Rockdale. Nominated by Mrs. A. E. Watson, seconded by Miss D. Dobbin. Master John Altreed, 11 Clevedon Road, Hurstville. Nominated by Mr. E. H. Zeck, seconded by Miss D. Dobbin.

Secretary's Report.—The report of the activities of the Society was presented by the Hon. Secretary (Miss D. Dobbin).

Presidential Address.—Owing to the illness of the President (Mr. S. T. Turner), his address was postponed until the September meeting.

Miss Thistle Y. Harris, B.Sc., gave an address, entitled,

"Some Glimpses of Evolution." The lecture, which was extremely interesting and informative, was illustrated with many lantern slides. A hearty vote of thanks was accorded the lecturer.

Alteration of Meeting Time.—The Hon. Secretary's motion, that the time of the meeting be 7 p.m. instead of 8 p.m. during the brownout, which had been introduced the previous meeting was then put to members and was carried, on a show of hands.

Election of office-bearers for the year 1942-1943:—

President: Mr. F. J. Ludowici.

Vice-Presidents: Messrs. A. E. Watson, E. H. Zeck, A. E. Hamilton.

Hon. Treasurer: Mrs. A. E. Watson.

Hon. Assistant Treasurer: Miss D. Ross.

Hon. Secretary: Miss Dolce Dobbin.

Hon. Assistant Secretary: Mrs. A. E. Watson.

Hon. Editor: Mr. E. H. Zeck.

Hon. Lanternist: Mr. Geoffrey White.

Hon. Assistant Lanternist: Mr. A. Booth.

Hon. Librarian: Mr. A. Booth.

Hon. Assistant Librarian: Miss Dorothy Booth.

Other Members of Council: Mrs. J. Powell, Misses L. Halloran, Thistle Y. Harris, Marjorie Davidson, Messrs. C. S. Ashley, H. S. Deed, J. W. Hawley, J. Powell, Rev. H. M. R. Rupp, and J. C. Wiburd.

Publication Committee: The President, Hon. Editor and Hon. Secretary.

Exhibition of Specimens.—Mr. A. Booth: Display of various books and magazines, and illustrated periodicals from the Library of the Society, which are available to members.

Mrs. H. Pace.—Specimens of fossils and a varied collection of other exhibits from the Burragorang Valley and other places.

Mr. M. E. Gray.—Collection of coloured photographs of various subjects.

Department of Agriculture.—Collections of various groups of insects.

Mr. E. Gostelow.—Exhibited a collection of his excellent water colour paintings of birds, illustrating our native parrots.

Mr. H. S. Deed.—Collection of shells, and a series of microscope slides, the work of pupils of Gardiner's Road School.

Miss White.—A fine collection of flowering plants, thirty-eight varieties, from her garden at Janalli.

Mr. A. E. Watson.—A collection of preserved flower specimens.

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SEPTEMBER, 1942.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, September 1, 1942, at 7 p.m.

In the absence of the President (Mr. F. J. Ludowici), Mr. A. E. Watson (Vice-President), occupied the chair. About 45 members and visitors were present.

Election of Members.—Miss R. Deasey and Master John Altreed were unanimously elected members of the Society.

Nomination of Members.—Miss M. Wickham, George's Hall, via Bankstown. Nominated by Miss D. Dobbin, seconded by Miss N. Luckie. Mr. A. H. Smith, Wiseman's Ferry. Nominated by Rev. A. Satchell, seconded by Mr. S. T. Turner.

Announcement.—The Rev. M. H. R. Rupp resigned from the Council, and Miss N. Luckie was appointed to fill the vacancy.

Exhibition of Specimens.—Miss K. Deasey: Specimen of Sturt's Desert pea (*Clianthus dampieri*), from Broken Hill.

Mrs. J. Powell.—Collection of flowers from Roseville, identified by Mr. A. E. Watson.

Mr. J. C. Wiburd.—Specimens of wild flowers, including *Pultenaea*, *Kennedyia*, *Crocea*, *Tetradheca*, *Boronia*, *Eugenia* and *Dillwynia*.

Mr. J. Powell.—Specimen of orchid which was described by Mr. Hamilton.

Mr. J. Hawley.—Journal from the Sussex Naturalists' Society. Mr. Hawley also told members of the commemorative gathering at Camperdown Cemetery, on August 8, when a number of trees were planted, and mentioned a Moreton Bay fig tree which was just about 150 years old.

Mr. A. E. Watson.—Specimen of a sow thistle, *Sonchus*, and salt bush, *Atriplex nummularia*.

Lecture.—Mr. S. T. Turner delivered his Presidential address which was entitled, "Drought and the Western Fauna." The lecturer was accorded a hearty vote of thanks for his instructive and informative address.

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OCTOBER, 1942.

The ordinary monthly meeting of the Society was

held in the Assembly Hall, Department of Education, on Tuesday, October 6, at 7 p.m.

The President (Mr. F. J. Ludowici), in the chair, with about 40 members and visitors present.

Election of Members.—Miss M. Wickham and Mr. A. H. Smith were unanimously elected members of the Society.

Nomination of Members.—Miss Hildegrande Finckh, 13 Wharf Road, Snail's Bay. Nominated by Miss D. Dobbin, seconded by Mr. F. J. Ludowici. Miss Jean Walters, 12 Napier Street, North Sydney, and Miss Delores Beveridge, 104 Amhurst Street, North Sydney. Nominated by Miss D. Dobbin, seconded by Miss Luckie.

Announcement.—The President announced the death of Dr. Clarke Webster, and members stood in silence as a mark of respect. The President also announced the addition to the library of the Poison Plants of N.S.W.

Exhibition of Specimens.—Mr. John Hawley: On behalf of his brother, Mr. J. W. Hawley, specimens of spherulites from the Stanwell district in Queensland.

Mr. A. E. Watson.—Piece of jarrah, *Eucalyptus marginata*, from Western Australia.

Miss Wright.—Specimens of plants, including *Chorizema*, *Callistemon*, *Dianella* and orchids from Janalli.

Lecture.—The Rev. Frank Cash delivered a most informative and instructive address, entitled, "Some Natural Wonders of New South Wales." The lecture was illustrated with excellent lantern slides, which were made from his original photographs. The lecturer was accorded a hearty vote of thanks.

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#### NOVEMBER, 1942.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, November 3, 1942, at 7 p.m.

In the absence of the President (Mr. F. J. Ludowici), Mr. A. E. Watson (Vice-President), occupied the chair. About 25 members and visitors were present.

Apologies.—Apologies were received from Mr. and Mrs. Ludowici and Mr. J. W. Hawley.

Announcement.—The Chairman advised members of the recent death of Mr. J. C. Wiburd, and spoke at length of his fine character and outstanding personality. Members stood in silence as a mark of respect.

Election of Members.—Miss Hildegrande Finckh, Miss

Jean Walters and Miss Delores Beveridge were unanimously elected members of the Society.

Nomination of Members.—Mr. P. W. Gledhill, 3 Fairlight Crescent, Manly. Nominated by Mr. John Hawley, seconded by Miss D. Dobbin. Mr. L. J. Glyde, 12 Methuen Avenue, Mosman. Nominated by Miss D. Dobbin, seconded by Mr. A. E. Watson. Miss Lilian Goldsmith, 43 Llewellyn Street, Marrickville. Nominated by Miss Watts, seconded by Miss F. Bewley. Miss D. Shaw, 48 Annandale Street, Annandale. Nominated by Miss M. Davidson, seconded by Miss Gina Ballantyne.

Exhibition of Specimens.—Miss Myra White: Specimen of bird's nest blown from pine tree, flannel flowers, *Actinotus helianthi*, *Acacia longifolia* and *Stypandra glauca*.

John Altreed.—Specimens for microscope slides.

Mr. C. S. Ashley.—Specimens of very large mulberry leaves, *Morus alba*.

Mr. F. Johnson.—A large series of interesting botanical specimens.

Miss Ivy Wright.—Collection of native plants from flower garden at Janalli.

Mr. P. W. Gledhill.—Slides of Morley and its neighbourhood; some illustrating earlier days.

The remainder of the evening was devoted to microscopic work. A member of the Microscopical Society had an excellent microscope and demonstrated a great many slides to members.

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#### DECEMBER, 1942.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, December 1, 1942, at 7 p.m.

The President (Mr. F. J. Ludowici), in the chair, with about 40 members and visitors present.

Correspondence.—The correspondence was dealt with at the Council meeting.

Election of Members.—Mr. P. W. Gledhill, Mr. L. J. Glyde, Miss Lilian Goldsmith, and Miss D. Shaw were unanimously elected members of the Society.

Nomination of Members.—Miss C. MacMurray, 63 Broughton Road, Artarmon. Nominated by Miss B. Coxhead, seconded by Miss E. Wright. Mr. A. F. Buckley, Box

2505 MM., G.P.O., Sydney. Nominated by Mr. John Hawley, seconded by Miss D. Dobbin.

Announcements.—Mr. F. Burrows, Hon. Secretary, Royal Horticultural Society of New South Wales, who was present, asked permission to place two matters before the Society. The first was to extend to members an invitation to attend the meeting of the Horticultural Society, on December 10, when the lecturer was to be Mr. Noel Burnet.

He then called attention to the proposed tree-cutting in the Mount Wilson area, which had been mentioned in the "Sydney Morning Herald," and asked that the Naturalists' Society support members of the Mount Wilson district in having the leases rescinded. He advised that the Royal Horticultural Society and the Forest League had protested to the Hon. W. F. Dunn, Minister for Agriculture and Forests.

Mr. Buckley, Mr. John Hawley, and Mr. A. E. Watson supported the motion, which was carried, and the Hon. Secretary was instructed to advise the Minister for Agriculture and Forests accordingly.

Mr. John Hawley spoke of the late Mr. J. C. Wiburd and mentioned his fine character.

Exhibition of Specimens.—Mr. F. J. Ludowici: Specimen of a long-horned tree cricket, *Paragryllacris combusta*, and a specimen of the spiny leaf insect, *Extatosoma tiaratum*.

Mr. A. E. Watson.—Specimen of a bean tree.

Miss Gina Ballantyne.—Specimens of Mangrove seeds and seedlings.

Lecture.—Mr. H. J. Lamble, Director of the Tourist Bureau of N.S.W., delivered a most interesting and informative address, entitled, "The Snow Country of New South Wales." The lecture was illustrated with numerous excellent lantern slides, and was much appreciated. A hearty vote of thanks was accorded the lecturer.

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#### FEBRUARY, 1943.

The ordinary monthly meeting of the Society was held in the Annex, Teachers' Federation Building, on Tuesday, February 2, 1943, at 7 p.m.

The President (Mr. F. J. Ludowici), in the chair, with about 25 members and visitors present.

Election of Members.—Miss C. MacMurray, and Mr. A. F. Buckley were unanimously elected members of the Society.

Nomination of Members.—Miss C. Nash, Correspondence School, Blackfriars. Nominated by Mr. J. W. Hawley, seconded by Miss D. Dobbin.

Correspondence.—The correspondence was mostly dealt with at the Council meeting. Letter from the Hon. W. F. Dunn, Minister for Agriculture and Forests. Mr. F. Burrows (Royal Horticultural Society), mentioned the efforts being made to have the Blue Mountain area proclaimed a reserve, and stated that Mr. Joseph Jackson and Mr. Hamilton Knight had gone over the area, and that Mr. Jackson was taking an active part in the matter.

Members' Night.—Exhibition of Specimens.—Mr. C. S. Ashley: Aboriginal axes from Emu Plains and botanical specimens.

Mr. John Hawley.—Nest of the goldfinch, *Carduelis*. Mr. Hawley gave a short address on nidification or nest building.

Mr. A. E. Watson.—Collection of metals, mineral and rocks. Fossil shells from Jamberoo, and fresh water mussels from the Lachlan River. Petrified wood from Wallsend. Mr. Watson described the specimens and the various uses of the minerals.

Miss Myra White.—Specimen of *Platylobium formosum*, paper nest of wasp, cocoon of woolly-bear caterpillar, and a star fish from Port Hacking.

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#### NOTICE.

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Any members who have spare copies of the "Australian Naturalist," Volume IV., pts. 1-16 (1918-1921), or Volume V., pts. 1-16 (1922-1925) are kindly requested to communicate with the Hon. Secretary.

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# The Australian Naturalist

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Vol. XI.

NOVEMBER, 1943.

Part 4.

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## GUIDE TO THE FRESHWATER SHELLS OF NEW SOUTH WALES.

By TOM IREDALE.

(Contribution from the Australian Museum.)

### PART I.

The study of freshwater shells is altogether different from that of land shells. It has the advantage that it can be carried out continuously and most, if not all, of the species are gregarious and therefore numbers can be easily secured. The animals live in every kind of freshwater, rivers, lakes, pools and swamps, and they can be easily kept in aquaria, where they breed freely so that their habits can be closely observed. They have never been favourites in this country, yet elsewhere they might almost claim first place, so much interest is taken in them. They, perhaps, have not the colour attraction of so many land shells and not the diversity of form, though they provide greater contrasts among themselves. There are no bivalve forms among land shells, while these have been famous, through the centuries, in freshwater. The greatest difficulty in connection with freshwater shells is their variability in form through their quick reaction to differences in the medium they live in. According to the acidity or alkalinity of the water they vary in size, and they also react to running water and to stagnation. Today controlled experiments in aquaria will help to solve problems, but fortunately in this State we are not required to test our species by such methods. However, it will be a great help to the student if he keeps aquaria and watches the growth and development of even the commonest species. Some of the queries that have cropped up in preparing

these notes will be mentioned in their systematic place. This guide is essentially merely an introduction, and must be treated as such as, if we look at the map, New South Wales is seen as an extremely well-watered country, a veritable paradise for the student. The map is very misleading as it does not indicate any of the pitfalls that waylay the investigator. The freshwater shells are more or less tied down to the river systems, but this statement is complicated by the fact that these river systems are not exactly what they seem. The geology of the State should be referred to on account of discrepancies, which are due to river captures and other earth movements. Briefly, the Murray-Darling River system occupies the bulk of the interior of the State, and has a peculiar faunula, which has been called the Mitchellian Fluvifaunula, a name given in memory of Sir Thomas Mitchell, who explored almost its whole length. Perhaps the Sturtian Fluvifaunula belonging to Central Australia reaches into the far north-west of the State, but little is yet known. All Australians will recognise this nomination, but the next, the Lessonian Fluvifaunula, will not so easily be recalled. This was named after Rène Lesson, a French naturalist belonging to a French exploring vessel, the "Coquille," who collected the first freshwater shells given to science while his ship was in Sydney Harbour. Therefore his name has been associated with the very distinct coastal fauna of the east coast from north of Sydney to coastal Victoria and Northern Tasmania. A minor Fluvifaunula has been named after G. Krefft, an early Curator of the Australian Museum, and a great pioneer naturalist. The Krefftian Fluvifaunula occupies the rivers of the north coast of N.S.W. and southern coastal Queensland. Dealing with Australia as a whole, these Fluvifaunulal names are preferable for citation as they envisage zoological entities, whereas the State names confuse distinct groupings, but when dealing with one State alone it is not so necessary. It is important, however, to know these facts, as they immediately account for difficulties, which would otherwise appear insuperable, such as the occurrence of very different species at localities apparently not very far apart.

#### CLASS PELECYPODA.

This includes all bivalve shells but no technical data will here be given concerning the nomination of the shells as this is presented in "A Basic List of Freshwater Mollusca of Australia," recently issued in the Australian

Zoologist, Vol. X., pp. 188-230, April, 30, 1943, which can be referred to for all technical matters. As to the present class a full account of the Freshwater Mussels of Australia appeared in the Australian Zoologist, Vol. VIII, pp. 57-78, pls. iii.-vi., May 9, 1934, wherein all scientific references are given. Here the local species will be mentioned, our knowledge being brought up-to-date. Freshwater bivalves vary in size from comparative giants, measuring up to seven inches in length down to minute shells, only an eighth of an inch across. Three distinct families are represented, the Freshwater Mussels, Family Prophehydellidae, including all the large species from about two to seven inches in length; Family Corbiculidae, the middle series, from about half an inch to an inch and a quarter across; and Family Sphaeriidae, the small forms, the largest about one-third of an inch, but generally less, down to one-eighth of an inch.

#### Family PROPEHYRIDELLIDAE.

Elsewhere Freshwater Mussels are collected for commercial purposes, as in the United States of America, where they form an industry employing thousands of people and are prized, both for the pearl shell and for the pearls found therein. None of our shells is worthy of pursuit, either for pearl shell or pearls. Certainly some of the latter have been found in our mussels, and also some of our species reach a size available for pearl buttons, but in neither case in a commercial sense.

Six genera have been separated in three subfamilies, but these divisions will probably be emended with more study. The first subfamily has the beaks of the shell smooth, apparently a rare feature in freshwater mussels, although thousands of species have been named throughout the world. The species vary from middle to largest size, two genera, *Velesunio* and *Alathyria*, characteristic of the Murray-Darling system, but also occurring in some of the coastal rivers. *Hyridunio*, which was placed here, has been found to have plicate beaks and is therefore transferred to the next subfamily. This comprises medium to small size shells, from two to three and half inches across, ranging through the coastal rivers from northern New South Wales to Victoria. The other two genera are *Prophehydella* and *Rugoshyria*. All these are useless for pearl shell as they are too small and too thin, and pearls are very infrequent. The last subfamily contains only one genus and species, the magnificent *Cucumerunio*, a large

elongated sculptured shell measuring six inches in length, with restricted habitat in the northern rivers. Now as to the species to be recognised: these may become numerous when close study is made, but here only the outlines can be drafted of the scheme to be followed in any future investigation. Probably each river has established its own form which may be either a species, subspecies, or even a variation of less value, but alongside must be reckoned ecological variation. This is not due to geographical isolation, but may vary from year to year through climatic causes. The chief climatic cause here is drought and its aftermath, floods. During the former mussels bury themselves in the mud left by the drying-up of the rivers, lakes, etc.; when the floods come the mussels re-appear, grow rapidly, breed quickly, and such alternation may occur more than once in a mussel's life. Such variation is generally clearly seen in the shell formation, sometimes the shell forming steps, swelling rather than lengthening, at others the opposite, but only experience will show.

Thus, *Velesunio balonnensis* is the characteristic form of the Upper Darling system, the Balonne River, though credited to New South Wales in the original reference, is now completely in Queensland. It is short and very swollen, and Barwon River specimens were regarded as conspecific. From the Richmond River a shell similar was regarded as a subspecies only with the name *adjunctus*, but it must now be given specific distinction and may not even belong to the group. It is more compressed, thinner, more angulate anteriorly, but words are of little use to indicate the differences. From the Balonne River throughout the Darling tributaries, the MacIntyre, the Gwydir, the Namoi, the Castlereagh, the Macquarie, the Bogan, forms of this group occur, each showing variation and possibly all these forms will later be named. Here a name is given only to the Murrumbidgee form, which is larger, more angulate posteriorly and is here figured. The type measures 90 mm. by 49 mm., and is named *V. mckeowni* sp. nov., after Mr. Keith McKeown, a well-known student of the fauna of the Irrigation Area of N.S.W. From the Murray River, at Benthagi, N.S.W., a series was collected agreeing with the figure given in my account (Austr. Zool., Vol. VIII, p. 62, pl. 3, fig. 7, and pl. iv., fig. 7, May 9, 1934), under *V. evansi*, the figures 6 on the two plates being true *evansi*. It is apparently common in Victoria and South Australia, and is here given the name name *V. testatus*,

the type from Benthagi measuring 69 mm. by 42 mm. Elkington Allen has collected a large number of specimens of this genus in the Nepean River, at Camden, also in the George's River, and it also lives in the Wollondilly River. It is most like the lastnamed in general appearance, compressed anteriorly, and swollen posteriorly, narrowed in front and broad behind, the posterior margin subtruncate and the ventral margin lightly curved. The average seen go about 64 mm. by 39 mm., but one old dead valve measures 86 mm. by 57 mm. The new species is named *V. transitus* as it is the first *Velesunio* found in the coastal areas around Sydney

The name *Alathyria* was introduced for the large crass shells without beak plications, and three species were differentiated, one from the Hunter River, a coastal river, the other two, one from the Darling system, one from the Barwon, and the other from the coastal South Queensland rivers belonging to this system. Many others will later be separated, and there is difficulty with the form occurring in the Hunter River, as it may represent a distinct genus. Its distribution is, however, not understood, as it seems to occur in the Lachlan and Shoalhaven Rivers, apparently quite dissociated systems. To get back first to the Barwon River *jacksoni*, this is a large thick shell with a notable winging about four inches across. Macquarie River specimens collected by Elkington Allen are larger, reaching to seven inches and with less winging and deeper and may be named *A. jacksoni alleni* subsp. nov., the type measuring 150 mm. long by 88 mm. deep by 60 mm. conjoined valves.

From Condobolin on the Lachlan River comes a similar shell, as also from Leeton on the Murrumbidgee River, and Echuca on the Murray River, anteriorly a little more attenuate and not so deep, the teeth stronger, and this may be named *A. selwyni* sp. nov., the type from Leeton measuring 105 mm. by 56 mm. Probably this type occurs throughout all the rivers of the Murray-Darling system, but curiously a similar shell appears in the Richmond River, obviously a distinct species. It was collected by Mr. H. S. Mort and is here named *morti*, more elongate than *jacksoni*, winging less pronounced, ventral margin almost straight, and posterior more rounded, teeth weaker, the type measuring 137 mm. by 69 mm., the umbo at about the anterior fifth.

Reverting to the Hunter River style, this is a more oval shell, of similar size, but not quite so lengthened and without winging and was called *profugus* by Gould nearly a century ago. It is comparatively a stouter and smaller shell with deeper muscle scars and heavier teeth, measuring about four inches long by about 2-1/3rd inches deep.

Shells from Narrandera on the Murrumbidgee River are not unlike the Hunter River shells, but are deeper, more rounded, stouter, with heavier teeth, the type measuring 88 mm. by 59 mm., and may not really belong to *Alathyria*, and these are confirmed by similar shells from Condobolin on the Lachlan River, living alongside shells of the *jacksoni* type. This Hunter River style shell from Narrandera may be called *A. condola* sp. nov. An even more puzzling form is a similar shell inhabiting the Shoalhaven, which is very like *profuga* when adult, being a little larger, more swollen, the anterior end a little prolonged and compressed; the juvenile shell is however compressed, the anterior compression more notable and the posterior end also compressed, the ventral margin almost straight, whereas in the adult this is well curved; this may be named *A. vadana* sp. nov., the type measuring 120 mm. by 68 mm. This species also occurs in the Wollondilly River. Much more research is to be done with regard to these freshwater mussels as two specimens from the Snowy River, N.S.W., are in bad condition, but do not agree with either of the above groups. *Hyridunio* was placed among the genera with smooth beaks, but a young specimen shows wrinkles, but apparently of different origin from those of *Rugoshyria*. The shell is solid, a little elongate, the dorsal and ventral margins subparallel, a slight median sinuation always present on the latter, and the anterior end rounded, the posterior a little produced; the teeth are well marked and the characteristic pseudocardinal pit is present. The Sydney species is named *australis*, and in northern New South Wales a longer shell recalling the Brisbane River *drapeta* is found and this, from the Clarence River, is figured and named as a new subspecies, *H. australis casus* subsp. nov., the type measuring 74 mm. by 38 mm. The Sydney shell is comparatively deeper, measuring about three inches by more than an inch and three-quarters deep, and there may be a southern race as a shell from Kiama is still deeper and more winged.

The members of the genus *Rugoshyria* are small, delicate elongate shells, smooth, but whose beaks are

sculptured, and are completely valueless in every sense. The original form was named from about Sydney as *depressa*, but has long been incorrectly known as *paramattensis*, and also sometimes as *cultelliformis*, a name given to a similar inland shell. The coastal shell measures about two inches long by a little over an inch in depth; in the south it is represented by a subspecies up Mount Kosciusko, *monticola*, smaller and deeper, the umbo more central, measuring just under two inches long by about an inch and a quarter in depth. On the southern lowlands, e.g., from Bega, a larger shell lives, a little broader anteriorly and more attenuate posteriorly, which may be called *R. d. bega* subsp. nov., the type measuring 68 mm. long by 32 mm. deep.

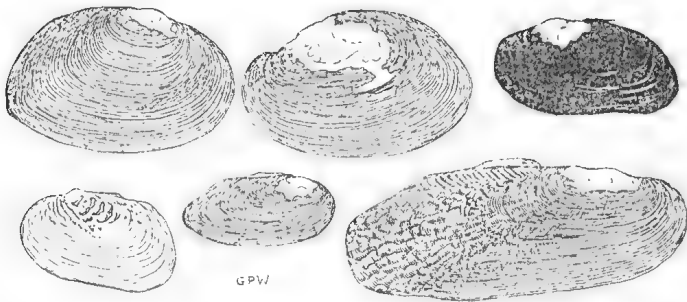


Fig. 1.—Upper row: *Velesunio mckeowni*, *Alathyria condola*, *Hyridunio australis casus*; Lower row: *Propheyriddella nepeanensis*, *Rugoshyria depressa lowanna*, *Cucumerunio novaehollandiae*.

In the north another distinctive subspecies occurs, a series from the Dorrigo, north N.S.W., collected by Mr. Melbourne Ward, having the posterior end shorter and more rounded, the anterior more attenuate, the teeth weaker, and may be named *R. d. lowanna* subsp. nov., the type measuring 59 mm. by 28 mm., the largest a few mm. longer.

Many years ago a similar shell was described as *cultelliformis* from the Bogan River; this is apparently very closely related, but has a more arched dorsal margin and a straighter ventral margin, measuring nearly three inches in length by about an inch and a quarter in height.

The other small group with sculptured beaks is *Propheyriddella*, whose type is *nepeanensis*, a more solid,

more square shell, named from the Nepean River. The normal shell measures about two and a quarter inches in length by about an inch and a third in depth. The Richmond River form was subspecifically named *opportuna*, as being larger and longer, two and three-quarters of an inch long by over an inch and a half deep, but Elkington Allen has found much larger ones in the Woronora going over three inches in length by two inches in depth, but these preserve the typical form, and can thus still be distinguished from the northern subspecies.

Local variation becomes notable in this group as it has developed in south-west Victoria into the curious little form, *glenelgensis*, which was separated as a distinct genus, *Protohyridella*, but whose beak sculpture is identical. The immature varies in form a little so that an immature shell from Narracan River, Gippsland, Victoria, has been described as a species. This is here commented upon as a couple of shells, from the Upper Bellenger River, north New South Wales, show greater differences from the typical *nepeanensis* in form, being more elongate, the anterior end narrower, the posterior more like that of *Rugoshyria depressa*, being elongated and somewhat attenuate, the beak sculpture more developed, so that this may be called *P. n. novata* subsp. nov., the type measuring 42 mm. by 25 mm.

The last species of freshwater mussel is the finest, *Cucumerunio novaehollandiae*, a shell over five inches long by only two inches deep, almost lanceolate in shape, strongly sculptured posteriorly; it is quite unlike any other shell and is restricted to the northern rivers. Although it was first reported from the river "Macquarie" that was not the name of the river intended, but, through confusion with Lake or Port Macquarie, some coastal river, perhaps the Hunter, was the source of this mussel. Before leaving the mussels, it may be recorded that we know nothing of their breeding habits upon which the classification of most extralimital species is founded.

#### Family CORBICULIDAE.

This family includes the small mussels under an inch, rarely larger and of bright coloration, yellow, sometimes streaked with purple, sometimes uniform purple, the interior similarly variable. They are oval, anteriorly rounded, posteriorly a little beaked and with a sculpture of concentric ridges. They apparently vary geographically



and, as they live in the sand at the bottom of rivers and pools, numbers are usually collected at a time. At first sight they all look alike, but small constant differences can soon be seen, and many species are named, but the absolute value of the observed distinctions must depend on further research. The earliest known was described by French naturalists from the River Nepean, and its specific name is *australis*, though it has long been known as *nepeanensis*. A little later, the Murray River form was named *angasi*, while the Hunter River shells were called *debilis* by Gould, and later renamed *sublaevigata* by Smith. Another species was named *faba* from the Richmond River, and its young or stunted shells were regarded as *minor*, an indeterminate name in this group. Five new described forms are here figured: *mussoni* from Narrabri on the Namoi River, *permena* from Yass at the extremity of the Murrumbidgee River, *maroubra*, a very distinct species from Maroubra, near Sydney, *esculenta* from Armidale, northern New South Wales, and *subovalina* nov., from the

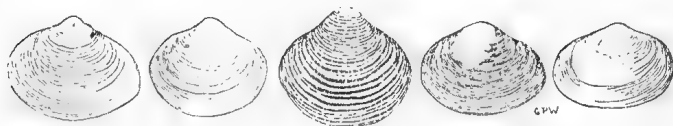


Fig. 2.—*Corbiculina mussoni*, *C. permena*, *C. maroubra*, *C. esculenta*, *C. subovalina*.

Barwon River. In addition a few shells, from Tibooburra, in the far north-west of this State, are determined tentatively as small specimens of *finkeana*, described from the River Finke, Central Australia. It would be very difficult to define the differences in a few words, the locality being the best test, and probably many more forms will be distinguished. The ecological conditions must be studied as two series from different parts of the Wollondilly River would readily be regarded as two distinct species. Indeed, large numbers collected around Narrabri were divided into no less than seven lots, and different names allotted to some, referring to already named species from different parts of Australia. Taking *australis* as the basis, *angasi* is a more rounded form with less defined sculpture, *debilis* is more oval with the sculpture also less marked, *faba* is larger, more oval and with bolder sculpture and generally of dark coloration, *mussoni* is deeper, less oval with coarser ribbing, *permena* is more triangulate with

closely-set defined ribbing, *maroubra* is larger, triangulate, with bold distant ribs and usually blackish outside, *esculenta* appears to be the largest yet, oval, more beaked than usual and with very close well-defined ribbing, *sub-ovalina* is small, broadly oval and with ill-defined ribbing, while *finkeana* is more oval with the ribbing better marked. It may be noted that none of this family lives in Tasmania, although otherwise throughout Australia.

#### FAMILY SPHAERIIDAE.

The peashells are small bivalves which have interested people in other countries, but have not yet appealed to any Australian student. Thus a complete book was written about one genus in the British Isles, and within thirty years another exhaustive account was published covering exactly the same ground. It will be many years before our species are treated so exhaustively, and if the ratio were observed, seventeen species allowed in the British Isles, ours might become unmanageable altogether. For the British authorities, many of them, all agree that their variation is immense, and each queries the other's conclusions. Three genera are here admitted and, as the distinction of the British genera depends upon anatomical research, the species varying in size from an eighth to a third of an inch in diameter, there is no finality as to the relationship of the local species. However, Smith, the conchologist of the British Museum, separated two of our species according to the British tradition, and this has

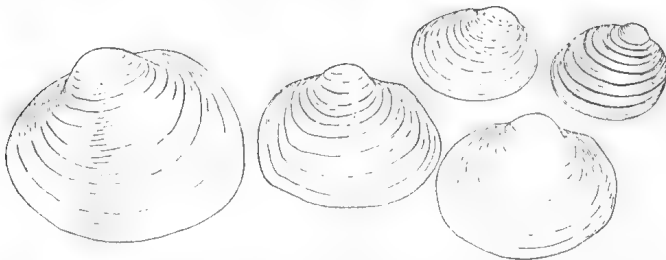


Fig. 3.—*Sphaerinovalva bradena*, *S. nundnalis*, *S. terenda* (lower figure); *Australperla mena*, *Glacipisum kosciusko* (two upper small figures).

been tentatively followed, though there is a grave suspicion that this may be not altogether correct. The larger ones are allotted to *Sphaerinovalva*, and *macgillivrayi* from Penrith is about a quarter of an inch across and deep, nearly equilateral. From Braidwood, on the Shoal-

haven, a larger, little more oblique, form was named *bradena*, and placed in *Australpera*, but it seems better placed here, while another form from Nundle, north New South Wales, *nundinalis*, is definitely more beaked and smaller. From the Irrigation Area, Murrumbidgee River, a more rounded shell with finer sculpture and the apex a little excentric comes; it is also smaller, measuring 5 mm. across and deep, and is here named *S. terenda* sp. nov. A small shell from Armidale, northern New South Wales, is now doubtfully referred to *Australpera* as a new species, *A. mena* nov., it measures only 3 mm. by 2 mm., and is very oblique and has stronger teeth than the preceding, recalling more *Glacipisum kosciusko*, a form dredged from the lake on Mount Kosciusko, also oblique, approximately the same size, but deeper and sculptured with pronounced ridges, quite unlike any other of this family here. These little shells carry inside them a number of minute baby shells.

(To be continued.)

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## BARNACLES AND GEESE.

(Part ii.)

By J. W. HAWLEY.\*

In antiquity the genesis and folklore pertaining to the fables and legends of the barnacle geese seem to have had two distinct lineages of descent.

Ray Lankester quotes a French archaeologist, who has brought evidence from drawings on pottery and shards discovered by excavation, to demonstrate that the evolution of the tree geese was prior to the Eagean civilization.

It has been suggested that, along the littoral shores of the Mediterranean Sea, the trading Phoenicians, sailing and drifting in their boats to various ports and channels, noticed that the flowers and fruit of the Mangrove, after falling from the tree assume a semblance and kindred form to a young bird with wings outspread, at ease, and at rest, settling on the muddy estuaries of the Grecian broken coast line, and hence arose the erroneous idea, expanding from

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\*Part i. appeared in "The Australian Naturalist," Vol. 10, Pt. 7, p. 237.

shore to shore, the sailor's sea-faring logical myth of the tree barnacle geese.

In the British Isles the first allusion to the barnacle geese is in the Exeter book, probably written before 750 A.D. In the form of a riddle, it has had various interpretations, but Brookes' has been accepted by most scholars.

In a narrow was my nebt†  
 Underflowen by the flood  
 Low was I besienken  
 Over covered with the waves  
 To a wandering wood  
 Quicken the life I had  
 Of the billows of the beamwood  
 White in parts were these  
 When the lift up-heaved me  
 Wind from wave upblowing  
 Bore me o'er the shieling cove.

A solution:—

And beneath the wave I lived  
 In the mountain billows  
 In the sea I waxed  
 Clinging with my body  
 When I from the clasping came  
 In my black array  
 My pranked garments fair  
 Me a living creature.  
 Say, what is my name?

The next reference seems to have been made by Nexham in the accepted date 1180 A.D. He describes the growth of the barnacle geese vulgarly called Bernekke from deal planks long soaked in salt water and after debating that being produced from water and not from sexual mating these birds may be liken to fish, to be eaten in Lent. He also adds that Bernekke are born only from planks exposed to sea-water or trees planted on the edge of the sea-shore. The story of the tree geese is repeated by Odoric and copied from him by Manderville. In the sixteenth century, Herbert Boethius, in his history of Scotland, insists that it is not the trees that produce the geese, but the seas into which the apples or fruit have fallen.

By this time, the name barnacle was established as a particular species of geese called Claiks by Boethius, and

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†A bird's beak.

Brant geese by others. Whether the word is Celtic or Latin in origin is unknown, but it was transferred from the (sea) shells or the timber, to the bird.

A metamorphosis may be quoted from Drayton: a soft and sappy gum from which the tree geese grow, called barnacles, which beholden, seem to be a jelly first by the fluxure nursed still greater and greater thrive, until you will see them transformed to perfect fowls when dropping from the tree into the mercy pond which under them doth die.

Wax ripe and taking wing  
 Away in flocks do fly  
 And again  
 Which where so'er they breed  
 On trees or rotten ships  
 Yet to my fens for feed  
 Continually they come.

In conclusion, Buchan quotes, that in the time of the Crusade, that barnacle geese birds from the shore marshes were classed as fish, and not denied to pious epicures, also a dish of liver dressed with rice and herbs, though contained in flesh was not classed as flesh. Pope Innocent III, however, put an end to the habit and would not have it regarded otherwise than a bird.

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NOTES ON THE SO-CALLED "PEPPERMINT GUMS"  
 OF AUSTRALIA AND TASMANIA (*EUCALYPTUS*  
*AMYGDALINA* AND ITS ALLIES).

By EDWIN CHEEL.

During 1935, whilst Government Botanist and Curator of the National Herbarium of New South Wales, I had occasion to report on the publication, "A Key to the Eucalypts and Companion to J. H. Maiden's Critical Revision of the Genus *Eucalyptus*," by W. F. Blakely. As certain changes in the names had been made, there was a general desire to know the official position, and the following notes are furnished on certain species.

*EUCALYPTUS AMYGDALINA* Labill.

This species was described in 1806 by Labillardiere from specimens collected in Tasmania. *E. salicifolia* Cav., Icon., iv., 24 (1797), is quoted as a doubtful synonym. Bentham (Fl. Aust., iii., p. 200), in referring to *E. salicifolia* Cav. (and

others), remarks: "Although evidently seen by the authors in bud or in flower, as well as in leaf, are far too imperfectly described to render their identification possible."

Maiden (C.R., 1, p. 151, 1905) lists *E. salicifolia* Cav., based on *Metrosideros salicifolia* Solander, as a synonym under *E. amygdalina*. In his notes on the synonyms, Maiden remarks "probably *Metrosideros salicifolia* 'a' and 'b,' Soland., MSS." The Latin description of Gaertner is copied by Maiden with the following remarks:—"Fig. 3 (a) of this plate consists of two fruits, which may be *E. amygdalina* Labill. (See also Labillardiere's original description.) Fig. 3 (b) consists of seeds. According to specimens in Herb. Vindob., labelled *Eucalyptus amygdalina* Labill., *Metrosideros salicifolia* Gaertn., Ins. Van Diemen, Herb. Bauer, Ferd. Bauer, the above is *E. amygdalina*, a view in which I concur. The specimens are in leaf and fruit." It will be noted that Maiden does not refer to (c) and (d) of the B. var. of Gaertner's *Metrosideros salicifolia* which, by the way, is quoted as a synonym of *Eucalyptus crebra* F. v. M., by Bentham (*vide* Fl. Aust., iii., p. 222).

A copy of Gaertner's work is in the library of the National Herbarium, and it will be noted that the (c) and (d) fruits and seeds figured by Gaertner are tentatively labelled in pencil by the late Mr. Maiden as "*crebra*." Maiden afterwards ran a pencil mark through the name "*crebra*" and wrote "*microcorys*" underneath. It will be clearly seen from this that the late Mr. Maiden was undecided as to the real position of the *Metrosideros salicifolia* of Gaertner.

The matter is further complicated when we find that Gaertner (Fruct., i., p. 174) quotes *Metrosideros salicifolia* v. Soland. MSS. as a synonym under his *Leptospermum umbellatum*, and refers to the illustration of Rumphins Amb., iii., p. 72, t. 45. The fruits depicted by Gaertner are copied by Lamarck, XII., iii., t. 421, fig. 4 (1797). Hooker (Bot. Mag., t. 3260, 1833) gives an illustration of *E. amygdalina* Labill., from a Tasmanian plant and quotes *Metrosideros salicifolia* of Gaertner (*Eucalyptus salicifolia*) as a doubtful synonym. Then we have Britten (XII., Bot. Capt. Cook, Voy. ii., p. 39, pl. 117) who gives *Metrosideros salicifolia* Gaertn., as a synonym of *Eucalyptus terminalis* F. v. M. The illustration published by Britten is from a drawing made by Solander marked Lizard Is., Thirsty Sound. Britten's illustration (from Solander's drawing) does not in any way resemble *Eucalyptus terminalis* of

Mueller, as already stated by Maiden (C.R., ii., p. 63, 1910), who remarks: "See XII., Bot. Capt. Cook, Voy. ii., p. 39, pl. 117, and suggests that *Eucalyptus racemosa* Cavanilles (1797) was probably the same as *Eucalyptus crebra* F. v. M. Bentham (Fl. Aust., iii., p. 200) regards *E. racemosa* Cav., as too imperfectly described to render its identification possible."

We have one specimen in the National Herbarium collection, which we received from the British Museum, determined by James Britten as *Eucalyptus terminalis*. This is figured in Botany of (Captain) Cook's First Voyage, Banks and Solander, Part ii., p. 39, pl. 117 (1901), and *Metrosideros salicifolia* Gaertn., Fruct. i., 171 (1738) (tab. xxxiv., fig. 3a), and Soland. MSS., is given as a synonym.

#### EUCALYPTUS RADIATA Sieber.

This is included as a synonym under *E. amygdalina* by Bentham. We have the type specimen collected by Sieber. (See D. C. Prod. III., p. 218, and Mem. Myrt., t. 7.) Unfortunately, Bentham mentions Woolls' specimens collected at Bent's Basin and Nepean River, and has thus created confusion by mixing two distinct forms or species under *E. amygdalina* Labill. var. *radiata* Benth. Sieber's specimens were probably collected on the Blue Mountains or on the tablelands near Mittagong. They are quite distinct from the Bent's Basin specimens collected by Woolls. The latter were described by Deane and Maiden as a variety under the name *E. amygdalina* var. *radiata*, and afterwards raised to specific rank by Maiden under the name *E. numerosa*. (See Proc. Linn. Soc. N.S.W., Vol. xxix. (1904), 752.)

Baker regarded this as *E. radiata* Sieber, but had apparently not examined Sieber's specimens very critically, or may not have seen the specimens at all. Both species (*E. radiata* Sieber and *E. numerosa* Maiden) have a very wide range, extending from Bent's Basin on the Nepean River, over the Blue Mountains and Tablelands in New South Wales to Victoria, chiefly in the cooler parts of both States. They are quite distinct from the true *E. amygdalina* of Labillardiere, which is confined to Tasmania. *E. numerosa* is usually found along the river beds and fresh-water creeks, and is easily distinguished from *E. radiata* by the smooth-barked upper branches—hence it is called the "River White Gum." *E. radiata* has persistent "box-like" or flaky bark, and is commonly known as "Peppermint." The essential oils of the two species are also quite distinct.

Baker and Smith separated some forms of *E. radiata*

and described them as new species under the names *E. australiana* and *E. phellandra* on account of the phellandrene constituent being absent in certain forms and present in abundance in the others, but, whilst phellandrene is absent in some forms growing at Nerrigundah, it is present in other forms in the same district, and varies from slight traces up to 1 per cent. in different localities. When the phellandrene oils are high, the forms are then called *E. phellandra*, and when absent *E. australiana*.

Quite recently another form has been described as a species under the name *E. Robertsoni*. I have carefully examined the whole of the material of these so-called species, and must confess that I am unable to distinguish any botanical characters that would warrant them being separated from what we now call *E. radiata* of Sieber. Seedlings have been raised from seed collected at Hill Top, Braidwood, Wyndham, Nerrigundah, Quaama, Big Jack Mountain, Laurel Hill, Batlow, and Tumbarumba.

EUCALYPTUS NUMEROSA Maiden.\*

This was originally described by Deane and Maiden under the name *E. amygdalina* var. *radiata*, and afterwards raised to specific rank.\* Blakely in his "Key to the Eucalypts" takes up the name *E. Lindleyana* for this species, and also describes a new var. *stenophylla*.

The species referred to is one of a series commonly known as "Peppermint," which are of more or less commercial importance. These species are mentioned in the classic work of Bentham (*vide* Vol. iii., Flora Australiensis), under the name *Eucalyptus amygdalina* var. *radiata*. They have also been dealt with by Mueller, Maiden, Baker and Smith, and others.

The specific name *Eucalyptus Lindleyana* was published in Vol. iii. of De Candolle's Prodrôm in 1828, who cites *Eucalyptus longifolia* of Lindley, illustrated in Botanical Register, Vol. xi., pl. 947 (1825) as a synonym. The plant from which the illustration was made was grown in the conservatory of the Comtesse de Vaudes at Bayswater (England). It died when it was 7 feet high, and no specimens were preserved. From the characters of the leaves, buds, and flowers depicted in the illustration, it

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\*Deane and Maiden, Proc. Linn. Soc., N.S.W., Vol. xx. (1895), 600, pl. lvi., figs. 1, 2, 3. Maiden, Proc. Linn. Soc., N.S.W., Vol. xxix. (1904), 752. See also Critical Revision Eucalytus, Vol. i., pp. 149-155 (1905).



more closely resembles *Eucalyptus radiata* of Sieber than *Eucalyptus numerosa* of Maiden. As there are no matured fruits depicted, it is impossible to say definitely what it is. Messrs. Bentham, Mueller, Maiden, and others preferred to regard it as a synonym of *E. amygdalina* or *E. radiata* of Sieber.

The specific name *Lindleyana* certainly has priority over *radiata* of Sieber, but the evidence is not sufficiently strong enough to enable anyone to rehabilitate the name *Lindleyana* to specific rank, especially as there are no specimens in existence.

It will be seen from the above that all three species were originally regarded by Bentham, Mueller, Woolls, Deane and Maiden as forms of *E. amygdalina*, but more recently the varieties *radiata* and *numerosa* have been raised to specific rank.

Specimens of *Eucalyptus radiata* Sieb., have been collected by me from the following localities:—

NEW SOUTH WALES.—Blue Mountains (Blackheath), Hill Top, Mittagong, Berrima, Bowral, Moss Vale, Bundanoon, Marulen, Wingello, Braidwood (Little River, Bombay, Buddawang), Monga (near Braidwood), Goulburn, Burrinjuck (Barren Jack), Stromboli (Australian Capital Territory), Cooma, Nerrigundah, Wyndham, Merumbula, Burruga, Reedy Creek, Yourie, Cobargo, Quaama, Batlow, Laurel Hill, Tumbarumba, Big Jack Mountain, Hanging Rock, Nundle, Glen Innes.

VICTORIA.—Genoa.

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#### Notes on *EUCALYPTUS RADIATA* Sieber.

During May, 1931 (whilst Botanist and Curator of the National Herbarium), I reported on specimens of Eucalypts collected at Wingello State Forest, New South Wales, by Mr. W. de Beauzeville (No. 141), 27/3/1931. The specimens collected, labelled *Eucalyptus phellandra* R.T.B., were found to be identical with *Eucalyptus radiata* of Sieber.

In former times the whole of the material in the National Herbarium commonly known as "Peppermint" was regarded by Mueller, Bentham, Maiden and others as belonging to the species *Eucalyptus amygdalina* of Labillardiere, which was originally described from Tasmanian material. The mainland material is slightly different from that of Tasmania, and was described by Sieber as a dis-

tinct species under the name, *E. radiata*, in 1828. This was reduced to a variety by Bentham in 1866.

Bentham included under his var. *radiata* two forms of Eucalypts, namely, *E. radiata* of Sieber, and a form commonly known as "River White Gum." This latter was described and figured by Deane and Maiden in 1895 (Proc. Linn. Soc., N.S.W., xx., p. 600, pl. lvi., figs. 1, 2, 3), under the name *E. amygdalina* var. *radiata*, and afterwards separated by Maiden in 1904 (Proc. Linn. Soc., N.S.W., xxix., 752) as *E. amygdalina* var. *numerosa*, var. *nov.* (vel. *E. numerosa* sp. *nov.*). With regard to the *E. radiata* of Sieber, Maiden considered it as "nothing more or less than a form of *E. amygdalina*, very common in New South Wales." He further stated that he could "see nothing distinctive enough to warrant its being called a variety." It is interesting to note that the two mainland forms, namely, *E. radiata* Sieber and *E. amygdalina* var. *numerosa* Maiden, together with *E. dives* were all figured by Deane and Maiden in 1895, respectively, as:—

- (1) *E. amygdalina* Lab.; (2) *E. amygdalina* var. *radiata*; (3) *E. amygdalina* var. *dives*.

Since that time the mainland forms of Eucalypts commonly known as "Peppermint" have been regarded by Baker and Smith as being distinct from the Tasmanian form, and described them under the names *E. Australiana* and *E. phellandra*.

Maiden reviewed Baker and Smith's work and finally decided to take up Sieber's name, *E. radiata*, for the mainland forms, so that we then have:—

*E. amygdalina* Lab., Tasmania.

*E. radiata* Sieber.

*E. amygdalina* var. *radiata* Bentham (partly).

*E. amygdalina* Deane and Maiden, who figured specimens from Hill Top (main southern line), in 1895, under this name.

*E. numerosa* Maiden.

*E. amygdalina* var. *radiata* Deane and Maiden.

*E. amygdalina* var. *numerosa* Maiden.

*E. dives* Schauer.

*E. amygdalina* var. *latifolia* Deane and Maiden.

It is interesting to note that as far back as 1895 (p. 608) Deane and Maiden came to the conclusion that the "River White Gum" (*E. numerosa*) was distinct from *E.*

*radiata* of Sieber, as will be seen from the following remarks:—

“We have proved that our ‘River White Gum’ does not entirely agree with Sieber’s *E. radiata* nor with Bentham’s var. *radiata*, and our tree is so well marked that had we decided that it was expedient to recommend the restoration of *E. radiata* Sieb., to specific rank we should probably have defined our ‘River White Gum’ as a variety of the same. In that case we might have called it *filiformis* in allusion to the pedicels.”

It is quite clear from the above remarks that Deane and Maiden were referring to the species now known in the National Herbarium, Sydney, as *E. numerosa* Maiden, and in the Technological Museum by Baker and Smith as *E. radiata*. The type specimen of Sieber’s *E. radiata*, as represented in the National Herbarium, Sydney, are quite distinct from *E. numerosa* Maiden, which is *E. radiata* of Baker and Smith (non-Sieber). The so-called species, *E. Australiana* Baker and Smith, *E. phellandra* Baker and Smith, as well as *E. Robertsoni* of Blakely, are in my opinion mere forms of *E. radiata* Sieber, and are not worthy of being regarded as distinct species.

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EXTRACTS FROM THE ANNUAL REPORT OF THE  
HON. SECRETARY (MISS DOLCE DOBBIN),  
AUGUST 3, 1943.

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The Society has now reached its forty-third year, and, although affected by the international situation, has increased its membership, and continued its work of endeavouring to stimulate interest in natural history, and in the preservation of our unique flora and fauna.

We have received more specimens for identification from country members than for some time past, but we would be pleased to hear more from them in regard to observations on animal, bird and plant life, as these are always of value and interest to other members.

The annual tree planting at Ball's Head has been postponed until August 14, when it is intended to plant about sixty trees and shrubs. Twenty-five of these have been presented to the Society by Mr. Althofer, of Dripstone, a new member, and a grower of Australian native plants, and twenty-five have been given by the Botanic Gardens. The North Sydney Council is anxious that the tree plantings be continued, and that the ceremony be an annual one.

In June a tree planting ceremony was held at the 113th Military Hospital, Concord, where thirty *Casuarina glauca* trees were planted. The hospital authorities have asked us to plant a garden of native shrubs. At the planting, members were shown over part of the hospital, and later were kindly entertained at afternoon tea by the matron.

The lectures during the past year have been very varied and up to the usual high standard, and we tender our thanks to the lecturers who so kindly gave up their evenings to address the Society.

The following lectures were delivered:—  
September (1942).—Presidential address, "Drought and the Western Flora," by Mr. S. T. Turner.

- October.—“Some Natural Wonders of New South Wales,” by Rev. Frank Cash.
- November.—A Microscope Evening, by Mr. P. W. Gledhill.
- December.—“The Snow Country of New South Wales,” by Mr. H. J. Lamble.
- February (1943).—Members’ Night.
- March.—“Birds of the Sydney District,” by Mr. Tom Irédale.
- April.—“Around and Across Australia,” by Mr. C. P. Hughes.
- May.—Members’ Night and a Lecturette, “Architecture Through the Ages,” by Mr. E. J. Bryce.
- June.—Froggatt Memorial Lecture: “Some Scale Insects and Aphids,” by Mr. E. H. Zeck.
- July.—Wild Animals in Captivity,” by Mr. Aubrey Halloran.

Excursions.—The excursions were well attended during the year, and the following places were visited:—Roseville Bridge, a walk from Janalli to Como, Engadine, Chinaman’s Beach, Cheltenham, Wollstonecraft, Cronulla, Ashton Park, Botanic Gardens, Dobroyd Head, Mr. and Mrs. Watson’s garden at Allawah, at their invitation, Mr. and Mrs. Zeck’s garden at Ryde, at their invitation, Ball’s Head, Chowder Park, and a few members, on a very wet day, visited Mr. Noake’s herb farm at Northmead.

All day outings were held at Lugarno, Cheltenham, Aqua Flora Park, Marley and Engadine.

Our membership is now 237. Eighteen were elected during the year, but we lost, through death, three of our old members, Mr. J. C. Wiburd, Mr. P. E. B. Barnett, and Mr. Matthew Reid.

The Council would like members to take a greater interest in the library, the books in it are valuable and cover a wide group of subjects, and should be helpful to students of this Society. The Hon. Librarian and the Hon. Assistant Librarian are always in attendance at the book cases on meeting nights to help members to find just the book they would like to study.

In an endeavour to help interest school children in the study of natural history, our President (Mr. F. J. Ludowici) has this year offered a number of prizes to school children for essays, through the Department of Education, and the Council hopes that a large number of children will send in essays on their observations and study of certain trees. Mr. Breakwell, of the Department of Education, is helping in

the matter. The prizes are for children of different ages, and essays will be judged at the end of the year.

We are pleased also that our President was elected a trustee of the Sir Joseph Bank's Memorial Fund. This Society has been interested in this project since its inception, and the Council hopes that something useful will now come from the new trustees of the fund.

The Society has also taken an interest in the proposed Reserve in the Blue Mountains, and hopes that from a small beginning, most of the primitive areas there will be created a "National Reserve." We are also interested in the Reserve at Kosciusko and would like that area also to be extended.

The Council desires me to extend our thanks to the Department of Education for their generosity in allowing the Society the use of the assembly room for meetings, and also allowing us to house our library on this floor. It is a great convenience to us.

The Council wishes, again, to tender its thanks to our Hon. Editor, Mr. E. H. Zeck, for his work with the Journal, and to our Hon. Lanternist, Mr. Geoffrey White.

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EXTENSION OF THE KNOWN RANGE OF  
*MIRBELIA JEANAE* AND *PROSTANTHERA LEICHHARDTI*.

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Whilst on a collecting expedition to Goonoo Forest area (between Dubbo and Mendooran, New South Wales) in September, 1942, my brother Peter and I noted two extremely rare and interesting plants.

The first, determined as *Mirbelia Jeanae* Blakely, a semi-prostrate undershrub up to 2 feet in height, had attractive purple-brown and reddish flowers. This plant was found sparingly distributed near the 10-mile peg on the Dubbo-Mendooran road (previously erroneously recorded as 6-mile peg). Previous records for this rare *Mirbelia* are as follows:—Penrose, Nowra, Mongarlowe and Badgery's Crossing. W. F. Blakely (Australian Naturalist, Vol. 10, Part 4, page 132), stated that *Mirbelia Jeanae* seemed to be confined to the Southern Tablelands. The present record extends the known range over 200 miles northward and westward. It will probably be recorded at other stations between the known northern and southern range limits when closer search is made.

*Prostanthera Leichhardtii* is represented in the National Herbarium, Sydney, by one specimen only from near Cobar,

New South Wales. It has, however, been recorded from several places in the interior of Queensland. The specimens collected by my brother and I were from plants at the 19-mile peg on the Dubbo-Mendooran road. The plants were noted on only one ridge (iron and sandstone conglomerate) but were fairly plentiful there. The plant in question is a small spreading bush of from 1 to 2 feet. The flowers were most unusual and looked for all the world like pale blue-green moths resting on the plant with folded wings. The leaves when crushed give off a pleasing mint-like odour.—GEO. W. ALTHOFER.

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### NATURALISTS' SOCIETY OF NEW SOUTH WALES.

#### *Proceedings.*

#### MARCH, 1943.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, March 2, 1943, at 7 p.m.

In the absence of the President (Mr. F. J. Ludowici), Mr. A. E. Watson (Vice-President), occupied the chair. About 30 members and visitors were present.

Election of Members.—Miss C. Nash was unanimously elected a member of the Society.

Exhibition of Specimens.—Miss Myra White: Collection of native flowers.

Mr. C. S. Ashley.—Gum from plane tree.

Lecture.—Mr. Tom Iredale, F.R.Z.S., Conchologist, Australian Museum, delivered a most informative and instructive address, entitled, "Birds of the Sydney District." The lecture was illustrated with many interesting lantern slides, and members' questions were answered by the lecturer. Mr. Iredale was accorded a hearty vote of thanks for his address.

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#### APRIL, 1943.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, April 6, 1943, at 7 p.m.

The President (Mr. F. J. Ludowici), in the chair, with about 50 members and visitors present.

Nomination of Members.—Mr. G. W. Althofer, Dripstone, N.S.W. Nominated by Mr. F. J. Ludowici, seconded by Mr. A. E. Watson. Mr. P. D. Althofer, Dripstone, N.S.W.

Nominated by Mr. F. J. Ludowici, seconded by Mr. A. E. Watson. Mr. Driver, Botanic Gardens, Sydney. Nominated by Mr. A. E. Watson, seconded by Miss D. Dobbin.

Exhibition of Specimens.—Mr. Fred Johnson, of Mullion Creek: Specimens of gall insects.

Miss G. M. Jordan.—Specimen of *Passiflora Herbertiana*.

Mr. A. E. Watson.—Specimen of mud oyster from Carr's Park, George's River.

Lecture.—Mr. C. P. Hughes, General Secretary, Australian Inland Missions, delivered an extremely interesting and informative address, entitled, "Through and Across Australia," which was illustrated with lantern slides. The lecturer was accorded a very hearty vote of thanks.

#### MAY, 1943.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, May 7, 1943, at 7 p.m.

The President (Mr. F. J. Ludowici), in the chair, with about 30 members and visitors present.

Election of Members.—Mr. G. W. Althofer, Mr. P. D. Althofer and Mr. Driver were unanimously elected members of the Society.

Members' Night.—Mr. Edwin Cheel: A series of botanical specimens, which he described to members.

Mr. E. J. Bryce.—Lantern slides, illustrating a short address on "Architecture Through the Ages."

Mr. E. H. Zeck.—Lantern slides, illustrating a short address on various species of insects of the order *Orthoptera*.

Mr. C. S. Ashley.—Specimens of various species of native plants.

Mr. Allan F. Buckley.—Called attention to the very neglected state of the gardens at the south-western approach to the Harbour Bridge.

#### JUNE, 1943.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, June 1, 1943, at 7 p.m.

The President (Mr. F. J. Ludowici), in the chair, with about 30 members and visitors present.



Nomination of Members.—Mr. Rabone, Taylor Square, Sydney. Nominated by Mrs. J. Powell, seconded by Mr. F. J. Ludowici.

Exhibition of Specimens.—Mr. A. E. Watson: Specimens of *Callitris cupressiformis*. Mr. Watson also discussed the *Callitris* group of pines.

Froggatt Memorial Lecture.—Mr. E. H. Zeck delivered the Froggatt memorial lecture, which was entitled "Some Scale Insects and Aphids." The lecture was illustrated with lantern slides, and the lecturer was accorded a hearty vote of thanks.

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#### JULY, 1943.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, July 6, at 7 p.m.

In the absence of the President (Mr. F. J. Ludowici), Mr. A. E. Watson (Vice-President), occupied the chair. About 36 members and visitors were present.

Election of Members.—Mr. Rabone was unanimously elected a member of the Society.

Exhibition of Specimens.—Mr. A. E. Watson: Collection of Casuarinas. Mr. Watson also discussed the means of identifying various species.

Lecture.—Mr. Aubrey Halloran, B.A., LL.B., delivered a most informative and instructive address, entitled, "Wild Animals in Captivity." In his address, the lecturer discussed the great care and attention which was necessary to rear various young animals successfully when in captivity. The lecturer was accorded a very hearty vote of thanks.

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#### AUGUST, 1943.

The annual meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, August 3, 1943, at 7.30 p.m.

Mr. G. A. McKenzie, Director of Education, was in the chair. The President (Mr. F. J. Ludowici), and about 60 members and visitors were present.

Nomination of Members.—Mrs. W. H. Bray, 4 Elizabeth Street, Allawah. Nominated by Miss Hughes, seconded by Miss D. Dobbin. Miss E. Duff, and Mrs. M. A. Duff, 460 Burwood Road, Belmore. Nominated by Mr. Richardson, seconded by Miss D. Dobbin. Mrs. E. D. B. Cotterell, 13 Garling Street, Lane Cove. Nominated by Miss D. Dobbin, seconded by Mr. Davies. Mr. Kenneth Thirlow, Boys'

Practice School, Erskineville. Nominated by Mr. A. E. Watson, seconded by Mr. S. T. Turner. Mrs. B. Welch, 26 Illiliwa Street, Cremorne. Nominated by Miss N. Luckie, seconded by Mrs. Houlston. Miss E. Seppelt, 12 Wilga Street, Bondi.

Secretary's Report.—The report of the activities of the Society was presented by the Hon. Secretary (Miss D. Dobbin).

Address.—Mr. S. T. Turner delivered an address, entitled, "Drought and the Western Flora," which was illustrated with lantern slides.

Election of office-bearers for the year 1943-1944:—

President: Mr. A. E. Watson.

Vice-Presidents: Messrs. F. J. Ludowici, E. H. Zeck, and A. E. Hamilton.

Hon. Treasurer: Mrs. R. J. Watson.

Hon. Assistant Treasurer: Miss D. Ross.

Hon. Secretary: Miss Dolce Dobbin.

Hon. Assistant Secretary: Mrs. R. J. Watson.

Hon. Editor: Mr. E. H. Zeck.

Hon. Lanternist: Mr. Geoffrey White.

Hon. Librarian: Mr. Albert Booth.

Hon. Assistant Librarian: Miss Dorothy Booth.

Other Members of Council: Mrs. J. Powell, Misses T. Y. Harris, Marjorie Davidson, N. Luckie, Gina Ballantyne, Messrs. C. S. Ashley, E. S. Davies, J. W. Hawley, J. Powell, and S. T. Turner.

Publication Committee: The President, Hon. Editor, and Hon. Secretary.

Resolution of Council.—A resolution as to whether the time of meetings should revert to 7.30 p.m. instead of 7 p.m. as at present was put to the meeting.

Exhibition of Specimens.—Mr. E. Gostelow: Exhibited a collection of his excellent water colour paintings of Australian birds which included various finches and rosellas, lyre birds, etc.

Department of Agriculture.—Collections of various groups of insects.

Mr. C. S. Ashley.—Collection of minerals. Specimens of sponges from Balgownie.

Miss T. Y. Harris.—Collection of nature calendars, which illustrated the work of school children. Collection of pressed plants.

Mr. A. E. Watson.—Collection of pressed plants.

Mr. S. T. Turner.—Collection of pressed plants.

Miss Ivy Wright.—Collection of native flowers grown in her garden at Janalli.

Mr. H. S. Deed.—Collection of shells and children's nature study books from his school.

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SEPTEMBER, 1943.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, September 7, 1943, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 50 members and visitors present.

Election of Members.—Mrs. W. H. Bray, Miss E. Duff, Mrs. M. A. Duff, Mrs. E. D. B. Cotterell, Mrs. B. Welch, Miss E. Seppelt, and Mr. K. Thirlow were unanimously elected members of the Society.

Nomination of Members.—Master Kenneth Traison, 68 Viola Street, Punchbowl, and Master Peter Morrison, 8 Orion Street, Arncliffe (junior members). Nominated by Mr. K. Thirlow, seconded by Mr. A. E. Watson.

Announcement.—The President announced the recent deaths of Mr. John Hawley and Mr. Robert Harris, and members stood in silence as a mark of respect.

Exhibition of Specimens.—Mr. S. T. Turner: Various species of wattles from the Shoalhaven and other botanical specimens.

Miss Gina Ballantyne.—Specimens of wattles.

Miss Myra White.—Specimens of Indian cedar, tree fungi, acacias and nest of a bird.

Mr. F. J. Ludowici.—Reported on the meeting of the Bank's Memorial Trust Fund, and advised that a Bank's Memorial Garden at Kurnell had been suggested. Mrs. Watson, Mr. Hamilton, and Miss Deesy also spoke. The printing of memoirs and housing of specimens had the preference of members.

Resolution of Council.—The resolution as to whether the time of meetings should revert to 7.30 p.m. instead of 7 p.m. as at present was placed before members for confirmation and was carried.

Lecture.—Mr. Anthony Musgrave, F.R.E.S., F.R.Z.S., Entomologist, Australian Museum, Sydney, delivered an extremely interesting and informative address, entitled, "The Red Heart of Australia." The lecture was illustrated with many natural colour slides taken on his journey, and at its conclusion he was accorded a very hearty vote of thanks.

**NATURALISTS' SOCIETY OF NEW SOUTH WALES.**  
**STATEMENT OF RECEIPTS AND EXPENDITURE**  
**FOR YEAR ENDING 31st JULY, 1943.**

Receipts.	£	s.	d.	Expenditure.	£	s.	d.
Balance, 1st Aug.,				Notices of meetings	18	6	11
1942 .. .. .	12	11		Printing Journals .	15	1	11
Subscriptions .. ..	35	10	6	Rent .. .. .	1	18	0
Sales.—				Postage .. .. .	1	4	9
Badges .. .. .	10	0		Refund of over cre-			
Books .. .. .	1	18	6	dit, Feb. statement	1	0	0
Flowers .. .. .	4	6		Bank Bal., 31/7/43	27	10	11
Jardiniere .. ..	2	10	0				
Refund tea-money	2	11	6				
Donations.—							
Estate of late							
Miss C. Black .	20	10	8				
Miss Peterson ..	10	0					
Savings Bank Int.	3	11					
	£65	2	6		£65	2	6

President, F. J. LUDOWICI.

Hon. Secretary, (Miss) D. Dobbin.

Hon. Treasurer, (Mrs.) R. J. WATSON.

Audited and found correct.

JOHN POWELL, Hon. Auditor.

31/7/1943.

**NOTICES.**

Any members who have spare copies of the "Australian Naturalist," Vol. iv., pts. 1-16 (1918-1921), or Vol. v., pts. 1-16 (1922-1925) are kindly requested to communicate with the Hon. Secretary.

Members are reminded of Rule 4 of the Society which reads: "All subscriptions shall become due on the first day of August and shall be payable in advance."

The Society's gum-leaf Badge may be obtained from the Hon. Secretary or the Hon. Assistant Secretary. Price, 2/- (postage and package extra).

# The Australian Naturalist

Vol. XI.

AUGUST, 1944.

Part 5.

## GUIDE TO THE FRESHWATER SHELLS OF NEW SOUTH WALES.

By TOM IREDALE.

(Contribution from the Australian Museum.)

Class GASTROPODA.

PART II.

(Concluded from Volume XI., page 95.)

The freshwater univalves are divisible into two sub-classes, the Gastropoda proper, and the Pulmonata. The former are operculate, the latter not, and these have each representatives of four families, Viviparidae, Paludetrinidae, Bithyniidae and Thiaridae, each with few species; Lymnaeidae, Bullinidae, Planorbidae and Ancyliidae, the two first-named being the most important. The latter series may be regarded as the true freshwater molluscs, the other series being later immigrations from the sea. It may here be mentioned that there is a number of molluscs which are banded between the worker on marine and the worker on freshwater forms, and these I have named Scironic Molluscs. These can again be subdivided into three series, the paramarine or those which live alongside marine forms in estuarine waters, and the amphoterine or those which live in both fresh and salt waters. These will be noted later with the scironic molluscs proper which live entirely in brackish water, but rarely in the sea, and never in fresh water. The last-named include *Ophicardelus*, *Salinator* and their relatives, with *Assiminea*-like forms, while among the amphoterine molluscs we may include some "Neritinids" (*crepidularia* rather belongs to the preceding) and the large Geloinid and Batissid bivalves, one of which may live in northern New South Wales. *Tatea*, which I have included among the freshwater molluscs, is amphoterine, but seems to favour the freshwater, while

*Potamopyrgus* is mostly freshwater, but some species also dwell in brackish water without harm. The bivalve *Fluvio-lanatus* accompanies *Tatea*, and this draws attention to the fact that the molluscan fauna of the many lagoons, bordering the east coast of Australia and Tasmania as far north as mid-Queensland is comparatively ill-known, and would repay intensive study. The status of such forms, as the bivalve *Erycina helmsi*, *Eulimella anabathron* and *Potamopyrgus ruppiae*, is puzzling, and there may be many others yet undiscovered to complicate matters.

#### Family VIVIPARIDAE.

These large smooth gastropods are found in tropical waters throughout the world, and range into temperate regions, so that in Australia they are more common in the north and centre, but manage to wander southward, but fail to reach Tasmania. The many species are difficult to separate as they are all greenish, subconical, with rounded whorls and operculate. From the name the animals are viviparous. The species living in the north of the State, inland only, is named *Notopala sublineata*, while the southern one in the Murray River is known as *N. hanleyi*. The specimen figured is from the Bell River, a tributary of the Macquarie River, and it would take a very special student to determine to which species it belongs without knowledge of the locality. It measures about an inch and a third in height and about an inch in breadth.

#### Family PALUDESTRINIDAE.

This family includes a large number of very small dark coloured subconical shells, which are numerous in Tasmania, but so far only a few have been found in this State. Curiously, nearly each belongs to a distinct genus, separated by slight variation in form, radular characters and operculum. Here, again, intensive study is very necessary to distinguish the groups, but the figures given will help. The first genus is *Potamopyrgus*, based on a New Zealand shell, but the Tasmanian species are scarcely distinguishable, and one has been found at Braidwood, on the Shoalhaven, comparable with the Tasmanian *niger*, subconical, whorls four, rounded, sutures impressed, mouth rounded, oval, almost free, and may be called *Potamopyrgus sparsus*, sp. nov., the type measuring 2.75 mm. in height by 1.75 mm. in breadth; colour, black-brown. Another member of a southern genus is *Pupiphryx cooma*, which, described from Cooma, south N.S.W., has also been found at Braidwood.

This shell is regularly pupoid, whorls flattened, sutures shallow, mouth oval, free, pale-brown, measuring 2.5 mm. by 1.5 mm. in breadth. It should be noted that these shells vary a great deal (comparatively) in size, and the figures given are those of a norm. In the north of the

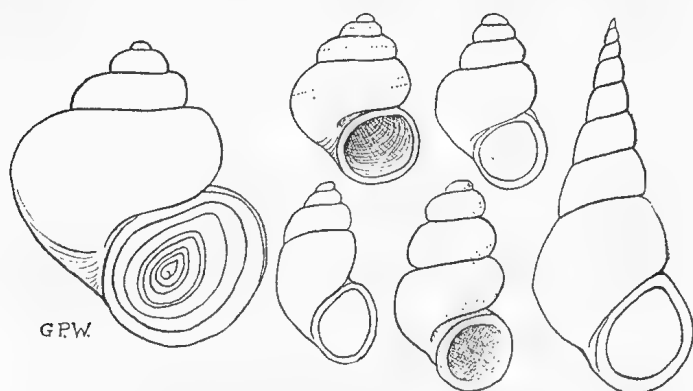


Fig. 4.—*Notopala sublineata*, *Posticobia chena*, *Potamopyrgus sparsus*, *Pupiphryx cooma*, *Fluvidona petterdi*, *Tatea kesteveni*.

State two other groups occur, the first, *Posticobia*, a short, broad shell, with rounded whorls, the periphery strongly keeled, the mouth almost free and somewhat transversely oval. The operculum differs a little from that of the southern series. The type, *P. brazieri*, from the Clarence River, measures 3 mm. by 1.25 mm., but a smaller shell from the Chichester Dam, Hunter River district, rarely exceeds 2 mm. and is nearly 2 mm. in breadth, and commonly the peripheral keel becomes obsolete on the last whorl. This has been called *P. chena* and is here figured. From the Richmond River a form was found so curious that it received three names in three genera before it received a generic name for itself, *Fluvidona petterdi*. It measures 3 mm. by 1.25, and is cylindrically pupoid, with very rounded whorls, deep sutures, mouth quite free, and is pale horn coloured, quite unlike the others above. A very different style of shell is the elongate shell of the genus *Tatea*, which is one of the borderline freshwater molluscs, being at home in brackish or even salt water. The genus ranges from South-west Australia along the south coast and up the east into Southern Queensland, but the variation has not yet been worked out. At least three separable forms occur in this State, the southern-

most *T. paradisiaca* from Twofold Bay, being short and broad compared with the one figured, *T. kesteveni*, from about Sydney up to the Myall Lakes, while the northern form from Ballina, *T. ballina*, is short, but not so broad as the first-named. They are all dark coloured, elongate, many whorled, whorls flattened, the last whorl much broader, the mouth oval, lip thickened, sometimes almost varicose. The operculum when taken out and examined with a microscope shows an internal claw of a peculiar kind. The figure gives the general appearance, which is unmistakable, the shells being between 4 and 5 mm. in height and 1.5 to 2.5 mm. in breadth.

#### Family BITHYNIDAE.

As workers are still wrangling about the distinctive features separating this family from the preceding after a hundred years of close study, it is only necessary to say that our representative, *Gabbia australis*, is much larger and has a noteworthy operculum, outwardly horny, with marked ridges, but internally shelly and smooth. As seen in the figure, the shell is larger, more stoutly built, the body whorl large, and commonly the apex is eroded, and the shell incrustated with black, the shell itself being brown. The Sydney shell, measuring about a quarter of an inch in height and one-sixth in breadth, is smaller and narrower than the form figured from Armidale, which may be called *Gabbia australis suspecta*, subsp. nov., the type measuring 7 mm. by 5 mm.

#### Family THIARIDAE.

This includes very numerous species in the islands north of Australia, but comparatively few on the continent, and again none reaches into Tasmania. The majority of the species are very elongated awl-like shells, but the common genus here, *Plotiopsis*, comprises small, strongly sculptured shells up to an inch in length by less than half an inch in breadth. Generally, the tip is eroded, and the variation is obscured through erosion, but the typical *balonnensis* is rather short and stout, the sculpture being of longitudinal ribs cut by concentric lirae, pale straw, spotted with darker, mouth oval, length about three-quarters of an inch by one-third inch broad. *P. tetrica* was described at the same time from the southern rivers, i.e., Murray, as being larger and with coarser sculpture. This occurs in southern N.S.W. Three other forms are here figured, a very long, narrow form, with less pronounced sculpture, the nodulation



obsolete save on shoulder. This was collected at Breeza on the Mooki River, and is named *P. flata*, sp. nov., the type measuring 27 mm. by 9 mm. A coastal form from the Clarence River is short and very broad, 22 mm. by 12 mm., the longitudinal sculpture being ill-marked, scarcely raising nodules, and this is named *P. sociana*, sp. nov. Shells from Tibooburra, on the Bulloo River, far north-west of this

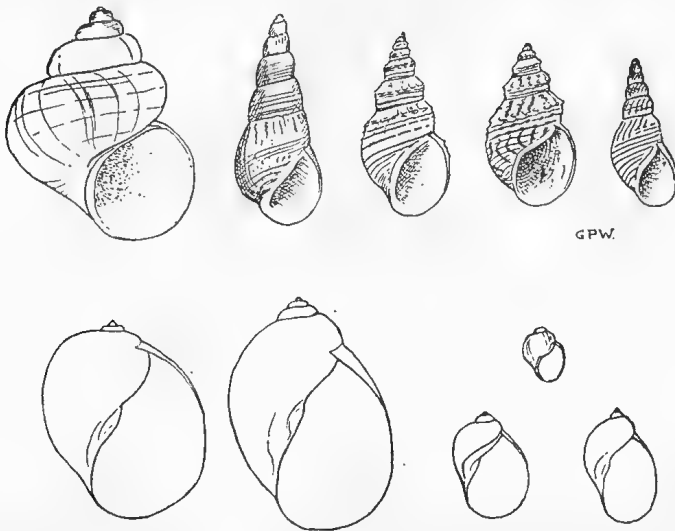


Fig. 5.—Upper row: *Gabbia australis suspecta*, *Stenomelania denisonensis ultra*, *Plotiopsis flata*, *P. sociana*, *P. thrascia*; Lower row: *Peplimnea opima*, *P. spiriger*, *Glacilimnea gelida* (very small upper shell), *Simlimnea morbida*, *S. aegrifer* (lower small figures).

State, are small, 14 mm. by 5.5 mm., with longitudinals pronounced but not persisting below the periphery, and is here named *P. thrascia*, sp. nov. Many other forms may later be distinguished. A different genus is *Stenomelania*, the extralimital members reaching about five inches in length with not much more than half an inch in breadth. Members occur through northern Queensland, and one form, *S. denisoniensis ultra*, has been found in the Clarence River. The shell begins with close-set spiral grooves, which become weaker on the upper part of the whorls and then almost fade out altogether. The local shell measures 28 mm. in length by 11 mm. in breadth, and is dark greenish brown in colour. This concludes the operculate forms.

## Subclass PULMONATA.

The determination of the freshwater shells allotted to this subclass is even more difficult than any of the preceding. The Lymnaeidae includes those thin subglobose shells with the mouth at the right hand, but the Bullinidae covering similar thin shells with the mouth at the left is very complicated as to species. The anatomy of the latter recalls that of the former, and for this reason they have sometimes (quite erroneously) been regarded as sinistral Lymnaeas. Really, the animals are very distinct in life and cannot be confused.

## Family LYMNAEIDAE.

This family includes few species, but one of them is notorious as the go-between in connection with the fluke disease, fatal to sheep. Since the danger was sheeted home a remedy was soon found and there is not much worry about the disease now. Only three groups occur in the State: *Peplimnea*, a large globose harmless form, and *Simlimnea*, the smaller less globose disease carrier, and *Glacilimnea*, a small degenerate ice-living form. The large *Peplimnea* are difficult to name as the variation of this shell becomes very confusing at times. Thus the typical *lessoni* was described from the Macquarie, 27 mm. by 20 mm., with a small elevated spire. From Cobar smaller shells, 17 mm. by 11 mm., have longer spires, and these may be called *P. l. thema*, subsp. nov. On the coast around Sydney the shell is very globose with scarcely an exert spire, and this is named *P. opima*, sp. nov., the type measuring 18 mm. by 15 mm. from Hornsby. A series from Glen Innes, north in the State, has a very long spire (for the genus), the shell measuring 22 mm. by 15 mm., and this is called *P. spiriger*, sp. nov. *Peplimnea perlevis*, described from the south Queensland tributaries of the Darling System, with small spire, and somewhat angulate shoulder, occurs in the northern rivers of the State, belonging to the same system. Similarly the Victorian *P. melbournensis* is regarded as conspecific with Murray River shells, and these occur in the Murrumbidgee also. Many more local forms will later be nominated when complete series are collected from many localities. The small typical Fluke-Snail is known by its size, spire, coloration, but sometimes specimens appear very like young *Peplimnea*. The typical *Simlimnea, brazieri*, was described from Sydney, 9 mm. long by 5.5 mm. broad, with a notable spire, but still really very

short; the shell is brownish and the aperture comparatively smaller than in the previous group. However, specimens from the north of the State have shorter spires and a bulkier body whorl with a more expanded mouth, and recall a small *Peplimnea*, but the colour and smaller columella fold separate them. This may be called *S. morbida*, sp. nov., the type from Walcha measuring 10 mm. by 7 mm. From the south of the State the specimens vary in the opposite direction, the spire being a little longer, and the body whorl narrower. This may be called *S. aegrifer*, sp. nov., the type from Bombala measuring 11 mm. by 6 mm. The genus *Simlimnea* also occurs in the west, but little attention has been paid as there was no disease. From 35 feet in the Blue Lake up Mt. Kosciusko, Hedley dredged a small species, 4.5 mm. in length by 3.25 in breadth, a degenerate form of unknown relation, so it has been called *Glacilimnea gelida*, the planate apex, lack of calcification, etc., separating it from the preceding.

#### Family BULLINIDAE.

This is the best known of all the freshwater families on account of the number of species that has been described. Sixty years ago over fifty species had been named and at the present time, neglecting all forms that may appear to be synonymous, there are still over that number of easily recognisable forms. Not much attention has yet been paid, though they have been accused of being possible carriers of the dread disease, Schistosomiasis, and small collections have been made. All lumped under a doubtful West African genus, *Bullinus*, little progress has been made in their classification until recently. In this essay the species are grouped as naturally as possible with present knowledge. All are sinistral, spire of variable length, sometimes acuminate, columella folded, sculpture weak, rarely notable, thin, generally unicolor pale brownish. The first series, *Lenameria*, may include two or three groups, as the *aciculata* series appear different, while the "*acutispira*" shells may form a third genus. The type of *Lenameria*, *gibbosa*, from Parramatta, is a stoutly built shell, with a short spire and large body whorl, the shoulder commonly tabulate, up to about an inch in length and over half an inch in breadth. Alongside it lives a long narrow shell with a long spire and a small mouth, described as *aciculata*, and very different in measurements, say 20 mm. in length by 7 mm. in breadth. Also there appears a third

series with long spire and broad mouth, measuring, say, 20 mm. by 10 mm., for which the name *adamsiana* is available. The extremes are very unlike and they seem to live apart, but there is a lot of variation. A fourth complication is the presence in some places of numbers of small shells, apparently adult, measuring less than 10 mm. in height, the spire about equal to the mouth and breadth about half length; this has been called "*acutispira*" in Victoria, but that name is unavailable. Species corresponding with these forms recur throughout the State, or rather throughout Australia and Tasmania.

A species, smaller, but recalling *gibbosa* in form, was secured in the Chichester Dam, Hunter River district, and it is separable by its fine reticulate sculpture which is missing in *gibbosa*. It has been called *L. renola*, the type being only 7.5 mm. by 4 mm., but the shell figured is 13 mm. by 7.5 mm. From the Clarence River comes a shell, 21 mm. by 11 m., similar in shape, but with longer spire, and it is also finely sculptured, and may be called *L. pretena*, sp. nov. A species, *fusiformis*, has been described from the Richmond River, only 12 mm. by 7 mm., which may be related to this, as it is somewhat similar in appearance and is "irregularly and finely striate." A shell recalling the *adamsiana* shell was described from the Urara River, a branch of the Clarence River, as *tortuosa*, measuring 20 mm. by 10 mm., again finely striate. Sowerby described *dispar* from Sydney, and specimens agreeing are puzzling: these have a long spire and long body whorl with short mouth, about 20 mm. 8 mm., but the upper whorls are swollen. The curious appearance may be due to some disease, as similar shells have been described and figured from other States. In the interior the genus *Isidorella* appears to predominate, but there are also curious forms of this (*Lenameria*) series. From the Bogan River *pectorosa* was named, a broad form recalling *gibbosa*, but obviously different. From the adjoining rivers similar shells are recorded, and there may be many species. At the same time *australiana* was recorded from the Bogan River, and this has been regarded as a variation only. A specimen from the original lot, collected at Muda, January 12, 1846, by Sir T. Mitchell's party, shows that this is apparently referable to a different genus, which will be referred to later. Hedley reported upon Victorian *Bullinus* in connection with the "bilharziosis" inquiry, and noted that the "*tenuistriata*" varied, so that quite a number of

species were involved. He then named a variety *confluens* from Echuca, on the Murray, and that species lives in the New South Wales Murray tributaries also. It recalls *gibbosa*, but is finely sculptured in a beautiful network effect. It measured 21 mm. by 12 mm. with the spire short. The Murrumbidgee carries a similar series, but the shell has a notably longer spire, though similarly sculptured, and must be named *L. epicropa*, sp. nov., the type measuring 17 mm. by 10 mm. from the Leeton irrigation channels. Specimens from Glen Innes in the north have been called *pectorosus*, but they have a smaller, more acute spire, and may be named *L. formalis*, sp. nov., the type measuring 17 mm. by 10 mm.

A large number from Belubula, of the Lachlan system, shows all smallish shells with rounded whorls, medium spire, very slight fold, agreeing with no other, and these are named *L. digressa*, sp. nov., the type measuring 13 mm. by 8 mm. Collected at the same time "out of a hot spring" are some similar shells, only larger, measuring 15 mm. by 9 mm., obviously only a hot water variant; but with these are many smaller, adult shells, narrow, with elongate spire (*acutispira*), the largest measuring about 9 mm. by 4.5 mm., and these must be named *L. calda*, sp. nov. With regard to these "*acutispira*"-like species there is a species at Bombala, south N.S.W., spire about same length as aperture, shell 11 mm. long by 6 mm. broad, spire conical, but whorls impressed, fold pronounced, sculpture growth-lines only, which may be called *L. placata*, sp. nov. Similar specimens appear to live near Goulburn, and have also been found, a different species, of course, as far north as Tamworth.

Now to the *australiana* complex. From Booligal, on the Lachlan River, a series of shells quite distinct from any of the preceding, its elongated oval form with a short spire, long oval mouth, strong columellar fold, the outer lip receding basally, indicating a new genus, *Mutalena*, the specific name selected being *reperta*. It was then noted that *australiana* belonged to the genus, having all the distinguishing characters, but smaller, spire shorter, slightly shouldered, measuring 16 mm. by 8 mm., *reperta* being 18 mm. by 7 mm.

Another species, hitherto unrecognised, seems to be *kreftii*, from Calverts Creek, the whereabouts of the locality not yet determined. but the figure shows the typical

characters, the measurements given being 18 mm. by 9 mm.

Another species comes from Mirroull Creek, north of Yanco Irrigation Area, differs in its attenuate spire, which is short but narrows rapidly, the sutures being flattened,

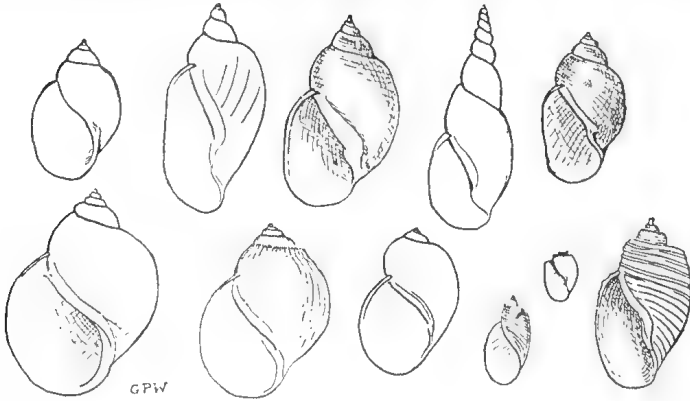


Fig. 6.—Upper row: *Lenameria digressa*, *Mutalena reperta*, *Lenameria epicropa*, *L. aciculata*, *L. renola*; Lower row: *Isidorella moola*, *I. montana*, *I. brazieri ludia*, *Amerianna carinata*, *Glyptamoda cosmata*, *G. ellea*.

the shell measuring 20 mm. by 11 mm., the new name being *M. modica*, sp. nov.

From Inverell, in the north, specimens recall this genus in form, but show concentric rows of a bristly periostracum, which may develop into ribs, placing it in the next, *Glyptamoda*, and it may be called *G. orta*, sp. nov., the type measuring 10 mm. by 6 mm.

Similar in general form is the curious sculptured shell described as *aliciae* from South Australia, and until recently it was thought to be restricted to that State and Victoria, but it is now known to occur in various parts of this State. The genus *Glyptamoda*, founded on *aliciae*, is like the preceding, with a very long mouth and a shortish spire with a pointed apex, but has revolving lirae, sometimes crossed by longitudinal threads. A species lives near Goulburn, at the extreme end of the Lachlan River's tributaries, and this has been named *G. ellea*; it reaches 15 mm. in length by 7 mm. in height, and has coarser sculpture than the type, the ridges more distant. From Willandra Creek, near Mossgiel, specimens nearer *aliciae*,

with distant heavy ridges, three on penultimate whorl, spire exsert, measuring 18 mm. by 10 mm., longitudinals absent, may be called *G. a. interna*, subp. nov. A most surprising discovery was the occurrence of a similar species at Tamworth, in the north; the shell is small and elegant, brown, thin, closely lirate and latticed with fine longitudinal threads; the spire is short, and the mouth long and oval, the shell measuring 7 mm. long by 4 mm. broad. It was called *G. cosmata* and is here figured.

Throughout northern Australia occurs a very distinct group, a thin shell with the apex planate, and only the last whorl showing, this being topped by a strong keel; a few species occur in the east and west, and the genus *Amerianna* may occur in Papua. The typical species was named *carinata* from the Boyne River, near Port Curtis, South Queensland, and this reaches into this State, the specimen figured having been taken in the Clarence River. There is a MS note that Musson also found it in the Namoi River, but the specimens have not been traced. Commonly found alongside the preceding "*Bullinid*" genera is the genus *Isidorella*. This was introduced for a Central Australian species on account of its globose form, but especially the smooth columella. The group is characteristic of the interior, but reaches to the coast in many places. All the species are very much alike, so that there may be many forms, dependent on locality and environmental stresses, still to be distinguished. The first to be named, *physopsis*, from this State, came from the Paroo River, a semi-tributary of the Darling in the far north-west, and it is very globose, the spire almost flattened, an umbilicus showing, thick periostracum, mouth very large, the shell measuring 18 mm. broad by 18 mm. high. *I. moola* was named from Moolah, near Mossgiel, in the south-east, on account of its lengthened (comparatively) spire, the shell measuring 19 mm. by 13 mm., the aperture 11 mm by 8 mm., while there is a fine reticulation present, perhaps indicative of a periostracum. Curiously the genus is represented up Mt. Kosciusko, a most unexpected location, by a form rather heavily clothed with a pilose periostracum, a striking feature of the Victorian representatives, the chief one being called *pilosa*, but this must give way to *crebreciliata*, as the name *pilosa* was previously used. The mountain shell, named *montana*, is ruffled at the suture as "*pilosa*," but the spire is more produced and sub-cancellate, the shell measuring 17 mm. by 11 mm. broad.

A similar shell, more elongate, without a notable periostracum, was described from Sydney as *brazieri*, and it is possible it may not be congeneric, but it is placed here pending further study. It was described from a specimen 12 mm. by 7.5 mm., brown, with a short spire and moderately globose form, the columella without a fold. Specimens from Bombala, in the far south, are a little more inflated, with the growth lines more pronounced, and measure 11 mm. by 8 mm., and may be called *I. b. ludia* subsp. nov. Specimens from Walcha, in the north, are still a little more inflated, though otherwise agreeing generally in character, and these may be called *I. b. parludia*, subsp. nov., the type measuring 12 mm. by 9 mm. The group is also represented the other side of the Blue Mountains, penetrating into the territory of the clothed *physopsis-moola* series.

#### Family PLANORBIDAE.

The small flat shells (*Planorbis*) are supposed to be related to the preceding by anatomists, but they are sufficiently differentiated conchologically. While some comparatively are large all ours are very small, ranging from 2 to 5 mm. in diameter. A genus, *Segmentina*, of Britain, etc., may really represent a distinct family, were it anatomically examined without prejudice. A similar kind of shell occurs throughout Australia, so it must have been anciently separated. Five genera are here allowed as a basis for research, *Pygmanisus*, the smallest with rounded whorls and small round mouth; *Plananisus*, a little larger with still rounded whorls but mouth elongated; *Glyptanisis*, with whorls carinated, more tightly wound and clasping oval mouth; *Glacidorbis*, a quaint few whorled shell much deeper than the preceding, and *Segnitila*, the "*Segmentina*" form, a glossy shell with small umbilicus and tightly coiled whorls with a keel below the periphery, the mouth ovate-angulate, the aperture sometimes showing internal teeth. *Pygmanisus* apparently ranges throughout the State, as it has been found at Cooma, Canberra, Yass and Goulburn, etc., the shell flattened, spire concave, as in all the members of the family, whorls many, rounded, mouth small rounded, measuring 2 mm. across by .75 mm. in depth. This has been called *Pygmanisus leonatus*, but specimens from Armidale are shallower, 2 mm. by .5 mm., with the spire more sunken, and these have been named *P. pelorius*. A shell was described as *macquariensis* from the River Macquarie, and it has the last whorl rounded, but the mouth lengthened and oblique, whorls many, and is placed



in *Plananinus*. The majority of our species are placed in *Glyptaninus*, the shells larger, whorls keeled, sculptured, whorls more tightly wound and mouth very oblique. Four species have been named: *ordessus*, from the Chichester Dam, with pronounced sculpture, about 3 mm. by 1 mm.;

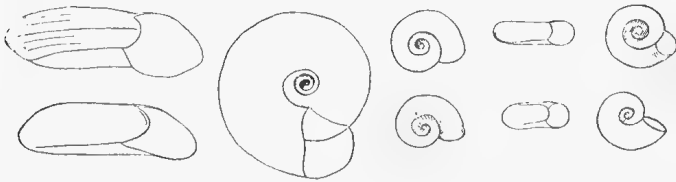


Fig. 7.—Upper left fig.: *Glyptaninus speranus*; Lower left fig. and centre fig.: *Segnitila idonea*; Upper right fig.: *Pygmaninus pelorius*; Lower right fig.: *Glacidorbis hedleyi*.

*waterhousei*, from the Clarence River, sculpture weaker, and shell shallower; *metaurus*, from Armidale, about same size as *ordessus*, but without concentric striation and other minor differences; and *speranus*, from Narrabri, on the Namoi River, the spire more sunken and apparently reaching a much larger size, up to 5 mm. by 1.75 mm. There may be many other species, as these must be carefully studied. Probably much of value will be learned as during the examination of specimens in the Australian Museum shells from New Caledonia determined as *montrouzieri* were found to be carrying young fixed in the umbilical cavity, a feature not seen in any Australian species yet not recorded elsewhere. The delightful little *Glacidorbis hedleyi*, differs from all in its few whorls, its comparative depth, its very thin shell, its lack of sculpture, save growth lines, and its fine, rich brown colour. It measures only 2 mm. in breadth and 1 mm. in height. Now as to *Segnitila*, this genus differs at sight in its form, the upper surface rounded, the lower flattened with a small umbilicus, the depressed apex and the glossy surface. There appears to be great local variation, so that many species may later be separated. Thus Penrith specimens, *australiensis*, have a broader umbilicus than most and the aperture shows internal teeth. Armidale shells have been named *alphena* on account of the narrower umbilicus, smaller mouth, without teeth, more sunken apex and almost concave base. Sydney shells have the apex little sunken, the shell is more openly coiled, but the umbilicus is narrow, and these may be named *S. idonea*, sp. nov., the type, figured, measur-

ing 5 mm. broad by 1.5 mm. high. Shells from the Tweed River have the umbilicus broader than that of *alphena* and are close to specimens from the Brisbane River, Queensland, which have been named *brisbanensis*, but the name has not previously been published. The Brisbane shells are small, 4 mm. by 1 mm., with the apex narrow, deeply sunk, umbilicus very narrow, the base concave. The Tweed River species has the apex less sunken, the umbilicus less narrow, the base less concave, measuring 6 mm. broad by 1.5 mm., and may be named *S. redita*, sp. nov. It may be noted that the coloration varies in this genus from yellow to deep red brown, and that sometimes specimens occur much larger than the average, and these show a distinct growth break, suggesting a rest period.

#### Family ANCYLIDAE.

Here, again, there is much of interest, though owing to their small size Freshwater Limpets are not easily collected. However, by collecting weed and placing it in glass containers the little shells may easily be observed. Again it must be repeated; there may be many species to be discovered, only four yet being named. These appear to be separable into two very distinct groups, one conical cap-shaped called *Pettancyclus*, the other larger, flattened, the apex more central for which the genus *Forsancyclus* is introduced, *P. enigma* being named as type. Of the former, *P. importunus*, from the Bermagui district, south New South Wales, is figured, 3.5 mm. long, 2.25 mm. broad and 2 mm. high, being more elevated and having the apex very excentric, easily separable from the Tasmanian *tasmanicus*.

*P. assimilis* was named from the Richmond River as being like *tasmanicus*, 3 mm. long by 2 mm. broad by 1.5

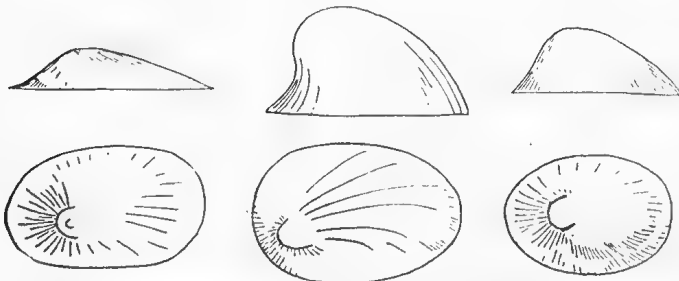


Fig. 8.—Left-hand fig.: *Forsancyclus enigma*; Middle fig.: *Pettancyclus importunus*; Right-hand fig.: *Pettancyclus tamesus*.

mm. high, broader, and with the apex more twisted to the right, but shells from Tamworth, here figured, differ in smaller size, more central, less excentric apex, less elevated, and comparatively broader, anteriorly, and may be named *Pettancyllus tamesus*, sp. nov., the type measuring 2.3 mm. by 1.7 mm. by 1 mm.

Shells were described as *enigma*, from the Chichester Dam, Hunter River district, and these appear to differ totally from *Pettancyllus*, as above given, and shown in the figures, and are referred to as *Forsancyllus*, the shell measuring 3 mm. long by 2 mm. broad by .7 mm. high, and is finely striate. To this genus belongs the Sydney *smithi*, which is much larger, 5 mm. by 3 mm. by 1.5 mm., more elevated, the apex less posterior, the anterior slope more convex, the posterior more concave. Petterd named *Ancyllus oblonga*, in a line, from the Richmond River, and specimens from the same locality belong to *Forsancyllus*. Petterd wrote, "A much longer, narrow form, very thin and pale colour," and the largest specimen is about 2.6 mm. by 1.75 mm. by 1 mm., being smaller than *enigma*, with the apex more central and more elevated, the anterior slope more convex. As the name *oblongus* had been used previously for an *Ancyllus*, this may be named *Forsancyllus divellus*, sp. nov. Recently, F. Elkington Allen brought in some freshwater shells, and amongst them was a series of *Problancyllus*, the first record for this State. The genus was proposed for a curious Ancyllid with a cap. It suggests that, under certain circumstances, such as isolation in a stagnant backwater, the *Ancyllus*-like shell does not grow quickly and then with the influx of fresh water a fresh growth takes place. Usually the growth continues normally, but in this group it becomes excentric, and the small shell appears to be perched obliquely on the apex. A fuller account with figures will be issued later, but this will serve to draw attention to this curious development, and search in backwaters may lead to further discoveries. The specimens Allen discovered in the Peel River, near Tamworth, and are of the form of *Forsancyllus*, as figured above, with an excentric cap on the apex. The shell is larger, measuring over 5 mm. in length by 3 mm. in breadth, with a height of 1.75 mm., and has been named *Problancyllus anticipatus*.

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AN ESSAY ON THE YELLOW BOX,  
*EUCALYPTUS MELLIODORA*.\*

“Woodman, spare that tree!  
Touch not a single bough!  
In youth it sheltered me,  
And I'll protect it now.  
'Twas my forefather's hand  
That placed it near his cot.  
There, woodman, let it stand—  
Thy axe shall harm it not!”

So sang the poet long ago, and his verse is a slogan which every Australian should learn by heart.

My home is a farm-house in the Harden district in New South Wales. My grandfather selected our land more than half a century ago and, fortunately, appreciated the value of timber. Unlike a great number of adjoining settlers who grubbed, cleared, and burned the native trees, he kept several paddocks in their natural state, and to-day my father and his family are reaping the benefit of his foresight. There is ample dead timber for fuel purposes, good shade and shelter for sheep, and sixty acres of beautiful natural park land, which forms a sanctuary for opossums and wild birds.

One paddock is near the home and is timbered throughout with yellow-box and red-gum trees. Just in front of our home is a yellow-box, *Eucalyptus melliodora*, which I have studied with a view to writing this essay.

The botanical name of the yellow-box—*Eucalyptus melliodora*—was first given to the tree by the famous botanist and explorer, Allan Cunningham, in the early days of our settlement. The name *melliodora* is derived from the Latin words “mel-mellis” (honey), and “odora” (a sweet scent). The name was well-chosen, as the lovely pale yellow blossoms of the tree have a delightful perfume like sweet honey. Especially is this noticeable after a shower of rain. Sometimes the tree is called the “Honey-scented gum.”

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\* This essay is the work of Master Woodley Smith (13 years, 6 months), St. Columba's Convent School, Harden, New South Wales, and is considered to be the most outstanding amongst those submitted in the recent competition on tree studies, sponsored by Mr. J. C. Ludowici (President of the Naturalists' Society, 1942-1943). The prizes were also donated by Mr. Ludowici. Particulars of the competition, which was open to school pupils and members of Junior Farmers' Clubs, whose ages were from 10 to 14 years, were published in the Education Gazette, February, 1943.—Editor.

SIZE.—The tree observed is about sixty feet high, and measures, at a distance of two feet from the ground, some seven round the girth. The trunk is of a fairly even rotundity, but tapers slightly at a height of twelve feet, where the first branch is formed.

The branches do not grow directly opposite each other on the trunk, but are separated by distances of two to four feet along the main body of the tree. There are four large limbs, and these grow fairly evenly round the trunk, giving the tree a symmetrical shape, and affording a deep shade on hot summer days. The leaves and twigs have a drooping tendency, and this factor helps the tree to escape the fierce rays of the summer sun, and to cast a heavy shade. The limbs are about one foot in circumference, and are some fifteen feet to twenty feet in length. The smaller branches and twigs are formed mainly at the end of each branch.

The trunk is hollow or "pipey" at a height of fifteen feet, and affords a home for a family of opossums. There is also a hole in one of the branches where in past years a kookaburra had a nest and reared her young. This hollow is six inches across and evidently leads to an inner "pipe" in the limb. The dry "pipes" which occur so much in the yellow-box trees are caused by the lack of moisture which the trees suffer from during drought times, while growing. Several of the branches have a gnarled or twisted appearance where they are joined to the trunk. This knotted state is characteristic of the yellow-box tree.

The tree discussed is more than fifty years old. We know this fact, as my grandfather states that it was a large tree when he settled here. Probably the age would be one hundred years.

HABITAT.—This particular tree grows on the slope of a hill and does not appear to be as large or as tall as the "red-gum" trees growing nearby. The country here is undulating with slopes and gently graded valleys. This tree appears to be smaller in size than its brothers, which grow in the valley some half a mile distant. The latter receive more moisture, being situated near a gully, which forms a fairly large stream in wet periods.

The tree described in this essay grows on a slope, and therefore does not receive a great deal of moisture. The "yellow-box" can stand a good deal of cold, as this locality suffers heavy frosts in winter, and often has late frosts in

November. These do not appear to affect the tree, although they often wither the hardy pepper trees in this district, especially those growing on creeks.

The "yellow-box" was evidently fairly abundant in this area before the settlers cleared the land, as in our timbered paddock these trees number seven or eight to the acre. This land is not eroded, as are many of the bare cultivation paddocks nearby. This proves the value of trees in keeping the soil together, and saving hilly country from being spoiled by the process of erosion.

"O'er mountain chain and vale and plain  
 They spread their sheltering arms;  
 They stand like guardian sentinels around Australia's  
 farms.  
 Their strength ensures security,  
 Their beauty ever charms."

—E. WEBSTER.

SOIL.—The "yellow-box" likes good soil. "My tree" grows in decomposed granite soil and granite boulders are on the hill beyond. The cultivation paddocks close by show rich chocolate-coloured soil when turned over by the plough. The wheat yields of these are excellent, averaging seven bags to the acre, while the paddock where "my tree" grows is well grassed and capable of carrying two or three sheep to the acre. The average rainfall here is 23½ inches per year.

The "yellow-box" is very drought-resistant. Some two years ago, during a period when no rain fell, these trees appeared to stand the strain exceptionally well. The branches of several "yellow-box" trees in the paddock near our house were lopped for starving sheep, and, although the leaves were not succulent, they helped, when used with other fodder, to keep the sheep alive during a bad period.

STRUCTURE OF BARK, LEAF AND FLOWER.—The bark of the "yellow-box" is thick and dark near the butt of the tree. As one looks further up the trunk one notices that it is flaky and shells easily. It is of a brownish-grey colour. Under this outer bark is an inner band of yellow bark. This has given the tree its name, "yellow-box." Sometimes it is called "yellow-jacket" or "yellow-gum." This yellow bark distinguishes it from other "box" species. About twelve feet from the ground the bark appears smooth and striped in places, and greenish-pink in colour. I noticed in

October that the young leaves appeared to be fairly short and thick. In December they appeared longer and thinner. They do not grow opposite each other on the twig.

The flowers, pale yellow in colour and fluffy like soft balls, grow from little cups, which appear in clusters, and are joined to the twig at the spot where the leaf-stem is formed.

FRUIT AND SEED.—The flowers appeared about the middle of October, and were still growing on parts of the limbs in late December. The fruits are small and shaped like half an egg, with a narrow outer raised band near the top of each. In December I noticed that the flowers had fallen from these cups and white "manna" fills most of them. Later the cups will become hard and brown.

There are no suckers or young trees in the vicinity of "my tree."

INSECT AND BIRD LIFE VISITING THE TREE.—From my observations I have noticed that many ants climb the "yellow-box," and these range in variety from the small ant to the large "sugar ant" type. They evidently find food in the white sweet "manna" in the fruit cups, as many of them are noticed carrying this white substance down the tree.

During the flowering period, especially on sunny warm days, there is a constant drone of bees seeking honey from the flowers. The "yellow-box" is a great honey-producer and a bee-keeper, with more than one hundred hives in a paddock not far from my particular tree, makes a good living from the honey.

I have often peeled off the outside thin layer of bark and found a white, filmy web which is formed by a small spider. This appears to be common on "yellow-box" trees.

Among the leaves attached to the trunk I often find the bag shelter of the case-moth, formed by various little sticks cut off to an even length, and colonies of black grubs of a "saw-fly" which cling to each other and exude a fluid from their mouths when disturbed.

The birds which visit "my tree" are many. The kookaburra and the white-backed magpie both rouse us early in the morning. A peewit has built a mud nest on a high branch, and the grey and pink galahs, with much screeching, flock to the topmost twigs, and in playful mood hang with heads suspended downwards from the limbs. On moonlight nights the wagtail keeps us awake with her call

of "Sweet pretty creature" from the branches, while under the tree are to be seen numbers of green ground-parrots, searching for seeds and insects. The currawong calls his echoing note from the "yellow-box," and the black crow caws as he sits and contemplates a visit to the fowl yard.

**VALUE OF BARK, WOOD AND LEAVES.**—The bark is useful for baking purposes and for lighting a fire. The wood is excellent for fuel purposes, throwing out a glowing fire on winter nights. The timber is good when round posts are needed for shed-building, or for gate posts or fences. As the "yellow-box" is often twisted and gnarled, it is hard to split, and this is the main objection the countryman has to using it. It is not as good as the "red-gum" is for fencing and building, as the white ants attack it more readily. The fact that it often has a "pipey" trunk is another objection. The tree is of good commercial value as a producer of honey. It does not appear to be used for making eucalyptus extract.

**DECORATIVE VALUE.**—The "yellow-box" is excellent as a shade maker for stock, and when grown in clumps as a shelter for them from wind and rain.

The tree is ornamental, and, if it were pruned and kept trimmed, it would be a splendid shade producer for avenues and parks.

The "yellow-box" can be grown from seed and, if small plants were obtained, schools could plant (as has been done on Arbour Days in many districts) small forests of this species. The children of the future would value the shade on hot summer days. The seeds could be planted in boxes and transplanted when the seedlings were about six inches high. The Australian Forest League and the Arbour Day Movement have done much to foster the love of our native trees like the "yellow-box." Too many of our bushland beauties have been destroyed by the axe and the bush-fire.

"The ruined beauty wasted in a night,  
The blackened wonder God alone could plan."

The careless smoker should be heavily penalised.—

"A fool there was and his pipe he lit  
On a forest trail where the leaves were fit,  
To become a blaze from the smallest bit  
Of spark, and the fool he furnished it:"

This war, with its sacrifice of lives, and desolation of countries, has made us realise the value of our own dear



land, Australia. Let us help the war effort by preserving for future generations the splendid native trees.

“My heartstrings round thee cling  
 Close as thy bark old friend!  
 Here shall the wild bird sing,  
 And still thy branches bend.  
 Old tree! the storm still brave!  
 And woodman leave the spot,  
 While I’ve a hand to save,  
 Thy axe shall harm it not!”

\* This essay is considered to be the most outstanding amongst those submitted in the recent competition on tree studies, sponsored by the Naturalists’ Society of New South Wales, which was open to school pupils and members of Junior Farmers’ Clubs of 10 to 14 years of age. Particulars of the competition were published in the Education Gazette, February, 1943, and the prizes were kindly donated by Mr. J. C. Ludowici, then President of the Society.

The above essay is the work of Master Woodley Smith (13 years, 6 months), St. Columba’s Convent School, Harden, New South Wales.

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#### THE FISHERMEN FROM THISCRITUS.

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Years gone, two aged fishers shared their rest  
 When in a wattle cabin on a bed  
 Of dry sea moss, beside the rush-lined wall  
 The twain had laid them down.  
 Round were strewn the instruments of their labourious  
 hands.  
 The creel, the rods of reeds, the hooks, the sails  
 Yet weedy from the wave lines  
 Wheel traps, frames of wicker work,  
 A pair of oars, sparse plaited mat-work coats served as a  
 pillow for their sleeping heads.  
 This told the story of their days of toil,  
 This was the sum of all their worldly wealth.  
 Nor door, nor watch-dog guarded them from harm,  
 In their eyes all seemed superfluous.  
 Who knew no sentinel save poverty,  
 They dwelt remote still against their narrow home,  
 Rolled up the gentle breaking waves of the sea.

—J. W. HAWLEY.

Greek poetry.—*Soutar*.

GEESE.

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THE HISTORY AND CHRONICLES OF SCOTLAND.

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(Part III.)

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By J. W. HAWLEY.\*

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This work is of great rarity and the translation is from the Latin of Hector Boethius' History of Scotland, executed by John Bellenden, Archdeacon of Moray, at the request of James the Fifth, who, it appears, was ignorant of that language, and was printed about the year 1536.

Now, to speak of the geese genera of the sea called "Claiks." Some men believe that they grow on trees by the nibbit (the beak), but their opinion is vain, and because the nature and the procreation of the Claiks is strange we have made no little labour and diligence to search for the truth and verity thereof.

We have sailed the seas where the Claiks are bred and found by great experience that the nature of the sea is a more reverberant cause or factor of their procreation than any other thing.

How be it, these geese are bred in many sundry ways. For instance, trees that are cast into the seas by process of time grew small worms; first, the worms show their heads and feet and, last of all, their plumes and wings; and, finally, when they have come to the last measure of maturity, they fly in the air as other fowls do.

It was noticeable and proven in the year of God, MCCCCXC (A.D. 1490) in the sight of many people. Beside the Castle of Petshego one great tree was brought to the Laird of the ground when some one divided the tree and saw a multitude of worms knawing themselves out of sundry hollows and bores on this tree. Some had both head and feet, some wings, but they had no feathers, and some were perfectly shapen fowls.

At last the people, in great admiration, brought it to the Kirk of Saint Andrew's beside the town of Tyne, where it remained to this day, and within two years after this happened one like tree came in the Firth of Tay beside

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\* Part II appeared in "The Australian Naturalist," Vol. XI., Pt. 4, p. 95.

Dundee, worm-eaten and hollow, full of young geese, in the same manner as we have shown.

One ship named the "Cristofar" was made of trees which grew in the Isles.

Master Alexander Galloway, a person of repute of Kinkell, was with us in the Isle, and he gave his most profound and earnest consideration to unravel the verity of this observation and misty doubt and, being somewhat venturesome, he lifted up the sea tangle, hinged full of mussell shells, but he was more astonished when he saw that there were no fish, but one perfect shaped fowl, small and great, offering to the quantity of shell.

There is a wonderful crag within the sea near the shore of Loch Levin, so straight and narrow, that no ship or boat may arrive, but someone will notice them. This Crag is called the "Bass," and everything in this Crag is full of admiration, and it is incredible that the number of Geis (geese), not unlike our fowls, sometimes called Sea Erns, and in no part of Albion are they seen in such vast numbers, and on this Crag at their first arrival in the spring they gather a great number of trees and sticks to build their nests, and that same night the Keeper of the Castle gathers sufficient fuel to last till next season. How be it, they have no other possessions, yet they take little indignation thereof, but hastily bring more trees from other places where they fly. The Keeper of the Castle takes the young geese from them with their full consent, and thus becomes a great profit yearly to the Lord of the Castle.

Within the bowels of the geese is a singular fatty substance of medicinal properties which heals many infirmities that are inflicted on mankind.

On the Crag grows a delicious herb, full of ends and holes like a water sponge, and when picked is delicious, fresh and sweet to the taste.

Oftimes fish with cowles over their heads like monks are seen signifying an omen of great mortality to man and beast.

In conclusion, at some future date, we will study the folklore and genealogy of the goose with the golden egg.

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## McCARR'S CREEK, PITTWATER.

On Saturday, 18th March, members of the Naturalists' Society of New South Wales, and the Manly, Warringah and Pittwater Historical Society visited McCarr's Creek, Pittwater.

The party commenced its walking tour from Church Point, which derives its name from the little wooden Methodist Church, built in 1872. We proceeded along the road skirting the shore to Ireland's cottage, where a date-palm, planted in 1902, gives a tropical touch to the surroundings. Just above on the rise is a monument with an inscription, which commemorates the early surveys of Captain John Hunter (1789), and William R. Govett (1829).

About twenty years ago the track that led from Church Point to Brown's Bay was replaced by a narrow road—the first intrusion into the quiet bushlands of the beautiful creek.

Now we are coming to George Brown's estate, "Water-side," a grant of 41 acres, made in the year 1880. Well-wooded heights rise steeply from the deep waters of the pretty bay, and an old pear-tree by the roadside is the only remnant of the garden. Mr. Brown passed away in 1917. The house vanished over 30 years ago, and the fine modern road runs over the spot. There is dense undergrowth at the head of the bay, and a large cave or "gibbie-gunyah" as the blacks would have called it. The gully descends to the sandy cove just covered by the high tide. A little corner of the bay near the sylvan track to the passion-fruit vines was once known as "Dorothy's Bower" after a member of the Brown family.

Now we are up about 150 feet here, and exquisite glimpses of the green waters are to be obtained through the fine old gum-trees and palms. There is plenty of scope for the botanist here. The road climbs, and down below at the waterside on Davy Walker's old selection hundreds of ancient, bleached shells indicate the position of an aboriginal kitchen-midden.

Bumpo Creek, a little affluent near the bend, received its name from old residents of Bayview in this way:—When one went up at high tide, one's boat continually bumped from one side to the other against snags and mangroves. Here is Cicada Glen, a reserve attached to Kuringgai Chase, with some magnificent *Livistona* or cabbage-tree

palms of a great height and probably 150 years old. Here the tide trickles in towards the picturesque gully, and the rill and salt water meet in the little glade.

Having rounded the bend in McCarr's Creek, we are now well on the way to the Silent Pool, at the entrance to the beautiful gorge forming part of the boundary of Kuring-gai Chase. This was a most sequestered spot before the road was made, and is near the limit of tidal action. Greenish waters, half-submerged rocks, tinted rose and red, and a tiny beach of white sand would make a subject for an artist. A runnel of fresh water after its 500 feet descent down a narrow glen makes a channel to the green pool. Here in the forest brakes is the retreat of the Coachwhip-bird, and at eventide the dominant notes of the "Currawong" or Black Magpie ring out a valediction to the visitor.

Now the road commences its ascent alongside the gorge and we look down on the tops of cabbage-tree palms and other flora. Those who have read "Martin Rattler" in their early years will remember Martin's adventures in the forests of Brazil. Well, this is not a Brazilian forest, but the jungle in McCarr's Creek. Gigantic water-vines intertwine among the trees, and in the gully is a ledge of rock ten feet sheer with a waterfall on the left, fed by a sparkling crystal-clear mountain stream. It is the haunt of Currawongs and Thrushes. The road bisects this affluent, and the spot should be marked with a suitable name, say, "Crystal Brook."

Still climbing for another half mile, we reach level country in a valley, where the creek flows along a rocky bed in a series of small cascades and "pot-holes" to the head of the gorge. The falls here have been named Lower Gledhill Falls. Thence about three hundred yards past clumps of *Hakea pugioniformis* or "dagger-point" bushes, brings us to the pond known as "The Duckhole," where the main stream and its right-hand branch meet. This pond was the resort of ducks over fifty years ago, truly a "sequestered pool in woodland valley."

After a visit to Upper Gledhill Falls and its emerald pool, the party camped and enjoyed afternoon tea in the glade near the brook. The pleasant breeze in this altitude cooled heated brows and acted as a restorative.

The right-hand branch rises at Tumble Down Dick Hill, 750 feet above the sea, and converges to the main

stream at the pond. These streams are really brooks, with pellucid pebbly pools—places where one would expect to find fairies at midnight. Grevilleas and epacris are in blossom, and in the spring the bush will be pink with boronia. In this region Peewees greet us, and the sad-voiced Crow seems to sorrow for “the tender grace of a day that is dead.” On the return journey, the shadows of eventide were commencing to creep across the creek, and our party of naturalists and historians reached Church Point, very pleased with the six-mile walk through the beautiful bushlands of McCarr’s Creek, Pittwater.—J. S. N. Wheeler.

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THE SANCTUARY—JENOLAN—IN JANUARY, 1943.

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The works of human artifice soon tire  
 The curious eye, the fountain’s sparkling rill,  
 And gardens, when adorned by human skill,  
 Reproach the feeble hand, the vain desire,  
 But, oh! the free and wild magnificence  
 Of nature in her lavish hours doth steal,  
 In admiration, silent and intense,  
 The soul of him who hath a soul to feel.

The River moving on its ceaseless way,  
 The verdant reach of meadow fair and green,  
 And the blue hills that bound the sylvan scene—  
 These speak of grandeur that defies decay—  
 Proclaim the Eternal Architect on high,  
 Who stamps on all his works his own eternity.

—*Longfellow.*

Translation from the Spanish of  
 Francisco de Medrano.

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Within this five square miles Sanctuary there is much of interest for the naturalist. Commencing at the “Five Mile” on the northern boundary, a well-graded winding road descends for fifteen hundred feet en route affording extensive views across valleys to mountain tops, far away to the east and south. Gradually the valley narrows between high peaks, shadows pattern the lower spurs, and, on rounding a sharp bend in the road leading due west, a great rugged cliff arrests attention, and seems to block further progress. This is the limestone formation containing the world-famous Jenolan Caves, a treasure house

of nature, unsurpassed in loveliness. This outcrop rises abruptly to a height of 800 feet and caps the Grand Arch through which the road continues on to the Caves House nearby. There is a friendly atmosphere about this hostelry that augurs well for the visitor.

The Devil's Coach-house lies adjacent to the north, and the Carlotta Arch is perched some hundreds of feet above the Coach-house. All these great openings were formed "lang syne" by flood waters, though at different periods of time.

It is an inspiring sight when the rays of the rising sun filter through the pendulous gum leaves, and gradually bathe the great cliff face in golden light, and piercing in through the rock crannies add lustre to the wings of the wild bees and welcome swallows, who favour this situation for nesting.

The Caves House is situated in a narrow pocket of perhaps a quarter of an acre in extent and is dominated on all sides by mountain peaks rising to 2,000 feet in height. A touch of northern alpine scenery is given to the surroundings by the tall old pines, planted long ago by our well-remembered friends, the late J. C. Wiburd and W. F. Blakely, on the surrounding spurs and ridges. These exotics with their close dark foliage and bizarre shape of the branches contrast strongly with the competing gum trees, whose limbs are sparsely covered with lighter coloured drooping leaves. The "Manna" gums are conspicuous in this area. By January they have shed their last year's coat. The smooth white trunks and limbs of these handsome natives support the glittering heads of delicate golden green leaves, to be followed later with foaming masses of white flowers. The undercover is mostly bracken, with some maiden hair and herringbone ferns on the east-north aspects, but on the westerly slopes, exposed to bleak west winds, the ferns give place to snow grass and the gums to stunted blackthorn and prickly bush, though here and there towering above the outcropping limestone is the Kurrajong, newly clothed, for spring is a late visitor to this whimsy country; their leaves glisten in the sunshine like burnished copper. Firmly rooted, they often stand out at precarious angles and defy the blustering sou-westers that sweep down the valley. They favour the broken limestone country, finding a good anchorage for tap roots between the boulders and are nearly always to be found on the western slopes—the bleakest aspect.

There is another approach from the "Five Mile," and that is by the old road, now a bush track, and this is the field naturalist's way. At the commencement of this walk, and for many miles along the track, the wayside was all painted with blue bells, no less beautiful than their namesakes (but not relatives), which adorn the Thames sidewalk in the famous Kew Gardens. A devastating bush-fire had gone through all this high country during the previous summer and every vestige of ground cover was consumed, yet with autumn rains there appeared, as if by magic, millions of seedlings, and in the following spring a wonderful flowering. Carried on long, slender but supple stems, they patterned acres of peppermint and white gum forest with every shade of blue from the palest to deep cobalt. Here and there whites were visible amongst the tawny seed ears of kangaroo grass. The track slowly descends along the narrow rocky ridge and finally merges into the landscape above the Carlotta Arch. Hereabouts the glaucous juvenile ovate leaves of a blue gum (a first cousin to the Tasmanian blue gum which has similar foliage) but quite distinct from the grey-green orbicular juvenile leaves of a white gum near the "Five Mile" contrast sharply with the duller greens of stunted peppermint and geebung. Some of the adult leaves of this rare blue gum measure over 30 inches in length, the longest recorded for the genus.

Now walk with me along the road from the Caves House towards Oberon—to Payne's Lookout, two miles distant and 1,800 feet above starting point. Fossil shells in the roadside cutting afford evidence of the Silurian age, and the numerous hairpin bends provide lookouts into the western valley, through which flows a permanent mountain stream of crystal clear water. At about 3 miles from the Devil's Coach-house this stream disappears underground, and then emerges and flows slowly for a short distance through a portion of the Right Imperial Cave, then disappearing again, to emerge at a distance of 100 yards to form the Blue Lake.

This road is well protected on either side by messmate and manna gums, which seem to favour the red soil. Blue bells, the Darling pea and the rich bunchy yellow heads of *Senecio* overhang the road cuttings. The flute-like notes of a mountain thrush roll down the mountainside in wild cadence. The lyre bird is not usually in vocal evidence at this time of the year, and great was our sur-



prise when, on rounding a bend in the road, we approached unnoticed a family of three and listened to the world's greatest mimic as he strutted, with preened tail feathers to and fro about the stage, a fallen log. His mate and their six-months-old offspring listened and watched the performance from a nearby tree. This rare occurrence was staged possibly for the education of the offspring, no less than for the edification of the actor and his spouse.

From some nearby thickets of bracken or briar, the whip bird may startle you with his loud crackling notes. White-shafted fantails, yellow and flame-breasted robins and tree creepers prospect the ground logs for sustenance, along with the wonga pigeon. While high overhead that monarch of the air, the wedge-tailed eagle, sailed on unperturbed by the futile efforts of his pursuers, the magpie and crow. Some birds of bright plumage—lowries and rosellas frequent the Caves House and accept offerings of sweets and fruit at close quarters. They were early visitors at our bedroom windows, and readily consumed the buttered (not dry) bread on the window sills. Some more emboldened would fly into the room and prospect along the footrail of the bed or on the washstand for more. Not so bold were the cat birds, but they came and picked a portion, then retreated hastily to a nearby false acacia tree.

The dark satiny plumage of the six-year-old male glistened in the bright morning sunlight as he hastened to and fro. The whereabouts of their bower was betrayed by a call note which resembled the meowing of a cat.

Roaming at dusk, the spiny ant-eater or a wombat or bandicoot may be observed, and later, in the moonlight, the ringtail and grey possums and marsupial mice give acrobatic displays as they travel from tree to tree. A single telephone wire stretched across the forty feet wide road provided a short cut for one of these Blondins.

Along the path where the underground river flows into the lake, sheltered from the cold west and south winds by the limestone outcrop, there is evidence of a temperate climate in the presence of native Daphne, wild mulberry, kangaroo apple and wonga wonga vine. Commencing where the lake overflows to form the Jenolan stream, the river oak, lichen covered with age, is very noticeable. Its habitat is confined to the lower levels—under 2,000 feet. Higher up on the cliff and mountain side facing north there are rock lilies and Port Jackson fig trees, some yellow box

and stringybark gums and the snow gums crown the summit with their white boles and thick shiny green leaves.

In the willow-lined lake you may see the fishes moving at first slowly in the deep jade-blue water, then suddenly speeding-up to take a surface insect or the morsel of meat or bread you have brought to feed these speckled beauties. Quickly turning and rolling in the sunlit water, as they submerge you see those opalescent tints on belly and sides which proclaim them to be rainbow trout.

On dark, warm nights the fireflies are a surprising and fascinating sight, as they dart around the eastern entrance to the Grand Arch, and through and about the undergrowth nearby, or pierce the darkness as they gyrate along the road and up the mountain side, their steely-blue glow rivalling in brilliance the denizens of the Milky Way far overhead. For how long these magic lanterns have frequented this sequestered spot, and how they were attracted to it, is a matter of speculation. They have not been seen further down the valley, and probably spread across the mountains from the rain forest at Mt. Wilson, 50 miles distant.—F. J. LUDOWICI.

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#### NATURALISTS' SOCIETY OF NEW SOUTH WALES.

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##### *Proceedings.*

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OCTOBER, 1943.

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The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, October 5, 1943, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 50 members and visitors present.

Election of Members.—Master Kenneth Traison and Master Peter Morrison were unanimously elected members of the Society.

Nomination of Members.—Master Peter Doenau, 5 Eulo Avenue Ryde. Nominated by Mrs. E. H. Zeck, seconded by Miss D. Dobbin. Master David Stuart, 5 Arthur Street, Marrickville. Nominated by Miss D. Dobbin, seconded by Mr. K. Thurlow. Miss M. Quinn, 29 Hurstville Street, Arncliffe. Nominated by Miss Boulter, seconded by Mrs. R. J. Watson. Miss H. Marshall, 25 Homebush Road, Homebush. Nominated by Miss Boulter, seconded by Mrs. R. J. Watson.

Exhibition of Specimens.—Mr. C. S. Ashley: Petrified wood from Bellambi and a lizard from Western Australia.

Miss Gina Ballantyne.—Specimens of *Kennedyia*, *Acacia*, aniseed plant and fungus.

Miss Peterson.—Specimen of fennel and native violet.

Mrs. E. Pring.—Specimen of spider from Gulf of Carpentaria and Mahogany bean.

Miss F. Bewley.—Rattle from five-year-old rattlesnake killed in Humboldt County, California.

Lecture.—Mr. P. W. Gledhill delivered an extremely interesting and informative address on "The Far-west of this State." The lecture was illustrated with lantern slides, some of which showed trees, donated by the Naturalists' Society, being planted at Menindie and Wilcannia schools. The lecturer was accorded a very hearty vote of thanks.

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#### NOVEMBER, 1943.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, November 2, 1943, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 40 members and visitors present.

Correspondence.—Letter from Kuring-gai Chase Trust regarding the sale of wild flowers; Royal Zoological Society of New South Wales with reference to the Snow Leases and the Macquarie Marshes. Other correspondence dealt with by Council.

Election of Members.—Master Peter Doenau, Master David Stuart, Miss M. Quinn, and Miss H. Marshall were unanimously elected members of the Society.

Nomination of Members.—Miss D. E. Hill, 22 Hunter Street, Strathfield. Nominated by Miss Boulter, seconded by Miss Ross. Masters Larry Arthur, 36 Carillon Avenue, Newtown. Ken Stuart, 89 Bay Street, Botany. Bob Swinbourne, 56 Alfred Street, Mascot. John Flynn, 1 Herbert Street, Rockdale. Les Hardacre, 25 Wilson Street, Mascot. William Jones, 60 Canonbury Grove, Dulwich Hill. Les Hughes, 28 Myall Street, Punchbowl. Bill McKinnon, 54 River Road, Revesby. Barry James, 11 Jay Avenue, Belmore. Calvin Calloway, 11 Flers Avenue, Earlwood. Bruce Lee, 37 Garden Street, Belmore. Rex Rosser, 30 Brooklyn Street, Tempe. Peter Jennings, 30 Railway Street, Banksia. Glen Joyce, 24 Tennant Parade, Dulwich Hill.

Dick Meale, 67 Warren Road, Marrickville. Nominated by Mr. K. Thurlow, seconded by Mr. A. E. Watson.

Exhibition of Specimens.—Mr. A. E. Watson: Pressed specimens of plants from Broken Hill.

Miss Wright.—Specimens of *Eriostemon* and *Crocea saligna*.

Master Len Little.—Pigeon's nest, eggs of quail and zebra finch.

Mrs. Powell.—Seeds of *Castanospermum australe*, the Moreton Bay chestnut.

Mr. C. S. Ashley.—Specimens of minerals, including quartz crystals used for wireless transmitters.

Miss G. Ballantyne.—Specimens of *Kunzea*, *Dianella* and *Stypandra*.

Miss Crisford.—Specimens of seaweeds collected in Egypt by Sir George Jackson in 1857.

Miss Quinn.—Specimens of coral from North-west Island, Barrier Reef.

Mr. Gray.—Lantern slides depicting the National Park, Heathcote and Woronora River districts.

Mr. A. E. Watson.—Delivered a short address on the Broken Hill district.

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#### DECEMBER, 1943.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, December 7, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 45 members and visitors present.

Election of Members.—Miss D. E. Hill, Masters Larry Arthur, Ken Stuart, Bob Swinbourne, John Flynn, Les Hardacre, William Jones, Les Hughes, Bill McKinnon, Barry James, Calvin Calloway, Bruce Lee, Rex Rosser, Peter Jennings, Glen Joyce, and Dick Meale were unanimously elected members of the Society.

Nomination of Members.—Mr. F. Bryce, 58 Macleay Street, Pott's Point. Nominated by Mrs. R. J. Watson, seconded by Miss D. Dobbin.

Mr. A. E. Watson read Mr. Ludowici's report on the meeting of the Banks Memorial Trust.

Exhibition of Specimens.—Mr. C. S. Ashley: Specimens of plant galls from Eucalyptus trees at Wyong.

Miss Peterson.—Specimen of hemlock.

Master Calvin Calloway.—Specimens of sawfly larvae, *Tenthredinidae*.

Miss Myra White.—Nest of a paper wasp.

Mr. Fred Johnson.—Specimens of leaf-eating insects.

Two lecturettes were then given. Mr. C. S. Ashley discussed his recent visit to the Broken Hill mines, and Mr. A. E. Watson discussed plant variations.

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#### FEBRUARY, 1944.

The ordinary monthly meeting of the Society was held in the Newsreel Theatre of the Shell Oil Company on Tuesday, February 1, 1944, at 7.30 p.m.

A number of films were lent and shown by the Shell Company, together with two lent by the National Fitness Council. A most interesting and instructive evening was spent viewing them. The President (Mr. A. E. Watson) thanked the company for their courtesy in allowing the Society the use of the theatre, and also the two assistants who had charge of the display.

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#### MARCH, 1944.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, March 7, 1944, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 65 members and visitors present.

Election of Members.—Mr. F. Bryce was unanimously elected a member of the Society.

Nomination of Members.—Miss Adrienne Burns, 95 Rangers Road, Cremorne. Nominated by Mrs. L. Powell, seconded by Mr. Powell. Master Barry Latter, 25 Abbott Street, Coogee. Nominated by Mr. M. E. Gray, seconded by Miss D. Dobbin. Mrs. F. H. Boyce and Mr. Boyce, c/o Babcock & Wilcox, Ltd., Regents Park, N.S.W. Nominated by Miss D. Dobbin, seconded by Miss N. Luckie. Mr. R. W. Black, Bank of New South Wales, Bathurst Street, Sydney. Nominated by Miss D. Dobbin, seconded by Mr. Ludowick. Mr. Keith Lines, The Astor, Macquarie Street, Sydney. Nominated by Miss D. Dobbin, seconded by Mr. A. E.

Watson. Miss Speck, Public School, Dulwich Hill. Nominated by Miss Deasey, seconded by Mrs. R. J. Watson. Mrs. M. Fludder, Box 2091, G.P.O., Sydney. Nominated by Miss Marshall, seconded by Miss Thompson.

Exhibition of Specimens.—Miss N. Luckie: Collection of pressed West Australian wild flowers and ferns.

Master Rex Rosser.—Collection of butterflies and moths.

Lecture.—The Rev. Frank Cash delivered a most informative and instructive address, entitled, "How the Harbour Bridge was Built." The lecture was illustrated with many interesting lantern slides, and the lecturer was accorded a hearty vote of thanks.

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APRIL, 1944.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, April 4, 1944, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 60 members and visitors present.

Election of Members.—Miss Adrienne Burns, Master Barry Latter, Mrs. F. H. Boyce, Mr. Boyce, Mr. R. W. Black, Mr. Keith Lines, Miss Speck, and Mrs. M. Fludder were unanimously elected members of the Society.

Nomination of Members.—Miss N. Elliott, 97 Eton Street, Sutherland. Nominated by Miss Dorothy Booth, seconded by Mr. A. Booth. Miss H. Swan, 45 Harriett Street, Marrickville. Nominated by Miss Boulter, seconded by Miss Ross. Miss L. Bardsley, 69 Pavilion Road, Queenscliff. Nominated by Miss Boulter, seconded by Miss Ross. Miss Joan Smith, 93 Rangers Road, Mosman. Nominated by Miss Adrienne Burns, seconded by Mrs. Powell.

Exhibition of Specimens.—Master Calvin Calloway: Collection of beetles.

Mr. C. S. Ashley.—Specimens of minerals, wild flowers and noxious weeds.

Mr. F. J. Ludowici.—Seeds of bunya pine, spiders and eggs of gecko.

Mr. A. E. Watson.—Collection of botanical specimens.

Lecture.—Mr. Price Conigrave delivered an extremely interesting and informative address, entitled, "History Along the Track." The lecturer was accorded a very hearty vote of thanks for his address.

## MAY, 1944.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, May 2, 1944, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 65 members and visitors present.

Election of Members.—Miss N. Elliott, Miss H. Swan, Miss L. Bardsley, and Miss Joan Smith were unanimously elected members of the Society.

Exhibition of Specimens.—Mr. C. S. Ashley: Pearly Nautilus shell and uncut specimens of sapphires and aquamarines from Emmaville, New South Wales.

Miss Myra White.—Sea urchins from Kurnell and a skipper butterfly.

Mr. A. Booth.—Fruiting specimen of *Eugenia myrtifolia*.

Miss Thomson.—Seeds of *Macrozamia spiralis*, the burrawong.

Mr. J. W. Hawley.—Sea urchins from Kurnell.

Lecture.—Mr. R. H. Anderson, Government Botanist, delivered an extremely interesting and informative address, entitled, "Glimpses of Tree Life in New South Wales." The lecture was illustrated with many excellent lantern slides, and at its conclusion the lecturer was accorded a very hearty vote of thanks.

## JUNE, 1944.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, June 6, 1944, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 65 members and visitors present.

Nomination of Members.—Master Kevin Burns, 95 Rangers Avenue, Cremorne. Master Ian Adams, 91 Rangers Avenue, Cremorne. Nominated by Miss Adrienne Burns, seconded by Miss Joan Smith.

Exhibition of Specimens.—Mr. D. D. Stead: Specimen of the Queensland Nut, *Macadamia ternifolia*.

Miss Jefferson.—Seeds of native *Wistaria*.

Miss Coxhead.—Specimen of scorpion from New Guinea.

Mr. C. S. Ashley.—Specimen of *Banksia*.

Mr. A. E. Watson.—Seedlings of *Poinciana* grown from seeds which were collected by Mr. Powell in New Guinea some years ago. Mr. Watson discussed the work being

done by the Broken Hill Field Naturalists' Club in connection with the Sturt Centenary, and mentioned Mr. Kinghorn's work in connection with the organisation of a childrens' Naturalist Society in country centres of the State, and the broadcasting of weekly talks.

Froggatt Memorial Lecture.—Mr. David Darwin Stead delivered the Froggatt memorial lecture, which was entitled "The Naturalist and the Bush Walker." The lecture was illustrated with numerous lantern slides, and the lecturer was accorded a hearty vote of thanks.

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#### JULY, 1944.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, July 4, 1944, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 60 members and visitors present.

Election of Members.—Master Kevin Burns and Master Ian Adams were unanimously elected members of the Society.

Nomination of Members.—Master Peter Smith, 93 Rangers Avenue, Cremorne. Nominated by Master Kevin Burns, seconded by Master Ian Adams.

Exhibition of Specimens.—Mr. A. E. Watson: Specimen of water-worn crystal.

Mr. F. J. Ludowici.—Specimen of *Eucalyptus torquata*.

Mr. A. F. Buckley.—Sample of Manganese used in the manufacture of steel.

Lecture.—Mr. Norman Chaffer exhibited a number of cine colour films, illustrating the nesting habits, etc., of various kinds of birds. These films were exceedingly beautiful and of exceptional interest, and at the conclusion of his address the lecturer was accorded a very hearty vote of thanks.

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#### NOTICES.

Members are reminded of Rule 4 of the Society which reads: "All subscriptions shall become due on the first day of August and shall be payable in advance."

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The Society's gum-leaf Badge may be obtained from the Hon. Secretary or the Hon. Assistant Secretary. Price, 2/- (postage and package extra).



# The Australian Naturalist

Vol. XI.

JULY, 1947.

Part 6.

## \*ONCHIDIUM ASSOCIATED WITH DEAD CORAL.

By JOYCE ALLAN and PHILIP J. BELL.

(Published by permission of the Australian Museum.)

(Figures i.-iv.)

### INTRODUCTION.

The Onchidiidae are slug-like, shell-less, invertebrate animals of the Sub-class Pulmonata, which embraces all air and semi-air breathing mollusca, but whilst the true Pulmonates are essentially terrestrial and fresh water groups, the Onchidiidae seem to be land Pulmonates which have retrogressed to an amphibious or quasi-marine life. Some species are able to exist for several weeks under salt water, and equally as well out of it (provided the air is moist). Actually, they appear to be an intermediate group between the true Pulmonates and the marine Opisthobranchiate slugs.

The Onchidiidae inhabit temperate and tropical seas, and are widely distributed in the Indo-Pacific. The family includes species which haunt muddy beaches, mangrove flats, and rocky shores, either in the vicinity of high tide mark, or within a range extending seawards to just beyond the low tidal zone. Their colouring and shape are often adapted to suit their environment, and their surface, which may be smooth, granular or papillose, seems toughened to cope with air conditions.

Although regarded as Pulmonates, the organ in the Onchidiidae which represents the pulmonary or branchial cavity—the so-called lung—is recognised more as a cavity of the kidney than a respiratory orifice. Respiration is understood to be aided by the skin and dorsal papillae.

\*Agassiz (1846, p. 259) emended *Onchidium* Buchanan (1800, p. 132) pro *Oncidium*, on etymological grounds. Although Thiele (1931, pp. 486-88) follows Agassiz, and drops the "h" in the family name, we have maintained the earlier spelling, as admissible.

The so-called respiratory orifice lies on the undersurface of the animal, towards the posterior end, and adjacent to the anal orifice. Philip Bell has observed on several occasions that the respiratory orifice is usually closed when the *Onchidium* is inactive, but is repeatedly opened wide at regular intervals, when it is in movement, and, on the application of a killing agent, the mollusc ejects air bubbles through it. It is felt by some authorities that the Onchidiidae would be better placed in the marine Opisthobranchiata rather than in the Pulmonata, on respiratory grounds.

The sexes are united in the Onchidiidae, but the genital orifices are widely separated. The male genital opening is situated at the anterior end, near the right eye-bearing tentacle, and the female genital opening is at the posterior undersurface, near the anal opening.

Certain members of the family have dorsal eyes on the back or mantle. These show varying degrees of organization, and are situated on the apices of the larger papillae, sometimes in groups of one to four or more on a papilla. An *Onchidium* may have a hundred or more eyes on its dorsal surface. Tropical Onchidiidae are the prey of an interesting fish, *Periophthalmus*, which skips along the shore in search of them. It has even been suggested that these eyes enable the mollusc to apprehend the shadow of the approaching fish, and to defend itself by suddenly contracting glands in the skin, exuding a liquid secretion which frightens away the fish. In support of this assumption, it is stated that genera of Onchidiidae possessing dorsal eyes appear to have the same geographical range as *Periophthalmus*, and that where this fish does not exist, the Onchidiidae are destitute of dorsal eyes. There may, or may not be some grounds for this belief: nevertheless, in the vicinity of Sydney, where this fish does not occur, both eyed, and non-eyed, species of *Onchidium* are found. Whatever their purpose, these dorsal eyes provide an important distinguishing feature in the classification of the species.

#### DISCUSSION.

Amongst marine mollusca, it is a normal environmental habit of limpets and their allies to make shallow depressions on rocky surfaces, and of certain bivalves to bore into rock, coral and sponge. Their very existence depends to a large extent on this adaptability, and the habits are well known to students of conchology.

Though of rare occurrence, instances of Pulmonatés boring into rock, also are known. Cooke (1895, pp. 49-50) quotes snails (*Helix*) making cavities in solid calcareous rocks near Boulogne, and similar cavities at Constantine and Palermo. In respect of those at Boulogne, litmus tests supported the theory that the snails were responsible for these excavations. Also, cavities made by *Helix aspersa* in limestone rocks in the British Isles, are well illustrated by Taylor (1914, pp. 244-245), indicating that the habit is not unusual there. Little information is available, however, to suggest that *Onchidium*s are associated with similar habits.

In early contributions by various authors, to the knowledge of this family, and in subsequent, infrequent notes on Onchidiidae, little reference is made to their habits, other than to the homing habit exhibited by an American species, *Onchidium floridanum* Dall, ably described by Arey and Crozier (1918, pp. 229-321), and to the particular environment of two Japanese species, as shown by Taki (1935, pp. 65-66).

Taki recorded that the main habitat of one of the Japanese species (*Oncidiella kurodi*), was a crack of weathered andesite, 30-50 mm. deep, near high tide mark, whilst he had been informed that the other species (*Oncidiella orientalis*), lived commensally with a littoral sponge, *Reniera okadai*.

In studying the homing habits of *Onchidium floridanum*, Arey and Crozier have thrown much light on the species in general, and have provided workers with a very interesting and useful paper. The authors state that the homing habit displayed by this intertidal species is even of a more striking character than that displayed by limpets. The species lives in groups or communities, in "nests" or cavities, in eroded shore rocks, from which they emerge at low tide when the "nests" are above water level, to feed on algae on surrounding exposed shore surfaces. Before the tide rises again, the individuals emanating from any one particular nest, return to that nest, meanwhile showing strong evidence of homing behaviour. Even more interesting is the statement that the *Onchidium*s composing any one nest, begin their return to that nest almost simultaneously, irrespective of how far distant they may be from one another at the time. Their nest-like cavities are either narrow crevices, or may be subspherical, and are almost obscured by growths of small mussels. The

authors do not suggest that the *Onchidium* is responsible for these cavities, but that it seeks them out in the eroded rock, for shelter, and treats them as its nest during high tide.

The occupation of these cavities by the American species of *Onchidium* bears some similarity to the behaviour of a species of *Onchidium* recently found associated with dead coral, in Moreton Bay, Queensland. As this phenomenon seems to have escaped observation in Australia, previously, and as Bretnall (1919, pp. 303-328) in his "Review of Onchidiidae from Australia and the South-western Pacific," makes no reference to their habits, the following account is offered in the hope that it may influence further investigation in this field.

#### ONCHIDIUM VERRUCULATUM CUVIER, ASSOCIATED WITH DEAD CORAL.

The phenomenon of *Onchidium* associated with dead coral, to the extent that the species appeared to have burrowed into it, was first observed by one of us (Bell) at Reef Point, Scarborough, Moreton Bay, Queensland, during 1944-45. On several occasions, small shallow excavations were noticed in pieces of dead coral (*Astraeidae*), found between tide marks. Approximately 50 per cent. of dead coral examined in some parts of the area was affected, indicating that the phenomenon was not uncommon. The excavations were of a distinct type, unlike borings made by a bivalve (*Petricola lapicida*), which is common in certain species of dead coral found in this vicinity. These shallow pits varied in size, and all were obviously of similar origin. Some were quite superficial, like a limpet's impression; others were up to half an inch or more in depth, and the walls in these well-formed pits were smooth, and rounded at the bottom. After consideration of local fauna, with a view to finding their originator, the size and shape of the pits suggested a possible solution—*Onchidium*. This idea did not fall in with their habits, as the investigator understood them at that time. Eventually, on the subsequent discovery of a piece of dead coral containing an unusual number of such cavities, six of them occupied by living *Onchidiids* (*Onchidium verruculatum* Cuvier), this conjecture proved correct.

These occurrences are restricted to a small area a few hundred yards wide, on a flat, somewhat sheltered beach of rather muddy sand. Dead coral is at all common only

on this portion of the beach. Two other species of dead coral (B/C and C/C), also occur in this restricted area, but are comparatively rare, and, although depressions of a somewhat similar nature have been noticed in them, on no occasion have *Onchidium*s been in occupation.

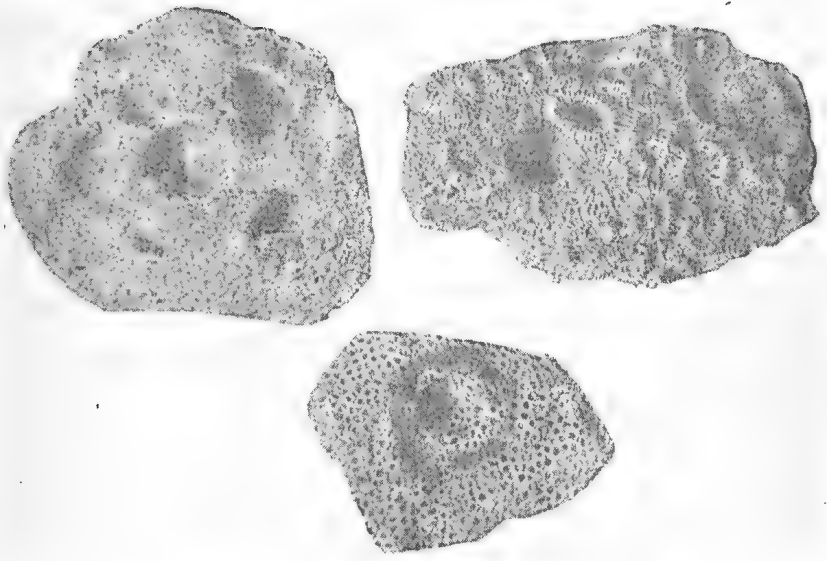
Approximately 10 per cent. of the coral examined (here designated as A/C) contained this species *in situ*, although, as mentioned above, a much larger percentage showed the characteristic depressions. *Onchidium verruculatum* Cuvier, appears to be the only species of Onchidiidae in this vicinity, where the dead coral is found with the mollusc attached; in fact, Philip Bell has rarely seen it there, except in association with this particular species of coral. He has found it, however, though in much smaller numbers, in the vicinity of Scarborough, in an area where there is no coral and little mud, an environment which is not so favourable to it.

Some *Onchidium*s were only partly submerged in the coral; others had burrowed down until their backs were flush with the surface. The camouflage effect produced by the latter was almost perfect. Their rough appearance and colouring made them almost invisible against the coral background.

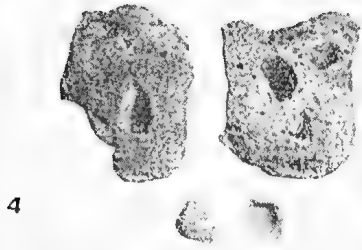
A comparison of depressions from which *Onchidium*s have been removed, and of those made by bivalves, show that the former are roughly circular in outline, with the sides sloping evenly to the rounded bottom. On the other hand, those made by bivalves are much narrower, deeper, usually sloping in a diagonal direction, and some show a decided undercut at one side.

An attempt was made to ascertain the extent to which the *Onchidium*s were responsible for the excavations in which they were found. Living specimens found *in situ* were removed, and placed on red litmus paper, upon which the paper turned violet. Similar, though weaker results, were noted on bringing the paper in contact with the bottom of the pit immediately after the removal of the occupant. No doubt, the secretion from the *Onchidium*, which can be copious, tends to dissolve or disintegrate the dead coral, and results in a depression sufficiently large to act as a safety zone for the mollusc.

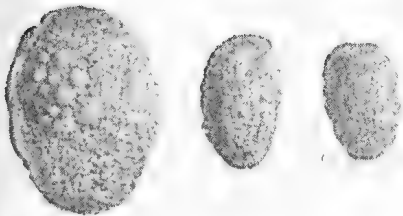
It is not suggested here that the molluscs have the same boring faculty displayed by some bivalves, for instance. The normal habit of an *Onchidium* seems to be to flatten itself, after the manner of a limpet, on an object



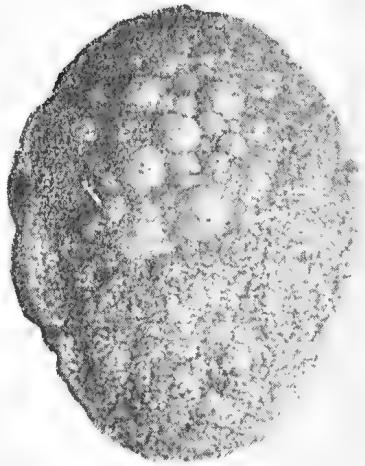
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with which it comes in contact, such as wood or rock, and to cling firmly by means of its broad, mucus-covered foot. Better still, if it can sink into a slight depression already made, or wedge itself into a convenient crack or hole, it may further disintegrate the surrounding area, by the aid of the mucus on its undersurfaces. It is evident that some method such as this, whereby the depression is enlarged and deepened, is adopted by the *Onchidiums* found associated with the dead coral.

An examination of a piece of dead coral from which several *Onchidiums* were removed, shows that the surface would be fairly easy to erode. Interrupted naturally by hundreds of tiny polyp holes, it is further riddled by the small, deep, tunnel-shaped holes of boring bivalves (some of which are still in occupation), and natural depressions brought about by wear. The *Onchidiums* would find this a most favourable environment on which to settle. Once settled, in the space of time, walls separating holes would be worn down, and depressions deepened and enlarged to

#### EXPLANATION OF PLATE.

The authors are indebted to Mr. G. C. Clutton, Australian Museum, for the photographs in this plate.

- Fig. 1. Three types of dead coral (Astraeidae) showing burrows traceable, and assumed traceable, to *Onchidium* action. Upper left is coral designated A/C; from burrows of which *Onchidium verruculatum* Cuvier, was removed. Depressions in corals on upper right (B/C) and lower (C/C) are similar in appearance:
- „ 2. Dorsal view of *Onchidium verruculatum* Cuvier. Note the dark eyes showing on some of the larger pustules.
- „ 3. Dorsal view of *Onchidium verruculatum* Cuvier (left). On the right are dorsal views of a light and dark specimen of *Onchidina australis* (Gray).
- „ 4. Excavations made in two pieces of coral by a boring bivalve (*Petricola lapicida*). From the coral on the right, the bivalve has been removed and the two valves are shown below. A bivalve still remains *in situ*. Compare the sloping nature of these deep burrows with the wide, shallower ones in the coral in Fig. 1 (upper left).

suit the relative size of the *Onchidium*. It is even suggested that the *Onchidium* may settle in a small hole or depression in the coral when young, remaining there for some considerable time, after the manner of limpets. Future investigation may indicate that this species possesses a similar homing instinct as that displayed by the American species.

Briefly, then, it is suggested that the *Onchidiums* have settled, at an uncertain period in their lives, on favourable spots on the dead coral, possibly over slight depressions or holes, and gradually by a mucus process have enlarged and deepened their sites, until they have become perfect burrows for them. The area surrounding a small colony of these burrows of varying depths, in a piece of coral four inches long, shows a worn appearance as though tracks have been made by the molluscs journeying to and from their cavities. If they do adopt these burrows as homes for any length of time, then at some stage they must have to vacate them during a search for food.

As a result of the above observations, the following points arise which can be investigated in this field, with advantage:—

The stage in its growth when the *Onchidium* settles on the dead coral, and the length of time it remains there.

The possibility of the homing instinct being associated with this burrowing habit.

The extent to which *Onchidium* utilises depressions and holes already present in the coral.

The breeding habits of the species.

As stated earlier, *Onchidium verruculatum* has been found also by Philip Bell in smaller numbers half a mile from the beach, on a reef only exposed at low tide. In that environment, it is attached to the undersurface of volcanic rock, but as there is little mud there, the situation is not as favourable as in the vicinity where the dead coral lies. He also found another species of Onchidiidae, *Onchidina australis* (Gray), on the edge of a black mangrove flat, at high tide, clinging to the undersurface of decayed wood, but not at any time in association with dead coral.

Two other species of dead coral (Astraeidae—B/C and C/C), show depressions similar to those on A/C, but *Onchidiums* have not yet been found on them. The coral indicated as B/C is not as common as that marked A/C,



and C/C is comparatively rare in the area under discussion.

#### SUMMARY.

Though several species of dead coral are found in the vicinity of Reef Point, Scarborough, Moreton Bay, where these observations were made, *Onchidium*s have been found in actual association with only one particular species of coral (A/C), the more common species there.

Fifty per cent. of this species of coral examined showed depressions traceable to *Onchidium* action. Approximately 10 per cent. of these had *Onchidium* actually *in situ*.

Two other species of dead coral showed similar depressions, but *Onchidium* have not yet been found associated with them.

*Onchidium verruculatum* Cuvier is the only species of the family noticed in the immediate vicinity, where dead coral is found with this mollusc attached, and is rarely found there except in association with coral A/C.

*Onchidium verruculatum* is frequently found also, but in smaller numbers, on a reef exposed only at low tide, situated half a mile from the beach, where there is no coral and little mud. This appears a less favourable environment for it.

The dead coral provides a favourable base on which to settle, and it is suggested that either by occupying a depression or a hole already prepared in the coral, or by making a slight depression, after the manner of limpets, the *Onchidium* gradually wears away surrounding particles of dead coral, by means of a mucus secretion, until a cavity of sufficient requirements is made.

The present observations on *Onchidium*s in association with dead coral suggest several mutually related problems which might be investigated with advantage in the future.

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## NOTE ON THE EGG PLACING OF A MEGALYRID WASP.

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By M. E. GRAY.

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For many years past there has been much speculation as to the manner in which the female "Long-tailed Wasp" placed its eggs in or near the larvae of certain wood-boring beetles, and many wild guesses and far-fetched theories have been advanced. All who have been interested in this subject have overlooked the fact that the beetle larvae hatch from eggs, either laid upon, or inserted into the bark of trees, and eat their way into the wood, the size of the tunnel increasing with the growth of the grub.

During September, 1941, at a point approximately 41 miles north of Windsor, N.S.W., along the new Sydney-Putty-Singleton road, I was fortunate in observing a large number of Megalyrid wasps in the act of placing their eggs into minute holes in stringy-bark safety-fence posts (with the bark stripped). Whether the egg is actually introduced into the body of the victim, or whether it is merely laid in the tunnel where it hatches, and the resulting wasp larva then proceeds to locate and attach itself to its host, is a matter still to be determined.

Messrs. M. Turnbull and M. Pittman, both residents of Putty, were with me at the time and witnessed the operations of the wasps.

The Megalyrids possessed a wonderful "instinct" for locating the holes, flying direct to, and alighting virtually upon the exact spot for the immediate placing of their ovipositors direct into the minute holes. The attitude adopted is similar to that assumed by a female grasshopper when laying its eggs in the ground, but there is definitely nothing in the nature of using the ovipositor as a "wood-boring instrument"; the long, thin hair-like ovipositor is simply thrust carefully into the hole already existing, the insect backing slowly as the organ is inserted to about two-thirds of its length; the eggs as they are exerted can be plainly observed as a slight bulge gliding steadily down the tube (ovipositor); any attempt to remove the ovipositor after the egg has entered the wood until it has cleared the ovipositor results in the immediate snapping of that organ. The species under observation placed two and sometimes three eggs in each hole visited.

They are exceptionally quick on the "take-off" if approached immediately upon alighting, but once the point of the ovipositor enters the selected hole they are easily taken by hand, making no attempt to escape.

I submitted specimens of this wasp to Mr. K. C. McKeown, of the Australian Museum, and he has informed me that the species does not appear to be represented in their collections.

[The *Megalyridae*, or "Long-tailed Wasps," constitute a small family of parasitic insects. They have very long, thin ovipositors, which in some species are more than three times the length of the insect's body, and from this have derived their popular name.—Ed.]

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#### REVIEW.

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LIFE STORIES OF AUSTRALIAN INSECTS.—By Brewster, Brewster and Crouch.

This work, the second edition of which has been issued, has been thoroughly revised and new information has been added.

It is a book intended for the use of pupils in primary and secondary schools, but should have a wide appeal to others interested in the insect life about them. Mr. T. McCarthy (Chief Entomologist, N.S.W., Department of Agriculture), in his preface to the book, says: "No one should know the requirements of the beginner in entomology better than the authors themselves, for they have been teachers in nature study in both primary and secondary schools for many years."

Interesting accounts of the life-histories and habits of a number of Australian insects are given, and much of the information has been based on personal observations of the authors.

The work contains 332 pages, and is illustrated with 53 plates, drawn by A. A. and M. N. Brewster, and there is a coloured frontispiece. The publishers are Dymock's, Sydney, and the price is 7/6.—EDITOR.

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A REVIEW OF THE SPECIES *PTEROSTYLIS PARVIFLORA*  
R.Br. (ORCHIDACEAE).

By the REV. H. M. R. RUPP, Northbridge, N.S.W.

*Pterostylis parviflora* is a polymorphic species found in all States of the Commonwealth except Western Australia, but in Queensland it is apparently confined to the extreme south. It exhibits great variability in respect of dimensions (of the plant), leaf-development, and flowering period; but only slight and relatively unimportant variations occur in the morphology of the flower. The present writer follows Fitzgerald (Austr. Orch., 1, 7) and Ewart (Proc. Roy. Soc. Vict., September, 1911) in regarding Lindley's *P. aphylla* as conspecific with *P. parviflora*, and agrees further with Ewart in his opinion that it can scarcely be said to merit even varietal rank. Bentham (Fl. Austr., VI., p. 361) and Hooker f. (Fl. Tasm., 22) retained Lindley's species; but the features by which they distinguished it occur quite frequently in forms which could not on any grounds be separated from Robert Brown's plant. The following observations are based upon prolonged study of numerous specimens from various localities in New South Wales, Victoria, Tasmania, and South Australia. Many have been examined in the living state, and others are in the National Herbarium at Sydney and in my own collection.

It may be said at once that Lindley's name, *aphylla*, if it was intended to mark the outstanding distinction between his species and Brown's, was not a happy choice; for practically all the various forms of *P. parviflora* appear to be leafless (except for stem-bracts) at some stage of their development. Bentham, l.c., cites Archer and Stuart as describing *P. aphylla* "with the same foliage" (as *P. parviflora*), "but with the radical tufts entirely gone at the time of flowering." This would seem to imply that the radical leaves are developed before the flowering season; yet in a group of specimens in Archer's collection at the Sydney National Herbarium, two plants have small basal rosettes just developing. Many specimens (agreeing well with Archer's) from mainland localities, have these incipient rosettes, suggesting development after, not before, flowering. No doubt under favourable conditions they might persist until just before the next flowering season. But the presence or absence of a basal rosette or cluster of leaves at flowering-time probably depends largely upon the

climatic and weather conditions under which the plant is growing. Casual observations of *P. parviflora* over a wide range of localities would lead one to suppose it to be inexplicably erratic in this matter. In nearly all the groups of specimens examined from 25 different localities, some plants are quite devoid of basal leaves, while others have either an incipient or a well-developed rosette. Such leaves are very rarely found attached to the flowering-stem itself, but develop on short branches attached to its base.

Bentham, following Stuart, remarks upon the peculiar manner in which the flowers of *P. aphylla* "front each other," and states that he could see no trace of this in *P. parviflora*. Even allowing for the fact that he had only a limited number of specimens (all dried) available, I find it difficult to understand his statement; for it is characteristic of all the forms of *P. parviflora* I have ever seen, that the flowers are turned towards the axis of the stem; which, of course, means that whenever they are set close together, they face one another. Fitzgerald's plate, l.c., makes this quite clear.

Hooker says that the galea of *P. parviflora* is longer and more deflexed than in *P. aphylla*, and that the petals are longer and more acuminate. These features appear to me to afford a better ground for distinction than the presence or absence of basal leaves; but they are inconstant, and after all are not in themselves of much importance. A relatively long galea and acuminate petals appear to be chiefly associated with very slender forms of the plant, the more robust forms usually having these segments shorter and blunter. This, however, cannot be stated as a definite rule. Sometimes the petals are merely acute, and occasionally they are actually longer than the dorsal sepal.

The form which is commonly recognised as representing Lindley's *P. aphylla*, is found chiefly on high country. It is usually a dwarf plant, but may attain a height of 18 cm., and is relatively robust, with 1-3 flowers, most frequently red-brown in colour. A remarkable form occurs in boggy places about Mount Irvine, in the Blue Mountains of N.S.W. It is suggestive of a "giant" of the plant just referred to, except that the flowers are quite green. It attains a height of 32 cm., and bears from 3-5 flowers. It is fairly robust, and quite leafless, except in a few instances, where an incipient basal cluster could be detected. Still more remarkable, perhaps, is a giant form from north-east

Victoria. Two robust specimens in my herbarium are just short of 40 cm. in height. One, with six flowers, has a well-developed basal rosette of ovate leaves; the other, with 7 flowers, has four similar rosettes clustered at its base. Such specimens are in striking contrast to the others with extremely attenuated stems, sometimes no more than five cm. high, with a solitary flower. The slender forms, however, often exceed 30 cm.

The flowers of *P. parviflora*, as the name implies, are small—the smallest in the genus, but closely followed in this respect by *P. daintreana* F. Muell. (N.S.W. and South Queensland) and *P. allantoidea* Rogers (W.A.). They vary in colour from bright green through darker shades to a rich red-brown, the latter being chiefly (but not invariably) found on highlands. Flowers of tall and robust forms are not necessarily larger than those of dwarf forms. The flowering stems are furnished with from one to four bracts below the inflorescence; these are usually small and loosely sheathing, but occasionally they are almost free from the stem and expanded into the semblance of genuine leaves.

Fitzgerald gives March as the flowering season; but in different localities I have personally collected flowers in every month except July, August, September, and October. As a general rule, however, one is more likely to find it in bloom during the autumn than at other periods. In New South Wales it is fairly common along the coastal belt, but extends across the main Dividing Range at least as far west as Mudgee.

Following is a list of specimens examined for the purposes of this paper:—

*New South Wales*.—Brunswick Heads (Fordham), Barrington Tops (Rupp), Maitland (Davis), Weston (Rupp), Hornsby (Blakely), Brighton-le-Sands (Fletcher), Braidwood district (Boorman), Capertee (Rupp), Mount Irvine (Scrivener), Mudgee (Collie), Ryde (Messmer and Rupp).

*Victoria*.—Rushworth (Rich), North-east District (Nicholls), Buninyong (Rupp), Brisbane Ranges (Nicholls), Cheltenham (Walter), Black Rock (Coleman), Oakleigh (French).

*Tasmania*.—Bellerive (Lucas), Hobart (Rodway), Unspecified Locality (Archer), Ida Bay (Rodway), Penguin (Atkinson), Rocky Cape (Perrin and Messmer).

*South Australia*.—Mount Compass. (Rogers).

THE COMMON BUSH OR DOG TICK  
(*IXODES HOLOCYCLUS*)

By E. H. ZECK.

Following on the discussion which took place at a recent lecture, the facts recorded below are given for the information of members of the Society.

Firstly, it may be stated that the common "bush" or "dog" tick is not an insect. In the scheme of animal classification, it is included in the class *Arachnida*, which is one of the classes or groups of animal forms placed in the phylum (1) *Arthropoda*. The phylum *Arthropoda* contains the largest number of described animal forms, and the most important groups or subdivisions included in it are:—

1.—The class *Crustacea*, which includes the crayfishes, crabs, prawns, wood-lice or slaters, waterfleas, etc.

2.—Class *Onychophora*, including the primitive caterpillar-like *Peripatus*.

3.—The class *Myriopoda*, including the centipedes, millipedes, fortylegs, etc.

4.—The class *Insecta*, which includes such forms as cockroaches, grasshoppers, butterflies, wasps and ants, beetles, etc. In this class the animal's body is divided into three well-defined regions—the head, thorax and abdomen. They have three pairs of legs and may possess one or two pairs of wings or may be wingless.

5.—The class *Arachnida* includes the spiders, scorpions, ticks, mites, etc. In this class the animal's body is divided into two main regions, an anterior or front region (the cephalothorax), which represents the head and thorax fused together, and a posterior or hind part, the abdomen. They are not winged and most species in their adult stage possess eight legs.

The various classes are further divided into orders, suborders, families, genera and species. Taking the class *Arachnida* as an example, we find it is divided into a number of orders or groups, and that one of the orders—the *Acarina*, is divided into a number of suborders, the ticks being included in the suborder *Mesostigmata*, a group in

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(1) A phylum is a group of animal organisms which have characters in common with each other, and are considered to have descended from a common ancestral form.

which the spiracles or breathing pores, "stigmata," are situated near the middle of the body.

This suborder is further divided into some four families and those animals referred to as the "hard-bodied ticks" (2), such as the common "dog tick," are placed in the family *Ixodidae*. The family *Ixodidae* includes nine genera and is not a large one in the number of species, as it contains only some 300 described forms from the whole of the world. Of the genus *Ixodes*, Nuttall and Warburton (1911), list some 48 species and a number of varieties for the world, and Taylor and Murray (1946) list some 14 species as occurring in Australia.

The body of an ixodid tick is divided into a small forepart or false head (the capitulum) which carries the mouth parts, and a posterior or hindpart (body) which bears the legs. On the upper surface of the body is to be seen the characteristic dorsal shield (the scutum) which in the male tick covers most of the upper surface, and in the unengorged female about the front third or less. Only two spiracles, or breathing pores are present, and these are only found in the nymphal (second stage) and adult ticks. They are to be seen one on each side of the body, just behind the insertion of the fourth pair of legs.

No eyes are present in *Ixodes*, but in those genera in which they occur they appear as a single facet, one on each side margin of the dorsal shield. In the development of an ixodid tick, after hatching from the egg, there are three stages—the larval, nymphal, and adult.

The development and habits of the common "dog" tick and the tick paralysis caused by it have been extensively investigated over a period of years, by various research workers, amongst whom may be mentioned, Ross (1924, 1926, 1935), and Oxe and Ricardo (1942). The pathological conditions produced in man are reviewed and discussed by Murray (1946).

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(2) As an example of the soft-bodied ticks, the common introduced fowl tick, *Argas persicus* (family *Argasidae*), found in this State, mainly in the dry western districts, may be mentioned. Except when in their six-legged larval stage, in which they may remain attached to a bird for a few days, these ticks do not remain on their host, but feed intermittently at night and hide by day. Their eggs are laid in the cracks and crevices where they shelter. The *Argasidae* have no scutum.



Briefly, the life-history of the common dog tick, *Ixodes holocyclus*, which was described by Neumann in 1899, has been found to be as follows: It is a three-host tick (3)—that is, it drops off the particular host animal upon which it has been feeding to cast its skin at each stage of its metamorphosis, and for egg-laying. It is a blood-sucking parasite and is capable of causing tick paralysis in man and other animals. The eggs are laid by a mated and engorged female, in a group in the surface soil, or under leaves, etc., and these, on hatching, give rise to the first stage or larval ticks.

The first stage or larval ticks, which emerge from the eggs, are hexapods, and, therefore, have six legs. They have no spiracles or breathing pores. These young ticks, often known popularly as "seed ticks," leave the ground where they hatched and after about seven days scatter about, and climb up to the top of some plant or other object to wait for a passing host animal. If disturbed or shaken, these ticks immediately extend their front legs away from their bodies, holding them in the air. Here, it may be mentioned, that in the *Ixodidae* there is a special sensory structure, known as "Haller's organ," which is situated on the upper surface of the last segment of the front legs, and this is believed to be an organ of smell.

The larval ticks, on becoming attached to a host, engorge on blood for four to six days and then drop off their host to the ground and become quiescent. After 19 to 41 days the second stage or nymphal tick emerges from the larval skin.

The second stage or nymphal tick acquires an additional pair of legs and is an octopod. It has eight legs. After hardening, in about seven days, it crawls up from the ground, as did the larvae, to await a passing host. On becoming attached it feeds on the blood of the host for about four to seven days, and then drops off and crawls into the soil to seek shelter, and there remains quiescent,

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(3) The Queensland cattle tick, *Boophilus microplus*, which transmits red water fever to cattle, may be mentioned as a one-host tick—that is, it does not leave its host animal to cast its larval and nymphal skins and mating of the ticks occurs on the host animal. The females only leave their host to lay their eggs in or on the ground, and the larvae on hatching, crawl up to await a passing host, as do the larvae of the "dog" tick.

until, after a period varying from 21 to 71 days, emerges from its nymphal skin as an adult.

The adult tick, which also has eight legs, hardens in about seven days. Mating takes place, and the females crawl up from the ground, as did the larvae and nymphs, to await a host. On becoming attached it engorges in from six to 21 days, until it becomes many times its former size, and then drops off to the ground to deposit its eggs, after which it shrivels and dies.

Egg-laying usually begins 11 to 20 days after leaving the host and may last from 16 to 34 days. The number of eggs laid by an individual female being about 1,800 to 2,500.

The adult males are rarely found on animal hosts, and have never been found attached or showing signs of engorgement.

Ross found that all stages were soon killed by desiccation. Ozer and Ricardo, in their investigations, found that unfed larvae and nymphs survived, and were active, after a period of 162 and 275 days respectively, and that most of a batch of larvae were active after immersion in water for 36 days. They also found that the average length of the life-cycle was about 240 days, but that the complete life-cycle can occupy 741 days, or possibly more, and also that the larvae as well as the nymphs and adults were toxic to animals, but greater numbers were required to produce paralysis. Ross records that a single tick (adult) may cause fatal paralysis in man and other animals, but that not all ticks produce paralysis. He did not find the symptoms of paralysis to occur in less than five days from the time the tick or ticks attached themselves to a dog.

In New South Wales, *Ixodes holocyclus* occurs throughout most of the coastal regions, where its main natural host is the small marsupial, *Perameles nasuta*, popularly known as the "long-nosed bandicoot."

During the summer of 1945, the writer removed 63 nymphal ticks, in various stages of engorgement, and one unengorged nymph from the body of a young bandicoot found at Ryde. Two nymphal ticks were also found attached to the ear of a long-tailed or black rat, *Rattus rattus*, trapped in the open at Ryde, by the writer, on 15/8/1931, and a fully-engorged female tick has also been removed from near a fowl's eye in the same district. The bird appeared not to be affected.

As ticks drop off their host animal when replete with blood, and this may occur at varying intervals of time during the wanderings of the animal, many ticks that fall from an animal having no fixed habitat must perish. The numerous progeny of any one individual female, however, is a means of securing their survival in nature, despite their difficulties in becoming attached to an animal host.

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- Taylor, F. H., and Murray, R. E., 1946.—Spiders, ticks and mites. (Descriptive and clinical.) Service Publication No. 6. School Public Health and Tropical Medicine. (University of Sydney).

## NOTICES.

Members are reminded of Rule 4 of the Society which reads: "All subscriptions shall become due on the first day of August and shall be payable in advance."

The Society's gum-leaf Badge may be obtained from the Hon. Secretary or the Hon. Assistant Secretary. Price, 2/- (postage and package extra).

## NATIVE.

In gracious park and garden  
 the slim adopted trees  
 shed their leaves gently,  
 to a fosterland's decrees.

Pencil-straight or spreading  
 symmetrically wide,  
 they pleasure the eye, leaving  
 the brain unsatisfied.

Pleasure the eye and leave  
 the heart unsatisfied  
 for strong rebellious branches  
 that every form defied.

Somewhere a ragged pattern  
 leaf-scratched on blue . . .  
 from limbs fire-scarred, storm-rent,  
 beauty that breaks anew.

Twisted boughs wrinkle  
 at knee and elbow turn;  
 rock-clasping roots, tenacious,  
 no kinder homing learn

yet foot a giant who takes  
 his colour from the sun,  
 a warrior-tree in pride  
 of many a battle won.

Somewhere a ragged pattern  
 leaf-scratched on blue . . .  
 not for lips' shaping  
 what message the winds construe

or why this force has baffled  
 fire and drought and dearth:  
 those roots draw nourishment  
 from rock instead of earth.

—GINA BALLANTYNE.

(First published: "Meanjin Papers.")

## THE SURVIVAL OF THE FITTEST.

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(Communicated by Mrs. Rudder.)

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By C. GARLING, Inverell.

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We were camped on the Western Plains, close to a very large meat-ants' nest. They very soon became a great source of annoyance by making inroads to our meat-safe, jam, honey, sugar; in fact, there was very little they did not attack.

After we were there a couple of weeks small black ants disputed the meat-ants' priority right. After a few days' skirmishing the meat-ants were for the time victorious. The black brothers, suffering very heavy losses, broke off the engagement and retreated. I thought that had ended the dispute. This was not so, for I noticed the meat-ants had sentries stationed all around their nest a little distance from it; and woe betide any little black ant they came in contact with. It was promptly snapped in two. The sentries were always on a clear patch of ground, where they had a clear view all round. They seemed very excited and held themselves erect, head in the air, and on sight of a black ant quickly pounced upon it. They evidently expected trouble.

I happened to be down the road that led from the scene of the battle. There I saw an army of black ants marching to the attack. The mass was about three feet wide and fifty yards long. About two hundred yards further down was another similar army. When the first army arrived on the battlefield a "ding-dong" battle started. For a couple of days the meat-ants were victorious. The black ants took their dead off the field of battle, and placed the wounded in a safe place, under cover and out of the sun. Then the second army arrived and was thrown into battle. I could see the meat-ants were losing morale, and started taking their eggs and young away to another nest, whilst others climbed trees and placed their charge in the hollow limbs. The fight continued viciously for some time. Then the new army drove a spear-head right across the nest. It was shaped like the letter V. The form of attack was: A little black ant grabbed a leg of its enemy, while another caught hold of an opposite leg, preventing a meat-ant getting hold of either, while more little fellows climbed up

and bit all, or nearly all, the legs off, and sometimes bit the body nearly in two. They then left it and went for the next enemy. The meat-ants retired to the entrance of the nest and crowded in the hole with all their heads together, which prevented the black ants from going below. Any that made the attempt were severely dealt with. This went on for a few days when the black ants went away from the entry and tunnelled underneath the bigger ones. It was too dark to see any more then, but next morning they had the defenders' legs bitten off, and there was not one sound meat-ant left on the field. The victors rested for a few days; and later followed the retreating army. They attacked and drove them from nest to nest for fully half a mile. Heavy rain intervened and quelled their blood lust.

I visited the scene two years later and found the black ants had full possession of all the conquered country.

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ERNST BETCHE.

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*An Account of His Career.*

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By EDWIN CHEEL.

In the Report of the Botanic Gardens, Sydney, p. 14 (1913), by the late J. H. Maiden, is an account of the death of Mr. Ernst Betche. It states: "He was joint author with Mr. Moore, of the 'Handbook of the Flora of New South Wales,' published in 1893, and co-operated with me in making investigations into the flora of New South Wales under the title of 'Notes from the Botanic Gardens, Sydney,' which were published in the Linnean Society of New South Wales." In the Journal and Proceedings of the Royal Society of New South Wales, Vol. LV. (1921), 153, a further reference by Mr. Maiden is made as follows: "After his death there was published the 'Census of New South Wales Plants' (in 1916), a work on which he and I had been engaged for many years."

The brief statement made in Mr. Maiden's reports states that the late Mr. Betche was born on December 31, 1851, and that he first served in the Horticultural College at Potsdam Municipal Garden at Berlin. In the year 1874 he was a volunteer gardener in the celebrated establishment of Von Houtte, of Ghent, Belgium.

In the year 1880 he left Cardiff, Wales, for Samoa, and thence to Tonga and the Marshall and Caroline Islands. He left Samoa for Cooktown, Queensland, and arrived in Sydney, New South Wales, in 1881.

Although two papers published by Mr. Betche in 1881 are mentioned by Mr. Maiden, it is not generally known that he became a naturalised citizen of New South Wales, the Certificate of Naturalisation (No. 192), dated 28/8/94, being signed by the Governor, Lord Jersey.

The two papers published by Ernst Betche in the year 1881 were on certain plants which he had observed in Samoa, Tonga, Marshall and Caroline Islands. Some of the plants which he had collected had not previously been described and were named in his honour. They are as follows:—

*Aglaiia Betchei* C.D.C. (*Meliaceae*).  
Apia, Samoa Island.

*Philostelma Betchei* Schlecht.  
See Engler Bot. Jahrb., Vol. 42 (1908), 16.

*Corysanthes Betchei* F. v. M. (*Orchidaceae*). Upulo.

*Bulbophyllum Betchei* F. v. M. (*Orchidaceae*).  
Apia, Samoa Island.

*Betchea papuana* (Pulle) Schlecht. (*Cunoniaceae*).  
See Pulle in Lorentz Nova Guinea, VIII., p.  
640, and Engler Bot. Jahrb., Band LII. (52), pp.  
146-151 (1914).

*Betchea australiensis* Schlecht.

According to Mr. C. T. White (Government Botanist of Queensland), the latter species is an *Ackama* and has been transferred to the genus as *Ackama australiensis* C.T.W., nov. comb., *vide* Proc. Roy. Soc. Qld. (1936), 10.

It is interesting to note that Bentham (*Flora Australiensis*, Vol. II., p. 444 (1864), records one species—*Ackama Muelleri*, from the Hastings and Clarence Rivers, New South Wales. This species was first described under the name *Weinmannia paniculata* by Mueller (*Fragmenta* ii., p. 83, 1860-61), and afterwards altered to *W. paniculosa*, l.c., 175. The latter name was followed in Moore & Betche (1893, p. 179), with *Ackama Muelleri* quoted as a synonym. The localities cited are brush forests from Gosford to Queensland.

In Maiden & Betche's Census (1916, p. 88), Allen

Cunningham's name *Ackama* (1839) is adopted and a new variety is listed which was described by Maiden & Betche (1912) under the name *Ackama Muelleri* Benth., var. *hirsuta*. This new variety is quite common in the Dorrigo district and, according to Maiden & Betche, l.c., "is apparently the form mentioned by Mueller in *Fragm.* VI., p. 188, from Camden Haven, Macleay River and Bellinger River." In the year 1926, when I was on a visit to Bellingen and the Dorrigo townships, I saw some fine specimens of trees in full flower, the branches clothed with clusters of very compound panicles of numerous small florets (not racemes as in *Weinmannia*) which, as stated by Bentham, l.c., "distinguishes *Ackama* as a distinct genus from the former. Then we have a statement published by Mr. C. T. White (1936, p. 10): "If we accept Schlechter's view of the genus *Ackama*, it is at present confined to four species—two, or perhaps three, in Australia, and one in New Zealand. As regards the North Queensland plant named by Schlechter as *Betchea australiensis*, and later by White & Francis as *Ackama quadrivalvis*, I may say it does not appear to me to be more than specifically distinct from *A. (ckama) paniculata* (F. v. M.) Engl. of Southern Queensland and Northern New South Wales."

Four additional species of plants have been named to commemorate the name of Ernst Betche—namely, *Betchea fulva* Schl., *B. myriantha* Schl., and *Betchea rufa* Schl., and also *Oncinocalyx Betchei* F. v. M. (Family *Verbenaceae*).

In the year 1887, the late Mr. Ernst Betche submitted a proposition to Mr. Charles Moore (Director of the Botanic Gardens, Sydney), that a Flora of New South Wales should be published. The proposals outlined by Mr. Betche were as follows:—

- (1) An introduction.
- (2) A glossary.
- (3) Explanation of abbreviations and technical terms.
- (4) Explanation of abbreviations of authors' names.
- (5) Conspectus of orders.
- (6) Systematic description of indigenous plants, orders, genera and species.
- (7) Supplementary system of enumeration of naturalised plants.
- (8) General index.



In "The Handbook of the Flora of New South Wales" is the first general description of the flowering plants and ferns of this State. It was published in the year 1893 and included a general sketch of the earlier botanical workers in New South Wales, with special reference to Baron von Mueller, Rev. Dr. Woolls, R. D. Fitzgerald, and Ernst Betche, who was an employee of the Botanic Gardens, Sydney, under Mr. Charles Moore.

The works of Robert Brown, Baron von Mueller and George Bentham, being of a comprehensive nature, were confined to a few of the principal libraries in the State, so that there was no other work available for public use except that of Woolls (1880) and Moore (1884) which contained the names and authorities of the plants only.

In April, 1907, a proposition was made by Mr. Betche to Mr. J. H. Maiden that a compilation of Australian ferns be arranged according to the system of classification in Christensen's Index Filicum (1906). A note was addressed by Mr. Maiden, 24/12/08, asking what was done in connection with the fern proposal. Mr. Betche replied that he had no time in office hours to complete the work on ferns. However, the list of names of ferns was completed by Mr. Betche, who, in November, 1910, submitted a proposal to Mr. Maiden that a second edition of the Flora of New South Wales should be published, and that the publication of "A Census of New South Wales Plants" should be postponed. Mr. Maiden replied that he did not wish to take an active part in a proposed revised edition of the "Flora of New South Wales" and that he (Mr. Betche) should get out the Census as early as possible. (See Memoranda in Mitchell Library.) The ferns referred to above are included in the Census (1916), pp. 1-8.

A "Key to the New South Wales Genera and Species of *Goodeniaceae*," by Mr. Betche, was published in the "Australian Naturalist," Vol. II., Part 12, October, 1912.

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## NATURALISTS' SOCIETY OF NEW SOUTH WALES.

*Proceedings.*

AUGUST, 1944.

The annual meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, August 1, 1944, at 7.30 p.m.

Mr. E. A. Breakwell, of the Department of Education, was in the chair. The President (Mr. A. E. Watson), and about 80 members and visitors were present.

New Member.—Master Peter Smith was unanimously elected a member of the Society.

Nomination of Members.—Mrs. M. Morris, 13 Findlay Avenue, Roseville. Nominated by Miss Deasey, seconded by Mr. J. Powell. Miss F. D. Herry, Folkestone, 26 Lavender Street, Lavender Bay. Nominated by Miss Watts, seconded by Miss N. Luckie. Mr. J. R. Leslie, 59 Prospect Road, Summer Hill. Nominated by Mr. E. H. Zeck, seconded by Mr. A. E. Watson. Mr. E. A. Breakwell. Nominated by Mrs. Watson, seconded by Mr. Watson. Master Neville Shearman, 915 Botany Road, Mascot. Nominated by Mr. Deed, seconded by Mr. Watson.

Secretary's Report.—The report of the activities of the Society was presented by the Hon. Secretary (Miss D. Dobbin).

Treasurer's Report.—The report and balance sheet of the Hon. Treasurer (Mrs. R. J. Watson), was presented to the Society and received as correct.

Election of Office-Bearers for the year 1944-1945:—

President: Mr. A. E. Watson.

Vice-Presidents: Messrs. F. J. Ludowici, E. H. Zeck, and A. E. Hamilton.

Hon. Treasurer: Mrs. R. J. Watson.

Hon. Assistant Treasurer: Miss D. Ross.

Hon. Secretary: Miss D. Dobbin.

Hon. Assistant Secretary: Mrs. R. J. Watson.

Hon. Editor: Mr. E. H. Zeck.

Hon. Lanternist: Mr. G. White.

Hon. Librarian: Mr. A. Booth.

Hon. Assistant Librarian: Miss D. Booth.

Other Members of Council: Misses T. Y. Harris, M. Davidson, N. Luckie, G. Ballantyne, Messrs. C. S. Ashley, E. S. Davies, J. W. Hawley, J. Powell, and S. T. Turner.

Publication Committee.—The President, Hon. Editor, and Hon. Secretary.

Address.—Mr. S. T. Turner delivered an address, entitled, "Some Beautiful Australian Trees," which was illustrated with numerous lantern slides. Mr. Turner also exhibited, on behalf of Miss T. Y. Harris, a number of coloured lantern slides, which had been prepared by Mr. Reeves, of Melbourne.

Exhibition of Specimens.—At the conclusion of the business of the meeting, members inspected the exhibits, which included paintings of orchids by the late Adam Forster, loaned by Mrs. McGregor, coloured illustrations of South Australian wild flowers, specimens of minerals, beetles, butterflies, native flowers, and a collection of pressed West Australian wild flowers, which had been preserved for more than 60 years.

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#### SEPTEMBER, 1944.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, September 5, 1944, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 40 members and visitors present.

Election of Members.—Mrs. M. Morris, Miss F. D. Herry, Mr. J. R. Leslie, Mr. E. A. Breakwell, and Master N. Shearman were unanimously elected members of the Society.

Nomination of Members.—Mr. and Mrs. S. C. Noake, 56 Burns Bay Road, Lane Cove. Nominated by Mr. E. S. Davies, seconded by Miss Dobbin. Mrs. Box, The Dorchester, Illuka Road, Rose Bay. Mrs. Menzies, 6a The Boulevard, Strathfield. Nominated by Miss Marshall, seconded by Miss N. Luckie.

Lecture.—Mr. A. R. Penfold, F. A. C. I., F. C. S., Curator of the Technological Museum, delivered an address, entitled, "The Jekyll and Hyde amongst the Oil-yielding Eucalypts." In his address he dealt with *Eucalyptus dives*, from which two different oils—commercial and medicinal—were obtained. He also briefly discussed the history of the production of oil from eucalypts in Australia, and the growth of the industry during the past few years. The lecture was illustrated with samples of the oils and by-products.

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#### OCTOBER, 1944.

The ordinary monthly meeting of the Society was held

in the Assembly Hall, Department of Education, on Tuesday, October 3, 1944, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 50 members and visitors present.

Election of Members.—Mr. and Mrs. S. C. Noake, Mrs. Box, and Mrs. Menzies were unanimously elected members of the Society.

Lecture.—Mr. N. L. Roberts, President of the Royal Zoological Society of New South Wales, delivered an address, entitled, "Mother Nature's Children." The lecture was illustrated with numerous lantern slides, which had been prepared by Mr. Roberts, and a number which had been lent by Mr. Keith Hindwood.

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#### NOVEMBER, 1944.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, November 7, 1944, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 70 members and visitors present.

Nomination of Members.—Miss Reid, Gardiners Road Public School. Nominated by Mr. Deed, seconded by Mrs. Watson. Miss D. Davies, Girls' Industrial School, Parramatta. Nominated by Mr. Davies, seconded by Mr. Watson. Miss H. Perichon, 45 Darley Street, Randwick. Nominated by Mrs. Box, seconded by Mr. Davies. Mr. W. H. Tynan, Commonwealth Bank, Sydney. Nominated by Miss Dobbin, seconded by Mr. Watson. Mr. G. H. Beswick, 109 Elizabeth Street, Sydney. Nominated by Miss Dobbin, seconded by Mr. Watson.

Lecture.—Miss T. Y. Harris, B.Sc., delivered an address, entitled, "Some Beautiful Australian Plants." The lecture was illustrated with numerous coloured lantern slides.

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#### DECEMBER, 1944.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, December 5, 1944, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 50 members and visitors present.

Election of Members.—Miss Reid, Miss D. Davies, Miss H. Perichon, Mr. H. W. Tynan, and Mr. G. H. Beswick were unanimously elected members of the Society.

Nomination of Members.—Miss G. Marshall, Sydney Hospital and Sanitarium, Wahroonga. Nominated by Mrs. Morris, seconded by Miss Luckie. Mrs. Boyce, Babcock and

Wilcox, Regents Park. Nominated by Miss Dobbin, seconded by Miss Luckie.

Lecture.—Mr. P. W. Gledhill, President of the Manly Historical Society, delivered an address, entitled, "Ramblings of a Naturalist." The lecture was illustrated with lantern slides.

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FEBRUARY, 1945.

The ordinary monthly meeting of the Society, by courtesy of the Vacuum Oil Co. Pty., Ltd., was held on February 6, 1945, in their Theatre, Kembla Building, Margaret Street. Films illustrating Central Australia, the Barrier Reef, and a trip on a tanker to Sumatra, where the company's large oil wells were situated, were shown to members.

The President (Mr. A. E. Watson), and about 86 members and visitors were present.

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MARCH, 1945.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, March 6, 1945, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 40 members and visitors present.

Election of Members.—Mr. C. E. Chadwick, Royal Hotel, Wollongong, was unanimously elected a member of the Society.

Nomination of Members.—Mr. A. Searl, 24 Mulgeria Street, Northbridge. Nominated by Mr. Zeck, seconded by Miss Dobbin. Mrs. W. Campbell, 22 Madeline Street, Hunter's Hill. Nominated by Mr. Rupp, seconded by Mrs. Messmer.

Lecture.—Mr. H. Hazelwood delivered an address, entitled, "Starvation Signals." The address was illustrated with lantern slides, many of which were coloured. Many views of Kew Gardens, England, were shown.

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APRIL, 1945.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, April 3, 1945, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 40 members and visitors present.

Election of Members.—Mrs. W. Campbell and Mr. A. Searl were unanimously elected members of the Society.

Nomination of Members.—Miss N. Dagg, 28 Monmouth

Street, Randwick. Nominated by Mrs. Morris, seconded by Miss Dobbin.

Lecture.—Mr. C. P. Hughes, General Secretary of the Australian Inland Mission, delivered a lantern lecture, entitled, "Australian Rainfall, Rivers, and Population Potentialities."

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MAY, 1945.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on May 1, 1945, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 50 members and visitors present.

Election of Members.—Miss N. Dagg was unanimously elected a member of the Society.

Discussion.—The matter of the Society becoming an affiliated member of the Forestry Advisory Council was discussed, and a resolution was moved and carried, that the Society become a member of the Council, paying an annual subscription of £2/2/-.

Lecture.—Mr. Tom Iredale, F.R.Z.S., formerly Conchologist to the Australian Museum, delivered an address, entitled, "Old Museums." The lecture was illustrated with lantern slides.

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JUNE, 1945.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, June 5, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 50 members and visitors present.

Nomination of Members.—Mr. Campbell, Hunter's Hill. Nominated by Mr. Watson, seconded by Miss Dobbin.

Froggatt Memorial Lecture.—Mr. John L. Froggatt, B.Sc., delivered the Froggatt memorial lecture, which was entitled "Notes on New Guinea." Mr. Froggatt discussed the mandated territory and islands of New Guinea, and spoke of the customs, agriculture and prospects in New Guinea.

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JULY, 1945.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, July 3, 1945, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 50 members and visitors present.

Election of Members.—Mr. Campbell was unanimously elected a member of the Society.

Nomination of Members.—Mrs. A. Smith, Box 28, Post Office, Auburn. Nominated by Mrs. Watson, seconded by Mr. Watson.

Study Meetings.—The President asked members to consider the advisability of again commencing the mid-monthly afternoon meetings for study purposes.

Lecture.—Miss Marie Byles, B.A., LL.B., delivered an address, entitled, "Exploring Among New Zealand Mountains." The address was illustrated with numerous lantern slides.

#### AUGUST, 1945.

The annual meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, August 7, 1945, at 7.30 p.m.

Owing to the absence of an officer of the Department of Education, who was unable to attend the meeting, the President (Mr. A. E. Watson) occupied the chair. About 60 members and visitors were present.

Election of Members.—Mrs. A. Smith was unanimously elected a member of the Society.

Nomination of Members.—Mr. and Mrs. C. E. Noakes, Windsor Road, Northmead. Nominated by Mr. Booth, seconded by Miss Booth. Miss A. M. Rainbow, Lady Davidson Home, Turramurra. Nominated by Mrs. Morris, seconded by Mr. Hamilton. Miss E. Wheeler, Station Street, Arncliffe. Nominated by Miss Ross, seconded by Miss Deasey.

Secretary's Report.—The report of the activities of the Society was presented by the Hon. Secretary (Miss D. Dobbin).

Treasurer's Report.—The report and balance sheet of the Hon. Treasurer (Mrs. R. J. Watson) was presented to the Society and received as correct.

Election of office-bearers for the year 1945-1946:—

President: Mr. A. E. Watson.

Vice-Presidents: Messrs. F. J. Ludowici, E. H. Zeck, and A. E. Hamilton.

Hon. Treasurer: Mrs. R. J. Watson.

Hon. Assistant Treasurer: Miss D. Ross.

Hon. Secretary: Miss Dolce Dobbin.

Hon. Assistant Secretary: Mrs. R. J. Watson.

Hon. Editor: Mr. E. H. Zeck.

Hon. Lanternist: Mr. A. Searl.

Hon. Assistant Lanternist: Miss Gina Ballantyne.

Hon. Librarian: Miss M. Quinn.

Hon. Assistant Librarian: Miss M. Davidson.

Other Members of Council: Messrs. J. Powell, S. T. Turner, C. S. Ashley, J. W. Hawley, A. Booth, E. S. Davies, Mesdames M. Morris, L. Powell, P. Messmer, B. Welch, Misses J. Geddes, N. Jefferson, and Boulter.

Publication Committee: The President, Hon. Editor, and Hon. Secretary.

Natural History Advisers.—Botany: Miss T. Y. Harris; Entomology: E. H. Zeck.

Address.—Mr. J. D. Tipper delivered an address, entitled, "The Romance of Muogamarra." The lecture was illustrated with numerous lantern slides.

Exhibition of Specimens.—At the conclusion of the business of the meeting members inspected the varied exhibits, which included specimens of shells, medicinal herbs growing in pots, pressed botanical specimens, specimens of beetles and butterflies, and a collection of insect pests of vegetables, loaned by the Department of Agriculture. Mr. J. Powell's prize of £1 for the best junior member's nature study exhibit was divided between Master Peter Smith and Master Glen Joyce.

#### SEPTEMBER, 1945.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, September 4, 1945, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 45 members and visitors present.

Election of Members.—Mr. and Mrs. C. E. Noakes, Miss A. M. Rainbow, and Miss E. Wheeler were unanimously elected members of the Society.

Alteration to Rules.—The amendment to Rule 8 of the Society, moved and seconded at the annual meeting, was confirmed by members.

Rule 8 was amended to read:—

The Council shall consist of a President, three Vice-Presidents, Hon. Treasurer, Hon. Assistant Treasurer, Hon. Secretary, Hon. Assistant Secretary, Hon. Editor, Hon. Librarian, Hon. Assistant Librarian, Hon. Lanternist, Hon. Assistant Lanternist, and 15 other members as hereinafter provided—also Natural History Advisers as considered necessary. At all meetings of the Council 10 shall form a quorum.

Lecture.—The Rev. H. M. R. Rupp, B.A., delivered an address, entitled, "In Search of Orchids." The lecture was illustrated with epidiastope pictures.



# The Australian Naturalist

Vol. XI.

MAY, 1948.

Part 7.

## NATURE—AND MAN.

Froggatt Memorial Lecture, 1946.

By KEITH C. MCKEOWN, F.R.Z.S.

The roots of a love of nature lie deep in the human mind, and these roots are as varied as the world they explore and by which they live. This nature love may arise in the beginning from a simple interest in the things that we see constantly about us; or from a desire to know more of the strange lives and still stranger habits of the myriad living things that share this world with us, and without which we ourselves could not exist; or its birth may lie in a search for and appreciation of beauty in whatever form it may be found. We may follow this interest in nature—the study, if you will—as a release from the trials and worries of the present-day world, and the unnatural way of life to which necessity forces us to conform; or it may be followed purely as a hobby—a means of filling in spare time. Such beginnings may lead to the growth of more scientific ideas and methods in our study, and we may even follow the guiding light into the professional field where, unless a breadth of interest is retained, there is a tendency to become lost in the maze of technicality. It was to the professional field that a love of nature led Walter Wilson Froggatt, but he never permitted it to obscure his great humanity and his other wide interests. Provided the search does not become wholly mundane, we can still recapture the real love, and thrill again with the discovery of new strangenesses, new wonder, and new beauty in this world of ours.

To-day, love of nature has been somewhat overloaded, perhaps, by the rather forbidding name of "Nature Study," under which its old freedom has been cramped, and it has become a "lesson" to be taught in the schools, in company with arithmetic, algebra, euclid, and their fellows. The old natural history has become "Natural Science" or biology.

And, it is possible, by this change, the younger generations have lost more than they have gained. Training in an appreciation of nature seems to have become as important in modern life as art and music. But, unfortunately, too often, the training denegerates into one of mere method; it becomes too stereotyped, and confined to a bare statement of essential facts—the complete story is told, the lesson is considered finished, and the teacher passes on to the next stage. The element of wonder is jettisoned or forgotten. The old Greek philosophers showed their great wisdom when they defined wonder as the beginning of thought. It would seem much the wiser course in the present-day teaching of nature study were part of the story—the lesson, if you so prefer it—left untold, and the child encouraged to seek for itself the ending of the tale. The teacher should, of course, be ever at hand to guide and assist, and to strive at all times to build up and encourage that sense of wonder and curiosity that is—or should be—present in every child. Frequently, too, much stress is laid upon “dead nature.” It is “living nature” that should be studied, for it is this alone that will encourage and develop a true love of the world about us. Perhaps it is aiming too high—though it should not be—to suggest that the ideals of the teaching of nature study should be to awaken the child to an interest in the world about it, and to train it in habits of observation; to set it wondering, puzzling, and comparing, and to reason from the known to the unknown—but all this should not be permitted to obscure or destroy a child’s fundamental love of nature. But then, I am not a teacher. . . .

A love of nature begins, of course, with the child, and, given favourable conditions for its development, grows and remains with it as an unending delight throughout life. John Buchan has written in his delightful autobiography, “Memory Hold the Door,” that “A man is only truly intimate with the countryside which he has known as a child, for then he lived very near the ground, and knew the smell of the soil and the small humble plants and the things that live at the roots of the grasses. He explored it on all-fours, whereas he strides or gallops over later landscapes.” And again, he says, “A child’s imagination needs something small which it can seize and adopt as its very own.”

How true this is I know from my own experience. At just what age my love of nature in all its forms began to

develop I cannot, I fear, remember, but I understand that at a very early age I was not altogether popular on account of my predilection for bringing home baby mice, gathered from their nests in the paddocks. At about from four to five years of age it must have been well established, and of that period I can remember many things. It was in those days that I first met Mr. Froggatt, to become his devoted follower—and, possibly, "Nuisance No. 1"—as he collected in the rain forests of the Richmond River at Wollongbar. I remember, too, how proud I was of the title of his "assistant," which he then bestowed upon me. That was the beginning of a friendship—and, perhaps, more than a friendship—that lasted until his death in 1937. Mr. Froggatt was a grand teacher in a subject which he himself loved and understood so well. As Legros says of Fabre: "A man must indeed love knowledge deeply before he can make others love it, or render it easy and attractive." I am certain that it was due to the help and encouragement that Mr. Froggatt gave me in those early years that I persevered along what was then a stony and rather barren road. I still possess the letters which he wrote to me, from time to time, from 1905 onwards, each written with a patience and understanding of the many and varied problems which beset me, although some of my questions must have proved terribly thorny; for when I wanted to know, I asked. . . .

Birds were my earliest favourites, but insects always had a secure footing in my affections. When I began to take an interest in this fellowship of the small creatures, one had to discover everything for oneself—for there were then no books or guides to which one could appeal. Froggatt's numerous articles in the *Agricultural Gazette of New South Wales* provided my sole nature literature, to be read and re-read until I knew every word of them, and was completely familiar with every illustration. I had, too, the *Agricultural Gazette* articles by North; but a series of articles by Chas. Musson, in the *Hawkesbury Agricultural College Journal* came as manna from heaven to aid me with my identification of birds. In 1906 came Froggatt's "Australian Insects," and in 1911, Leach's "Australian Bird Book"—the long drought had at last broken! One learned the hard way before the coming of the books, but perhaps it was all to the good, for one *really knew* the creatures which one studied. Maybe, to-day, with all our books, things are made too easy, and we tend to take a super-

ficial view of nature, and to consider that because we have read a thing, we know it.

Books should be used as guides to an unknown land written by those who have passed through the country before us. From them we may learn what is already known and recorded, and, as we progress, find out which of our own discoveries are new. When we have merely read what someone else has observed, and we make use of it, we may be said to "borrow" it—but when we have actually seen this thing for ourselves, *then* it becomes our own. Every statement, no matter what the status of the authority who is responsible for it, must be tested against our own knowledge before it can confidently be accepted as fact. It is regrettable that such distrust of one's fellow workers in the field must exist—but, when one studies the literature of science, it is amazing to find how many recorded observations, whether right or wrong, by early naturalists, have been passed on unquestioned over the years without confirmation. Even one's own work, however carefully it may be done, must be watched with a critical eye, lest some new found fact does not refute conclusions which we had considered to rest upon a firm base.

Over the last 30 years or so many books on the varied aspects of nature in Australia have appeared—many of them good, some indifferent, and some bad. The great scarcity of nature books is a thing of the past—but it is still discouraging to find how soon the best of them go out of print, and are not reprinted.

Books giving descriptions of the varied forms of life and their many species are essential to the nature student who desires to place his knowledge on a firm foundation, especially in country districts, where other facilities, as museums and natural history societies, are not available. Nor must we overlook those books which stimulate thought by the impact of other minds, other opinions, upon our own, to aid in keeping burning the flame of what Kipling has called "insatiable curiosity," and urge us on to further efforts to unravel even a few of the many fascinating mysteries that surround us.

But the reading of books must never be allowed to come between us and the love for and direct contact with living nature—for this is capable of being, throughout life, a constant delight, even where books may be absent, and knowledge of the things seen far from profound; but they

can and do form a background to our studies and enjoyment. The average nature lover cannot be expected to find inspiration in technical scientific writings. It is here that accurate popular books have a very definite place, especially in awakening an interest in the lives of the little creatures—even though such books may be frowned upon by the strict scientist, who cannot see beyond the walls of his own laboratory. Legros, in his biography of the great French naturalist, Fabre, tells how "Scarcely ever, indeed, was he first inspired by the doings of others in this or that direction; he read scarcely anything, and nature was his sole teacher. He considered that the knowledge to be obtained from books is but so much vapour compared with the realities; he borrowed only from himself, and resorted directly to the facts as nature presented them. One has only to see his scanty library of odd volumes to be convinced how little he owes to others, whether writers or workers."

A great deal of Mr. Froggatt's writing was of an essentially popular and easily understood nature. Two of his nature studies, in the pages of the *Agricultural Gazette*—and now, perhaps, almost forgotten—stand out as wholly delightful examples of the craft. They are "The Willy Wagtail" and the "White Ants." My own non-technical writings have been largely inspired not only, perhaps, from a rooted conviction in the need for such books arising from recollections of my own early days before the coming of the books for those who "want to know"—but also from my associations with Mr. Froggatt, which has also had its influence.

The specialist has been defined as "A man who knows more and more about less and less." To-day is a day of specialisation; it is forced upon us whether we wish it or not, confining our studies, our occupation, and even our lives, within the high banks of an ever-narrowing channel. It is only in our thoughts, dreams, and interests that we can find freedom from its restrictions. It is here again that we find, to-day, much of the release and charm of the love and study of nature, to lose oneself in the beauty and mystery of the world about us; to spend a stolen hour or so in attempting to unravel the intricacies of the world of life around us—of the living things that share the land with us, and which are so often ignored and considered of no importance. Walter Wilson Froggatt had this wide love of the world around him, and of the life which filled it; his

interests embraced a very wide field of living nature: the insects, the birds, and the furred animals, and the plants—he knew them intimately. He was the last of the general naturalists who have given us of their wide knowledge of Australia. The day of the general naturalist has passed, but they have left us their harvest, gathered from a land that was then much younger than it is to-day, for many of the things which they recorded as familiar have gone, never to return.

The question of the disappearance of native fauna and flora brings us to another aspect of nature study—that of the conservation of our rapidly decreasing native life and the re-establishment, where there is yet time, of those species which are approaching extinction. Mr. Froggatt was always a very strong advocate for an adequate and constructive scheme for the conservation of our wild life. Legislation and the efficient administration of the resulting regulations—usually far too lax—will do much; the provision of adequately administered sanctuaries will do more. The true nature lover, however, does not need regulations, laws, and enforcement to preserve our wild life; he preserves it because of his love for, and his interest in it, and its future. The more nature lovers, the greater is the prospect for its well-being and future survival, for they will endorse what Elton has written: “Your attitude towards the animal world round you will help to determine the animal world that your descendants will live with.” The world of nature should be regarded as a trust, which must be passed on to future generations as little changed as possible—even when full concession has been made to the needs and advancement of our so-called civilisation. Much must, undoubtedly, lie in the hands of the child, and in his education in such matters lies the real key to the future. A child who has been taught to love the little creatures, and who has been brought up in an atmosphere of full understanding and appreciation of them is unlikely ever wilfully to harm any creature which has been virtually one of its playmates and companions.

. . . And what is the use of it all? There are still those who ask “What is the use of nature study?”; there are those who think it a waste of time and who can see no purpose in it unless the knowledge it brings is applied—or directed into some profit-making channel. Of course, the economic entomologist and the economic botanist, and the other workers in applied science hold a very important

place in our daily life and prosperity, but it is not with them that we are concerned here. If a love of nature has done something towards fulfilling an innate desire and search for beauty; if it has given a new interest to some man, woman, or child in the outback, or has filled an hour with true happiness—then it is fully justified without troubling to search for further reasons. But why seek for reasons. . . . ?

The true nature lover is rarely lonely; he finds his own company sufficient so long as he can find a little patch of bushland and the open sky. He finds his own amusement, and does not cry for the world to entertain him. This aspect is well brought out by Fabre in writing of his native countryside: "For an impassioned botanist, it is a delightful country, in which I could pass a month, two months, three months, a year even, alone, quite alone, with no other companion than the crows and the jays which gossip among the oak-trees; without being weary for a moment; there would be so many beautiful fungi, orange, rosy, and white, among the mosses, and so many flowers in the fields."

That a love of nature adds much to the completeness of a man's life was brought very strongly home to me during the war, when I received many letters from servicemen telling me of the things they had seen, or seeking light on some problem of animal life. There were many men who turned—perhaps for the first time—to the little creatures about them, and found a world full of fascination and interest. They had something with which to occupy their spare time—this in marked contrast to the men who, when their military duties were ended for the day, could find nothing but boredom. Of two men stationed in North Borneo, one wrote constantly of his boredom and the merits or de-merits of the picture show—when there was one. Life to him was one long unbroken monotony and discontent. The other wrote telling me how he never missed an opportunity to get into the jungle, either by day or night, so that he might see all that he could while he was in the country, and (he added) did not mind how long he was stationed there. Here were two men leading the same life—but with what a difference! And so, writes Legros: "Considering these creatures, we end by discovering more things than are contained in all the philosophies . . . if we know how to look for them."

## THE CASUARINA.

By A. E. WATSON.

The Casuarinas, known to most Australians as she-oaks, are very familiar to our people, but are little known beyond our shores, except in south-eastern Asia and the adjacent islands.

It is a lonely genus, being the only one of its family, *Casuarinae*, and is represented by about 15 species in New South Wales, varying in height from a few feet to the tall, majestic river oak, attaining a height rivalling the Eucalypts.

The timber of the larger trees, chiefly the forest oak, *C. torulosa*, was much used by the early settlers for roofing houses. The boles were cut into convenient lengths and then split into shingles by a radial cleavage from centre to circumference. The timber does not split readily along the annular rings as is mostly done in preparing forest timber for fences, palings and building slabs. When split radially, the enlarged medullary rays are exposed, and this gives it the superficial appearance of a piece of English oak which has been similarly split. The early settlers, noticing this resemblance, applied the name "oak" to the timber and to the casuarinas generally. The name, however, was an unfortunate selection, as the trees are in no way related, nor alike in appearance. However, the term has become well established and generally accepted among bush people as applicable to all species of casuarina. The roofs of the structures built by Ben Boyd at Twofold Bay are largely composed of oak shingles, which, after doing service for about 50 years, were still in sound condition in 1901.

Biologists, applying the science of embryology, are able to trace the evolution of genera down the track of time from the earliest association with a common ancestor back in the coal period or earlier; but there does not seem to be a common ancestor of the casuarina. All acacias, on germination, assume a common form of pinnate leaf, the phyllodia developing later as a sort of habit acquired by some species to guard against climatic conditions imposed upon them by nature in ages gone by. Now, many of these phyllodia-bearing acacias, if wounded badly by accident or intent, will put out a few of the juvenile form of leaves at



the seat of the wound where the new life is starting. The acacias supply but one instance illustrating a habit very general among our bush trees.

A casuarina seed when germinating sends up its two cotyledons, and from between these, a plumule developing nodes and internodes, but no juvenile leaves. The vestigial leaves forming whorls of scales, varying in number from five to 16, around the nodes, remain the same throughout the life of the tree. In fact, the casuarinas do not develop leaves at any stage of their existence. The functions of the leaves are carried on by a mass of deciduous branchlets which are by some people thought to be leaves.

A summary of these facts points to a conclusion that the origin of our forest oaks is lost in antiquity, and the habit of relying on substitute leaves has endured so long, that the power of developing juvenile or any form of leaves has long passed away, and we are unable to see the original form of the true leaf.

Anyone familiar with the casuarinas must have noticed cone-like growths springing from among the young branchlets, mostly on the male trees, for the casuarinas are generally dioecious in habit. These cones or galls are caused by a gall insect, *Cylindrococcus spiniferus*, of the family *Coccidae*, and if the scales of the cone are carefully removed the larva or pupa of the insect will be found in the centre of the mass. The young coccid or "crawler" settles in the axis of the vestigial leaf-scale. The outgrowth caused may be regarded as a modified form of branchlet, much shortened, but with the nodes and internodes in the respective places. Some of these galls collected from a swamp oak, *C. glauca*, measured over an inch in length and half an inch in diameter, the scaled overlapping like the unopened flower head of a thistle. Here is an instance again where the wounding of the branch has caused an outgrowth of what are probably the juvenile leaves of the casuarina, as mentioned earlier when referring to acacias.

If we are prepared to accept this evidence we may describe the long-lost leaves of casuarina as having been arranged in whorls of from five to 16, springing from well defined nodes along the branchlets, sessile and much overlapping at the base and tapering to an elongated point with edges serrulate. But, of course, this is only speculation. The evidence requires more confirmation.

## THE JONAH FISH.

By G. P. WHITLEY.

*(Contribution from the Australian Museum.)*

Thousands of fishes are submitted to the Australian Museum for classification from many localities in Australia, the South Seas, and even from South Africa and other countries, but only rarely have collections been received from Antarctica. Yet recently a fish, reminiscent of Jonah, was brought to us direct from the stomach of a Blue Whale which had been caught in the Antarctic. The specimen (Austr. Mus. Regd. No. IB., 1903) had been collected by an Australian observer aboard a Japanese whaler in Lat.



65°17'S. and Long. 151°08'E. on February 1, 1947, and was presented by Mr. F. F. Anderson, Director of the Commonwealth Fisheries Office, Sydney. Apart from lacking a tail-fin, and being a little battered about the head and fins, the fish was not damaged by digestion and was recognised as *Paralepis coatsi* (Dollo, 1908). It was just over one foot long and is shown in the accompanying figure. Remarkable features are the great length of the body in front of most of the fins, the long snout and toothed jaws, and the nakedness of the skin, the only scales present being a row spaced along the lateral line.

The colour, in alcohol, was pale tan above, dull blue below, as far back as anal fin. Eyes and interorbital bluish. End of snout and lower jaw dusky and some slight infuscation on some ridges of head and jaws. Fins yellow or whitish. Ventrals without black basal spots.

Similar fishes have been reported from Antarctic whale stomachs by J. R. Norman in his report on the Fishes of the *B.A.N.Z. Antarctic Research Expedition*, published in 1937, so the suggested vernacular name Jonah Fish may not be inappropriate.

## BIRDS OF THE ILLAWARRA.

By ELLIS McNAMARA.

*(Communicated by C. E. Chadwick.)*

The notes which follow refer mainly to the birds observed around the Cordeaux River district, which is a valley in the Illawarra Ranges, some ten miles west, by road, from Wollongong, New South Wales. Its altitude varies from 1,000 to 1,880 feet above sea level.

Most of the flatter land which had been cleared has largely grown up again into bush and scrub in more recent years.

There are areas of rain forest in most of the gullies, and the mountain sides are covered, principally with heavy forest. Behind the ranges, to the west, are considerable areas of heathland.

The soil on the eastern side of the river is of sandstone type, and that on the western side mostly of volcanic origin. The area, generally, may be considered typical of much of that in the Illawarra Ranges.

The coastal lowlands are mostly cleared, but have scattered clumps of open timber, and some of the gullies have heavier timber with thick scrub beneath.

The writer has done little field work in the lowlands, or along the sea shores, and these notes, necessarily, are incomplete so far as these areas are concerned. The references to the birds of the Five Islands have been taken from an article by J. A. Keast, which appeared in "The Emu," Vol. XLII., Part 3.

**BRUSH TURKEY**, *Alectura lathami*.—During the early days of settlement brush turkeys were present in the Illawarra brushes, but I can find no record of them being seen during the last 50 years.

**STUBBLE QUAIL**, *Coturnix pectoralis*.—During good seasons they are fairly plentiful in grasslands and crops.

**BROWN QUAIL**, *Synoicus australis*.—Small parties appear in grassland and about cultivation paddocks during some seasons, and I have also noted them in bracken fern areas.

**PAINTED QUAIL**, *Turnix varia*.—A few years ago small numbers of this beautiful little quail appeared in my district. They seemed to prefer the scrubby areas, particularly ti-tree scrub, and were more often heard than seen. Their small, roughly circular scratchings were a feature

of the areas they frequented. I have not seen one during the last three years.

**TOPKNOT PIGEON**, *Lopholaimus antarcticus*.—When its food supply is plentiful quite large flocks of these fine pigeons still appear in the brushes, mainly in the autumn and winter months. This is gratifying, when it is remembered that it has always been much persecuted by "pot hunters." The vast flocks, containing thousands of birds, spoken of by early settlers, however, are a thing of the past. The subspecies *Lopholaimus antarcticus minor* occasionally appears in the district.

**PURPLE-CROWNED PIGEON**, *Ptilinopus superbus*.—Early settlers spoke of a beautiful little bronzewing which was rarely seen. It was almost certainly this species. I have been told of one that was shot about 20 years ago near where the Mt. Keira Boy Scouts' Camp is now.

**WOMPPO PIGEON**, *Megaloprepia magnifica*.—Wollongong is the type locality of this beautiful pigeon. I have been told of one that appeared for a few days around this district about 1920. It has not been seen since.

**WHITE-HEADED PIGEON**, *Columba norfolciensis*.—During earlier years this species was fairly plentiful at times, but I have only one record of it since 1928.

**BROWN PIGEON**, *Macropygia phasianella*.—Small numbers may usually be found in most of the brushes. They show a marked preference for patches of ink berries.

**PEACEFUL DOVE**, *Geopelia placida*.—My only record is of a single bird that appeared in the orchard in April, 1929.

**GREEN WINGED PIGEON**, *Chalcophaps chrysochlora*.—Though not common this handsome little pigeon is holding its own fairly well. They are occasionally seen about roadways.

**COMMON BRONZEWING**, *Phaps chalcoptera*.—I have few records of this species which is decidedly rare in this district.

**BRUSH BRONZEWING**, *Phaps elegans*.—Much more plentiful than the previous species. During 1945 they suddenly appeared for a time in places where I had not previously seen them. It was a common occurrence to flush them when driving along roadways.

**WONGA PIGEON**, *Leucosarcia melanoleuca*.—It is pleasing to be able to record that this fine bird is increasing in numbers in this district. When I commenced observations in 1928 it was rare, due chiefly to the depredations of "pot hunters." During the last ten years their numbers have

steadily increased, and one is constantly meeting with the bird in unexpected places, while their distinctive calls have become one of the common sounds of the district.

BANDED LANDRAIL, *Hypotaenidia philippensis*.—Well distributed, though seldom seen. It is particularly fond of the blackberries surrounding water soaks.

SPOTLESS CRAKE, *Porzana plumbea*.—Occasionally appears in the reeds about dams and swamps.

EASTERN SWAMP HEN, *Porphyrio melanotus*.—Common about some swampy areas and appears to be spreading.

COOT, *Fulica atra*.—Rarely seen about the shores of dams.

LITTLE GREBE, *Podiceps ruficollis*.—Common and can be seen on most sheets of water in the district.

FAIRY PENGUIN, *Eudyptula minor*.—This species nests on the Five Islands and inhabits the surrounding area throughout the year.

WHITE-FACED STORM PETREL, *Pelagodroma marina*.—Also breeds in numbers on the Five Islands.

WEDGE-TAILED SHEARWATER, *Puffinus pacificus*.—Breeds on the Five Islands in large numbers. Large numbers are not uncommonly seen close to the shore, and dead specimens are frequently washed up on beaches.

GIANT PETREL, *Macronectes giganteus*.—Has been recorded from the Five Islands.

FAIRY PRION, *Pachyptila turtur*.—Also recorded from the Five Islands.

BLACK-BROWED ALBATROSS, *Diomedea melanophris*.—Has been noted in the vicinity of the Five Islands.

SHY ALBATROSS, *Diomedea cauta*.—Also seen in the same area as the foregoing species.

CRESTED TERN, *Sterna bergii*.—Is a common bird at places along the coast and breeds in large numbers on the Five Islands.

LITTLE TERN, *Sterna albifrons*.—In lesser numbers than the preceding species. It breeds on the coast adjacent to the Five Islands.

SILVER GULL, *Larus novae-hollandiae*.—Very common along the coast and areas adjacent. In stormy weather they are sometimes seen some distance inland. They breed in large numbers on the Five Islands.

POMARINE SKUA, *Stercorarius pomarinus*.—Has been noted at the Five Islands.

SOOTY OYSTER-CATCHER, *Haematopus unicolor*.—An in-

habitant of the Five Islands. It has been recorded as breeding there.

SPUR-WINGED PLOVER, *Lobibyx novae-hollandiae*.—Found in suitable areas throughout the district. In the early days of settlement at Cordeaux they were quite common, but in more recent times they have been seldom seen. Occasionally they are heard passing over at night.

RED-CAPPED DOTRELL, *Charadrius ruficapillus*.—Recorded from the Five Islands.

BLACK-FRONTED DOTREL, *Charadrius melanops*.—Is not uncommon about shores, gravel beds, water holes, etc.

WHIMBREL, *Numenius phaeopus*.—I recently noted a flock of these close to the sea near Bass Point. They were feeding both at the seaside and in adjacent grassland.

SOUTHERN STONE CURLEW, *Burhinus magnirostris*.—In the early days of settlement at Cordeaux this bird was often seen along the river flats, now covered by the storage reservoirs, and their weird calls were a feature of the nights. They have been heard only once in the last twenty years.

WHITE IBIS, *Threskiornis molucca*.—My only record of this species is of a single bird that spent some time about the shores of the storage reservoirs during the dry summer of 1942.

STRAW-NECKED IBIS, *Threskiornis (Carpibis) spinicollis*.—In earlier times numbers of straw-necked ibises frequently appeared at Cordeaux. In more recent times they have appeared only once, in the summer of 1942.

ROYAL SPOONBILL, *Platalea regia*.—I saw a pair of these about one of the storage reservoirs a few times during February, 1938.

WHITE-FACED HERON, *Notophyx novae-hollandiae*.—Is commonly met with throughout the district wherever there is water and sufficiently open country.

PACIFIC HERON, *Notophyx pacifica*.—For some time during the summer of 1941 a single bird was often to be seen about two creeks at Cordeaux. It has been recorded from the Five Islands.

REEF HERON, *Demigretta sacra*.—Seen occasionally at the Five Islands.

BLACK SWAN, *Chenopsis atrata*.—Occasionally appears on sheets of water at Cordeaux and may be seen on other lagoons, etc., in the district.

WOOD DUCK, *Chenonetta jubata*.—This fine and hand-

some duck appears and breeds about water holes in some seasons. It is quite rare, however.

GRAY (BLACK) DUCK, *Anas superciliosa*.—The common duck in this district. Flocks may be seen at almost any time on sheets of water wherever there is sufficient cover of reeds. They breed locally.

GRAY TEAL, *Querquedula gibberifrons*.—In earlier times gray teals were sometimes seen at Cordeaux, but I have no record of their appearance in more recent times.

MUSK DUCK, *Biziura lobata*.—A few of these may usually be seen on the storage reservoirs at Cordeaux.

BLACK CORMORANT, *Phalacrocorax carbo*.—Always present about sheets of water at Cordeaux and other places. Also recorded from the Five Islands.

LITTLE BLACK CORMORANT, *Phalacrocorax sulcirostris*.—May usually be seen about the Five Islands.

PIED CORMORANT, *Phalacrocorax varius*.—Very common about the storage reservoirs at Cordeaux, where parties of twenty or more are usually to be seen about the fringes of water, particularly where there are stumps to provide perches.

LITTLE PIED CORMORANT, *Phalacrocorax melanoleucus*.—Seen about the same places as the foregoing species but much rarer.

AUSTRALIAN GANNET, *Sula serrator*.—Recorded from the Five Islands.

AUSTRALIAN PELICAN, *Pelecanus conspicillatus*.—Numbers of pelicans may usually be seen on Lake Illawarra. On rare occasions they have appeared on the storage reservoirs at Cordeaux.

SWAMP HARRIER, *Circus approximans*.—Has been recorded from the Five Islands and adjacent mainland.

GRAY GOSHAWK, *Astur novae-hollandiae*.—One of our commonest hawks. Usually seen about forested mountainsides, where it breeds.

WHITE GOSHAWK, *Astur novae-hollandiae*.—I have only three records of this lovely bird. When seen gracefully floating round above the dark green of jungle areas, it is a sight that lives in the memory. Its appearance causes a great commotion among the pied currawongs in the vicinity.

AUSTRALIAN GOSHAWK, *Astur fasciatus*.—Is rather rare. I have seen only one nest. It was in heavy forest country.

COLLARED SPARROWHAWK, *Accipiter cirrocephalus*.—I have seen this species only once. The bird was perched in

a small sapling by the roadside and allowed me to approach quite close before darting off.

WEDGE-TAILED EAGLE, *Uroaetus audax*.—The lordly wedge-tail is frequently seen, particularly about the mountainous parts, and breeds in the more remote areas. It does little, if any damage, from an economic point of view, in this district, and must destroy considerable numbers of rabbits.

WHITE-BREADED SEA EAGLE, *Haliaeetus leucogaster*.—A few specimens of this noble bird may be met with about shores and around the edges of storage reservoirs. They nested for some years in the cliff face below Robertson's Lookout.

WHISTLING EAGLE, *Haliastur sphenurus*.—A few appeared in the dry summer of 1944, but I have seen none since.

BLACK-SHOULDERED KITE, *Elanus axillaris*.—This graceful and lovely hawk is sometimes seen, perched near, or hovering above, cultivation paddocks. I have also met it in lonely swampy areas.

CRESTED HAWK, *Baza subcristata*.—A small flock appeared about 1880, but none have been seen since.

PEREGRINE FALCON, *Falco peregrinus*.—A falcon believed to be of this species was seen attacking a white cockatoo in November, 1939, near a ravine, in wild mountain country. This is my only record.

BROWN HAWK, *Falco occidentalis*.—This well known hawk is only occasionally seen about here.

NANKEEN KESTREL, *Falco cenchroides*.—The attractive and very valuable nankeen kestrel is common and well distributed both about the settled areas and in lonely swamp areas.

OSPREY, *Pandion haliaetus*.—I saw a pair fly over in October, 1936.

BOOBOOK OWL, *Ninox boobook*.—Is quite common in timbered country. On warm spring nights the familiar calls may be heard coming from a dozen or so different points at once. It is found both in the more lightly timbered areas and in the dense gullies.

POWERFUL OWL, *Ninox strenua*.—This largest of our owls is to be found in some of the densest mountain gullies. The loud "whoo-hoo" call may frequently be heard from such places on clear winter evenings. The blood-curdling screech, presumably uttered by this bird, has startled many residents when heard for the first time.

BARN OWL, *Tyto alba*.—Is seldom seen, but its screech-



ing call is not infrequently heard, usually from the more open timbered country.

**RAINBOW LORIKEET**, *Trichoglossus moluccanus*.—During the early days of settlement, and up till about 40 years ago, large numbers of rainbow lorikeets passed through and fed on flowering trees, but I have seen none during the last 20 years.

**MUSK LORIKEET**, *Glossopsitta concinna*.—Was also present in large numbers at the same time as the previous species, but a few still pass through.

**LITTLE LORIKEET**, *Glossopsitta pusilla*.—In some seasons, the autumn of 1938, and again in 1945, for example, vast numbers of little lorikeets pass through and some feed on flowering eucalypts. Smaller numbers may be observed during other years.

**YELLOW-TAILED BLACK COCKATOO**, *Calyptorhynchus fulureus*.—Small flocks of up to twenty or more birds frequently appear, particularly during rainy weather. They are especially fond of wattle scrubs.

**RED-TAILED BLACK COCKATOO**, *Calyptorhynchus banksi*.—During the early days these were frequently seen, but I have seen only one party of four birds during the last 20 years.

**GANG-GANG COCKATOO**, *Callocephalon fimbriatum*.—Small flocks of up to a dozen or so are frequently seen in forest country, particularly about the top of mountain ranges. They are handsome birds, and the peculiar wheezing calls are very distinctive.

**WHITE COCKATOO**, *Kakatoe galerita*.—During the early days of settlement at Cordeaux flocks of white cockatoos were common, but I have seen only two birds since I commenced observations.

**KING PARROT**, *Aprosmictus scapularis*.—This beautiful parrot was present in great numbers during the early days and did much damage to orchards and corn crops. It is now rare, but small parties sometimes appear in orchards towards the end of the apple season. They show a preference for the heavily timbered country.

**CRIMSON ROSELLAS**, *Platycercus elegans*.—Is one of our commonest birds, being well distributed through all types of timbered country, even the poorest swamp country. It is very destructive to orchards, attacking not only the ripening fruit, but also frequently eating the fruit buds during the winter. Large numbers are sometimes destroyed

in orchards, but they always appear in undiminished numbers the following season.

**EASTERN ROSELLA**, *Platycercus eximius*.—Is quite common, but not widely distributed like the preceding species. It is usually found in lightly timbered areas. At Cordeaux they show a marked preference for basalt country, and are seldom seen in the sandstone areas. They are very destructive to orchards and corn crops, so it is fortunate that most of the orchards are in the sandstone soils.

**TURQUOISE PARROT**, *Neophema pulchella*.—A few of these lovely little parrots inhabited a restricted area at Cordeaux in the early days. They have long since vanished, but they may still be seen in a locality a little to the west.

**SWIFT PARROT**, *Lathamus discolor*.—Like the lorikeets mentioned earlier, these were once much more plentiful, but small flocks still occasionally pass over.

**GROUND PARROT**, *Pezoporus wallicus*.—Odd specimens were noted at Cordeaux during the early days, but it now appears to be confined to a particular area of suitable habitat at the southern end of the district, where it is not uncommon.

**TAWNY FROGMOUTH**, *Podargus strigoides*.—Is found wherever there is timber throughout the district, and is much more often seen than other nocturnal birds. They are frequently seen perched on posts by the roadside.

**DOLLAR BIRD**, *Eurystomus orientalis*.—The showy, and noisy, dollar bird is generally found in forest country where there are tall dead trees. They are also fond of ring-barked areas adjacent to forest. They are migratory, arriving towards the end of October.

**AZURE KINGFISHER**, *Alcyon azurea*.—The beautiful azure kingfisher is rare in my experience. I have met with it only occasionally about timbered streams.

**LAUGHING KOOKABURRA**, *Dacelo gigas*.—Common throughout the district in all types of country. Many of them succumbed during the dry winter and spring of 1946, but their numbers are not noticeably diminished to-day.

**SACRED KINGFISHER**, *Halcyon sanctus*.—Is quite common throughout the district, particularly in ring-barked and lightly timbered country. It is migratory, arriving early in September.

**WHITE-THROATED NIGHTJAR**, *Eurostopodus mystacalis*.—Is seldom seen, but its peculiar call notes are not infrequently heard in forest country.

**SPINE-TAILED SWIFT**, *Hirundapus caudacutus*.—During

dry seasons large flocks are frequently seen hawking in the upper air. Their appearance is almost always the prelude to a period of drought, and, the higher they are flying, the longer the dry spell.

**FORK-TAILED SWIFT, *Micropus pacificus*.**—I have only one record. Four were seen hawking in the upper air during a terrific windstorm on December 10, 1938.

**PALLID CUCKOO, *Cuculus pallidus*.**—Common throughout in open timbered country, and in some of the heathlands.

**FAN-TAILED CUCKOO, *Cacomantis flabelliformis*.**—Very common in scrubby forest country. They are partly migratory, some birds remaining throughout the winter, the others returning during the latter part of August. They call but little during the winter.

**BRUSH CUCKOO, *Cacomantis pyrrhophanus*.**—May be found in rain forest and mountain gullies during spring and summer. I have no record of it during the cooler months. They sometimes call throughout spring nights.

**HORSFIELD BRONZE CUCKOO, *Chalcites basalis*.**—Quite common in both forest and jungle country. A few apparently stay during the winter, but the main body arrives back during August, about the same time as the fan-tailed cuckoo.

**GOLDEN-BRONZE CUCKOO, *Lamprococyx plagosus*.**—Not nearly as plentiful as the foregoing species, but is not altogether rare in some forest areas.

**KOEL, *Eudynamis orientalis*.**—A small party appeared about the district for a couple of weeks in December, 1945, and did considerable damage to ripening stone fruits.

**SUPERB LYREBIRD, *Menura novae-hollandiae*.**—Despite fears expressed about their survival when foxes became plentiful, the lyrebird seems to have maintained its position well and has probably increased in the last decade or so. There does not appear to be any need for concern as to their survival.

**NOISY PITTA, *Pitta versicolor*.**—There is a noisy pitta in the Australian Museum, Sydney, said to have been collected near Wollongong about 1870. It is possible that it had escaped from captivity, for this is far from its usual range. I have not seen it during extensive wanderings in rain forest areas during the last 20 years.

**WELCOME SWALLOW, *Hirundo neoxena*.**—Very common about towns and buildings in farming areas. They may also be found about cliff faces in more remote areas.

**TREE MARTIN, *Hylochelidon nigricans*.**—Flocks appear at

times in the summer and autumn. Their movements are rather irregular, and I have no record of them breeding here.

FAIRY MARTIN, *Hylochelidon ariel*.—Flocks of this species also appear in summer and autumn, but their numbers are fewer than the foregoing species.

JACKY WINTER, *Microeca fascians*.—Is very common and one of the best known birds in open and lightly timbered country.

SCARLET ROBIN, *Petroica multicolor*.—During the cooler months scarlet robins may be found in fair numbers in the lowlands and open country. In the spring they retire to the mountain and more remote areas to breed, usually well away from civilisation.

FLAME ROBIN, *Petroica phoenicea*.—More plentiful than the preceding species and, like it, may be met with in the open country in the cooler months. It is not so retiring in its breeding habits, and commonly nests about clearings in the mountain country, clefts in outbuildings on farms being a favourite site.

ROSE ROBIN, *Petroica (belchera) rosea*.—Fairly common and well distributed in rain forest and heavily timbered mountain gullies. Some few birds remain in the mountain country throughout the winter, but most of them depart about early April, and return during late August. Its nest, usually placed high up in an inaccessible position, is one of the daintiest in "birdland." The peculiar "winnowing" action of the wings and tail is a good means of identification. On cold, wet days in spring, they often leave the tree tops, and search for food quite close to the ground.

WHITE-THROATED WARBLER, *Gerygone olivacea*.—At Cordeaux this species is quite rare and restricted to a few patches of open forest. They are migratory, arriving early in October.

BROWN WARBLER, *Gerygone richmondi*.—One of the commonest birds in rain forest areas, their rather feeble calls and small forms fluttering around the outside of trees being one of the most noticeable features of such areas. On winter days I have often seen them leave their jungle home and descend to adjacent orchard country, returning to the jungle about sundown. The beautiful nest is usually hung from thorny vines that grow over jungle trees.

GRAY FANTAIL, *Rhipidura flabellifera*.—One of the commonest birds in almost all types of country where there is sufficient timber cover.

**RUFIOUS FANTAIL**, *Rhipidura rufifrons*.—This beautiful bird, with the charming tinkling call-notes, is fairly common in rain forest and heavy forest country, usually in the vicinity of gullies. It is migratory, leaving during April, and returning about the first week in October. They do not normally begin to nest until December, and so are among the latest nesting birds. Odd that this bird should be migratory, while its closely similar gray relative is stationary.

**WILLIE WAGTAIL**, *Rhipidura leucophrys*.—Very common in open country, particularly about farm buildings.

**LEADEN FLYCATCHER**, *Myiagra riubecula*.—Comparatively rare, usually found on heavily forested hillsides. It is migratory, arriving during the first half of October. The peculiar quivering movement of the tail is a good identification point. In the autumn, they sometimes appear in orchards, and more open country.

**SATIN FLYCATCHER**, *Myiagra cyanoleuca*.—I have only one record of this species. A single bird was seen in heavy forest country on October 6, 1936.

**RESTLESS FLYCATCHER**, *Seisura inquieta*.—In my experience this species is comparatively rare and is confined to open forest country. Its hovering habits and rasping call-notes are notable points.

**BLACK-FACED FLYCATCHER**, *Monarcha melanopsis*.—Fairly common in rain forest and scrubby mountain gullies. Migratory, arriving during late September. It is a handsome, showy bird, and the loud, clear call-notes attract attention. The beautiful moss-covered nest is not often built before December.

**BLACK-FACED CUCKOO SHRIKE**, *Coracina novae-hollandiae*.—Common in open forest and ring-barked country. It is part migratory, or nomadic in habits, normally arriving late in August, but sometimes they may be seen about during the winter months.

**LITTLE CUCKOO SHRIKE**, *Coracina robusta*.—Early in September, 1942, a pair of little cuckoo shrikes appeared in an area of heavy forest on a mountain side. They remained throughout the spring and summer, but much searching failed to reveal a nest. They appeared in the same area for a few days in the following September, but I have seen nothing of them since.

**CICADA BIRD**, *Edoliasoma tenuirostris*.—Comparatively rare and usually confined to heavily timbered areas, about the tops of mountain ranges. Apparently strictly migra-

tory, it arrives about the end of October, or early in November. It is seldom seen, but the distinctive cicada-like call is frequently uttered.

WHITE-WINGED TRILLER, *Lalage tricolor*.—In some dry seasons, this handsome bird, with the fine canary-like song, appears in fair numbers in open forest areas and orchards, which latter are favoured nesting sites. At Cordeaux it shows a marked preference for and, indeed, is virtually confined to basalt country.

SPOTTED QUAIL THRUSH, *Cinclosoma punctatum*.—Odd pairs of spotted quail thrushes are scattered about the forest mountain country, particularly in sandstone areas, where the undergrowth is not very thick.

SPINE-TAILED LOGRUNNER, *Orthonyx temmincki*.—Mount Kembla is the type locality of the logrunner, the first specimen having been collected there in 1804 by Robert Brown, the famous botanist. It is found in almost all areas of rain forest in the district favouring the areas where there is plenty of undergrowth. Blackberries growing about the fringes of rain forest and along the banks of creeks are favourite haunts and they occasionally even nest in such places. Prior to the series of droughts, which began in 1939, logrunners were to be found in many places not truly rain forest, such as gullies in forest areas where a few rain forest trees and scrub grows. Droughts, and bush fires, have since driven them from some of these places, and the total numbers of birds in the district has probably shown a slight decline in the last decade, due entirely to drought conditions. There is no reason to fear for their survival, however.

PILOT BIRD, *Pycnoptilus floccosus*.—This sweet voiced songster is quite common throughout the mountainous areas, in rain forest, as well as hardwood areas. They are most numerous in heavily timbered places, where there is a dense growth of scrub, particularly near the tops of ranges. An early morning spent in such areas, with the beautiful calls coming from all directions, is an experience that lingers in the memory. They are also fond of blackberry bushes, growing along creeks and over once cleared hillsides. Pilot birds are particularly fond of areas that have been burned during the previous season, and on which the undergrowth is beginning to grow again, and are among the few ground birds that are to be found on areas recently swept by fires. They do not appear to have any defined

territories, individual pairs wandering over a large tract of country.

HEATH WREN, *Hylacola pyrrhopygia*.—This accomplished little mimic dwells in heath lands throughout the district, but is comparatively rare in the more southerly areas, becoming more numerous as one travels northwards. It is quite plentiful in the heathlands to the west of Mt. Keira.

EASTERN WHIP BIRD, *Psophodes olivaceus*.—Quite common throughout the district, where there is sufficient growth of scrub to provide cover in both forest and jungle areas. Perhaps more so than any other bird, they have taken wholeheartedly to the blackberries, particularly those growing along gullies and creeks. Most of their nests are now built in blackberry bushes, and the safety afforded by such sites may account, in part, for the marked increase in the numbers of whip birds during the last 20 years. In areas nearer the coast, where blackberries do not thrive, lantanas provide similar sanctuary. There is considerable local variation in their calls.

BROWN SONGLARK, *Cinclorhynchus cruralis*.—I have a few records of this fine songster in grassland and crops.

AUSTRALIAN GROUND THRUSH, *Oreocincla lunulata*.—Though not common, the ground thrush is found throughout the rain forest areas, and in some ti-tree scrubs, and "half brush" areas. They are also frequently found in blackberry areas. In the winter, when the apple leaves have fallen, they often appear in orchards adjacent to scrubs. The beautiful song is often heard at dusk, and early in the morning, in the early spring, about the time the beautiful moss-covered nests begin to take shape.

WHITE-FRONTED CHAT, *Epthianura albifrons*.—I have only one record of this species at Cordeaux. However, it is not uncommon about the coastal lowlands.

REED WARBLER, *Acrocephalus australis*.—May be found among the reed beds in lagoons about the coastal lowlands.

FANTAIL WARBLER, *Cisticola exilis*.—Recently I saw several in an areas of low reeds, tussocks and grass around Tom Thumb's Lagoon.

LITTLE GRASSEIRD, *Megalurus gramineus*.—Has been recorded from the Five Islands and adjacent mainland.

ROCK WARBLER, *Origma rubricata*.—Found about all timbered sandstone mountain ranges and gorges, particularly where there are large rocks and cliff faces. They are

particularly numerous in areas to the north-west of Cordeaux.

**LITTLE THORNBILL**, *Acanthiza nana*.—I have only once seen little thornbills at Cordeaux. They are found in some areas nearer the coast, generally where there are turpentine trees.

**BROWN THORNBILL**, *Acanthiza pusilla*.—Much the commonest thornbill in the mountain areas, where it may be found in all types of country where there is a sufficient cover of scrub. Once cleared areas, grown up with bracken and blackberries, are favourite haunts, and patches of low bracken are the favourite nesting sites.

**STRIATED THORNBILL**, *Acanthiza lineata*.—Common in open and scrubby forest areas in both the mountains and lowlands, but it is not so widely distributed as the brown thornbill and keeps more to the forest tree tops.

**YELLOW-TAILED THORNBILL**, *Acanthiza chrysorrhoa*.—Very common in cleared areas, cultivation paddocks, and orchards, where there are a few scattered trees to provide cover in both mountain and lowlands.

**BUFF-TAILED THORNBILL**, *Acanthiza reguloides*.—In my experience the buff-tailed thornbill is rather rare, and I have only seen isolated parties in the scrubby timber growing about heathlands, usually far from civilisation.

**YELLOW-THROATED SCRUB WREN**, *Sericornis lathamii*.—Very common in all rain forest and half brush areas in the mountain country. The bulky hanging nest is a feature of all gullies in such places.

**WHITE-BROWED SCRUB WREN**, *Sericornis frontalis*.—Probably the commonest bird in the mountain country, where it is found everywhere there in scrub in all types of country. It is one of the few birds commonly found in areas overgrown with bracken fern, and may also be found in patches of scrub in the coastal areas.

**LARGE-BILLED SCRUB WREN**, *Sericornis magnirostris*.—Rare and confined to rain forest areas. It seems to be half-way between scrub wrens and thornbills in appearance and habits, for most of its food is obtained about masses of vines and jungle trees.

**SUPERB BLUE WREN**, *Malurus cyaneus*.—Very common throughout the district in gardens, and partly cleared areas, and in heathlands. It is most plentiful in mountain areas, partly overgrown with blackberries and bracken fern.

**VARIEGATED WREN**, *Malurus lamberti*.—This lovely bird is sparsely distributed over the mountain country, sometimes



in company with the blue wren, but generally in more heavily timbered areas, and about the fringes of heathlands.

**SOUTHERN EMU WREN, *Stipiturus malachurus*.**—Found in most heathland areas, and is much more plentiful than a casual search would indicate, owing to its retiring habits. It is occasionally found well away from its true home, in areas of blady-grass and bracken fern, and in autumns, when there was a heavy growth of grass and weeds, I have even seen it in orchards.

**EASTERN BRISTLE BIRD, *Dasyornis brachypterus*.**—Further searching is needed to indicate the range of this rare and little known bird. At present it appears to be confined to the densest parts of one particular tract of heathland.

**DUSKY WOOD SWALLOW, *Artamus cyanopterus*.**—Common in open timbered country, particularly ring-barked areas, in both the mountains and lowlands.

**MAGPIE LARK, *Grallina cyanoleuca*.**—Very common throughout in open country, generally in the vicinity of water.

**GRAY THRUSH, *Colluricincla harmonica*.**—Common throughout the timbered areas. In the winter it is commonly found about orchards and open country, but in the spring it usually retires to the heavily timbered mountainsides to breed.

**EASTERN SHRIKE TIT, *Falcunculus frontatus*.**—Found throughout the heavily timbered areas, but not plentiful anywhere.

**GOLDEN WHISTLER, *Pachycephala pectoralis*.**—This beautiful songster is quite common throughout the timbered areas, particularly about the mountain areas, where it is equally at home in rain forest, scrubby forest, and open forest.

**RUFIOUS WHISTLER, *Pachycephala rufiventris*.**—Common in the open and scrubby forest areas. It avoids the rain forest, but extends farther into the lonely heathlands than its golden relative, unlike which, it is migratory, arriving back about the end of September.

**OLIVE WHISTLER, *Pachycephala olivacea*.**—On September 9, 1934, I heard strange notes coming from a blackberry bush on a hillside. It proved to be an olive whistler. Soon afterwards it disappeared up the mist-covered hillside, calling repeatedly. It was in the vicinity the two following mornings, and then I heard it no more. The following

April, one appeared for a few days in an adjacent locality. These are my only records.

SOUTHERN YELLOW ROBIN, *Eopsaltria australis*.—Very common in all types of timbered country in both mountain and lowland areas.

EASTERN WHITEFACE, *Aphelocephala leucopsis*.—I have a few records of this species in dry, lightly timbered country.

ORANGE-WINGED SITTELLA, *Neositta chrysoptera*.—Rather rare. I have seen them occasionally in heavily timbered mountain country where they keep to the big trees.

BROWN TREE-CREEPER, *Climacteris picumnus*.—I have seen this bird a few times in the poor forest country to the west of Cordeaux.

WHITE-THROATED TREE-CREEPER, *Climacteris leucophaea*.—Common and widely distributed throughout the timbered country in both mountains and lowlands. It is just as much at home in rain forest as in the poor forest surrounding heathlands, it being one of the few birds one may be sure of seeing in such places.

RED-BROWED TREE-CREEPER, *Climacteris erythroptera*.—Comparatively rare, being found in heavily timbered mountain areas, often in association with its white-throated relative, which it much resembles. The call-notes, however, are quite distinctive.

SILVER EYE, *Zosterops halmaturina*.—Very common in rain forests, orchards and gardens, and areas overgrown with blackberries. It may do a small amount of damage to ripening orchard fruit, but the balance is much in its favour. Generally speaking, fruit it attacks is too ripe to market. During early April vast numbers pass over at night travelling northwards.

MISTLETOE BIRD, *Dicaeum hirundinaceum*.—Found throughout the timbered areas, and occasionally in orchards and gardens. In this district, it is more numerous in autumn and early winter, than at other seasons.

RED-TIPPED PARDALOTE, *Pardalotus ornatus*.—Rare, and as it keeps to the tree tops in heavy timber, is seldom seen.

SPOTTED PARDALOTE, *Pardalotus punctatus*.—Very common and well distributed through all types of forest country, in both mountains, and lowlands. Its small size, and tree-top habits, make it difficult to observe, except during the breeding season, when they come to the ground, and are quite fearless.

WHITE-NAPED HONEYEATER, *Melithreptus lunulatus*.—Is not found throughout, but is common enough in favoured

areas. Usually they keep well up in big trees, in heavy forest country, preferring the more level country, rather than mountain ridges.

BROWN-HEADED HONEYEATER, *Melithreptus atricapillus*.—My only experience of this species at Cordeaux was a small flock that was often seen in timbered country during the winter of 1945. I have also seen them in the scattered timber about heathlands behind Mt. Keira.

SCARLET HONEYEATER, *Myzomela sanguinolenta*.—This beautiful little bird seems to be quite rare in this district. On infrequent occasions, they appear when the crimson bottlebrush and ti-tree are in blossom, and I once saw one in an apple tree.

EASTERN SPINEBILL, *Acanthorhynchus tenuirostris*.—Quite common throughout in most classes of timbered country. It is one of the few birds often seen about mountain tops, and poor timbered heathlands. It is also a common bird about orchards and gardens.

TAWNY CROWNED HONEYEATER, *Gliciphila melanops*.—Found in the heathlands, in the northern end of the district. The most southerly point that I have seen it was in the vicinity of Broker's Nose Lookout, where it showed a preference for low scrub.

REGENT HONEYEATER, *Zanthoniza phrygia*.—I have seen this handsome bird only once, but in the early days of settlement at Cordeaux, flocks were often seen.

FUSCOUS HONEYEATER, *Meliphaga fusca*.—Four of these birds appeared among an irruption of honeyeaters at Cordeaux during the dry summer of 1940-1941.

LEWIN HONEYEATER, *Meliphaga lewini*.—One of the commonest birds in rain forest and heavy forest country. It is very common in orchards and does some damage to ripening soft fruits, and in earlier days considerable numbers were destroyed, because of this. However, as an orchard bird, the balance is very much in its favour.

YELLOW-FACED HONEYEATER, *Meliphaga chrysops*.—Very common in both open and scrubby forest country and ti-tree scrubs. It is also frequently seen in orchards, and does some little damage to soft fruits.

WHITE-EARED HONEYEATER, *Meliphaga leucotis*.—Is not widespread, but common in certain favoured areas, such as ti-tree scrubs, fringes of rain forest towards the heads of mountain gullies, and in some heathland areas.

YELLOW-TUFTED HONEYEATER, *Meliphaga melanops*.—I have seen this fine honeyeater at Cordeaux only once, dur-

ing the dry summer of 1941. It is occasionally seen in timbered gullies in the heathlands to the west.

CRESCENT HONEYEATER, *Phylidonyris pyrrhoptera*.—Common in favoured areas, chiefly towards the heads of gullies in heavily forested mountain country, in places where bloodwoods grow, and occasionally in heath country. It sometimes appears in orchards when the trees are in blossom.

YELLOW-WINGED HONEYEATER, *Meliornis novae-hollandiae*.—Very common in heathlands, ti-tree scrubs, and forest country, where the undergrowth consists of ti-trees, banksias, etc. Large numbers sometimes appear when the ti-trees are in blossom.

WHITE-CHEEKED HONEYEATER, *Meliornis niger*.—Quite rare in my experience. I have seen them only in company with the foregoing species on blossoming ti-trees.

NOISY MINER, *Myzantha melanocephala*.—Rare about the mountains, but very common in open timber about the coastal lowlands.

RED WATTLE BIRD, *Anthochaera carunculata*.—The vast flocks, early residents speak of, are not now seen, but small flocks frequently pass through during the winter months. Their appearance usually coincides with frosts.

LITTLE WATTLE BIRD, *Anthochaera chrysoptera*.—Small parties are often met with in heath country, interspersed with eucalypts, particularly during the summer months. Sometimes larger numbers appear when the ti-trees are in blossom.

NOISY FRIAR BIRD, *Philemon corniculatus*.—Sparsely distributed through both mountain and low country, in more open timbered areas. It does not seem to be common anywhere.

AUSTRALIAN PIPIT, *Anthus australis*.—Common wherever there is open grassland, in both mountain and low country. It is also found in many of the more open patches of heathland.

DIAMOND FIRETAIL, *Zonaeginthus guttatus*.—Common about the coastal areas in suitable spots, but decidedly rare in the mountains.

BEAUTIFUL FIRETAIL, *Zonaeginthus bellus*.—Thinly distributed through the more open heathland areas, usually in the vicinity of timber. This beautiful bird is very quiet and shy, and easily overlooked. It seems to be more numerous behind Mt. Keira than elsewhere.

RED-BROWED FIRETAIL, *Aegintha temporalis*.—Very common in open country, cultivation patches, orchards and

gardens. Clearings partly overgrown with blackberries, in hill country, are favourite haunts.

**BANDED FINCH**, *Steganopleura bichenovii*.—In recent years small parties of these finches have occasionally appeared in orchards at Cordeaux. They have also been noted in the vicinity of Wollongong.

**OLIVE-BACKED ORIOLE**, *Oriolus sagitatus*.—Thinly distributed through the mountain areas, usually in fairly heavy forest. They appear in the spring, being seldom seen at other seasons. It is one of our finest mimics.

**SPANGLED DRONGO**, *Chibia bracteata*.—One of these appeared towards the end of February, 1948. It remained only for about a week, and then disappeared. One had appeared at Mangerton, near Wollongong, about a fortnight earlier.

**SATIN BOWER BIRD**, *Ptilonorhynchus violaceus*.—Fairly common in rain forest and half brush areas. There is considerable seasonal variation in their numbers which, generally, are greater in the late autumn and winter months. During this period, in 1944, great numbers appeared in the district. They do considerable damage to orchards, sometimes attacking fruit before it is half-grown, and sometimes are very destructive to some kinds of vegetables. Bowers are frequently made in patches of scrub adjacent to orchards.

**GREEN CAT BIRD**, *Ailuroedus crassirostris*.—Odd pairs are scattered through the true rain forest areas. They seem to be more numerous on the coastal side of the ranges, but are nowhere plentiful. They are usually quiet and shy through the day. The peculiar cat-like wail being frequently uttered as night approaches.

**AUSTRALIAN RAVEN**, *Corvus coronoides*.—Common in all classes of open country, including heathlands.

**LITTLE CROW**, *Corvus bennetti*.—During the late spring of 1936, when cicadas were in plague numbers at Cordeaux, a small flock of little crows appeared, and fed on them for a few weeks. They kept more to the heavy timber.

**WHITE-WINGED CHOUGH**, *Corcorax melanorhamphus*.—In the early days of settlement at Cordeaux, a small flock of these appeared during a dry season.

**PIED CURRAWONG**, *Strepera graculina*.—Very common about the mountain areas, in all classes of timber, being more plentiful in rain forest, but found even in heathlands. During the winter they congregate in flocks on the flats during the day, returning to the mountain tops to roost.

The flocks break up in the spring, when breeding pairs are found scattered throughout the forest country. It is, by reason of its numbers, and cosmopolitan tastes, the most destructive bird in our orchards, and sometimes damages vegetable and other crops.

GRAY CURRAWONG—RAVEN, *Strepera versicolor*.—During the winter, odd birds appear with flocks of their pied relatives, about flats in the mountain country. A few pairs are scattered through the heathlands, where they breed in odd clumps of trees.

GRAY BUTCHER BIRD, *Cracticus torquatus*.—Not very common. Found scattered throughout the forest areas and in orchards and gardens.

BLACK-BACKED MAGPIE, *Gymnorhina tibicen*.—Very common in open timber and cleared areas, as well as orchards and gardens. Also found in heathlands.

WHITE-BACKED MAGPIE, *Gymnorhina hypoleuca*.—During the early days there were a few white backs in some localities, but since then they have interlived with the black-backs, to such an extent, that true white-backs are now an extreme rarity.

#### INTRODUCED BIRDS.

The following introduced birds also occur in the district.

INDIAN TURTLE DOVE, *Streptopelia chinensis*.

RED-WHISKERED BUL-BUL, *Otocompsa emeria*.

SKYLARK, *Alauda arvensis*.

GOLDFINCH, *Carduelis carduelis*.

HOUSE SPARROW, *Passer domesticus*.

STARLING, *Sturnus vulgaris*.

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#### NOTICES.

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Members are reminded of Rule 4 of the Society which reads: "All subscriptions shall become due on the first day of August and shall be payable in advance."

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The Society's gum-leaf Badge may be obtained from the Hon. Secretary or the Hon. Assistant Secretary. Price, 2/- (postage and package extra).

## ORIGIN OF SUBMARINE CANYONS.

By DAVID G. STEAD.

In *Natural History* (New York) for June, 1941, there appeared a fine article by H. E. Vokes, entitled, "Canyons Under The Sea." In this he described what was termed "a Super-'Grand Canyon' within 130 miles of New York City." The principal subject of this article was the great Hudson Canyon, equal to the Grand Canyon of the Colorado in depth, but having more precipitous sides, 44 miles in length, the summit of its shoreward end, or beginning, being 500 feet below sea level, and its depth at the bottom being at about one mile below the present ocean surface.

Mr. Vokes mentions a number of other canyons of a similar or somewhat similar type, off the coast of America and elsewhere, and states that all of these represent "a strange family of submarine features which no scientific facts can explain." He discusses various theories as to the causative agencies, including the altogether impossible one of vast quantities of melting ice on the continents, and at the Poles, having "flooded" the seas and so raised the level to a prodigious extent.

## NOW A SOUTH AUSTRALIAN EXAMPLE.

My reason for referring to this article of six years ago is that a great undersea canyon has recently been discovered off the coast of South Australia. As reported at the beginning of May of this year, an Australian naval vessel, the "Lachlan," which was then carrying out submarine survey work, came upon this canyon. It has been stated that some geologists having suspected the existence of this canyon, the "Lachlan" was instructed to run along the 100-fathom line to the south of Kangaroo Island, towards Robe, and take soundings. These soundings showed, in half a mile, almost a sheer drop of 3,000 feet in the sea floor level. A flat-bottomed canyon about eight miles wide was then indicated; and, on the other side, the sea floor rose 2,500 feet in two miles. The soundings were taken about 30 miles south of Kangaroo Island.

## A PARALLEL TO THE HUDSON CANYON.

To my mind we have here almost an exact parallel to the Hudson Canyon and its origin. In the case of the Hudson Canyon, we find the present embouchure of the

Hudson River to be about 130 miles away. In the South Australian example, the outlet of the great Murray River, lies some miles away northwards. At present the Murray River finds its way to the Southern Ocean through Lake Alexandrina, and then by that long lagoon-like strip of water known as The Coorong, which is separated from the sea for many miles by a narrow sandy spit.

Great as is the Murray River system—including the Murrumbidgee, the Lachlan, the Darling and other feeders—there appears to be much evidence of a vastly more extensive flow of water from its basin during what we might call its youthful days. To-day the largest part of its basin is filled with extensive silts, and at a low elevation, so that over the major part of the courses of the parent river and its feeders we find more or less a succession of meanders—with a consequent low velocity in the streams and a relatively low excavating power, as so much of the total mileage is so near to base level.

#### THE "MURRAY CANYON."

I have given this short description of the Murray River system to indicate what an Old Man river the Murray is. And yet I am going to suggest, tentatively, on the information available, that this great South Australian submarine canyon was excavated by the Murray River in its earlier days. For that reason I designate it here, the "Murray Canyon." Obviously, if the Murray River did this work, it could not be doing it to-day, nor could it have done it when the canyon was under the sea. But it might have done it if the bottom of the canyon had been something over 3,000 feet above its present level—just as we can conceive of the Hudson River, or the Congo, or the Ganges, Indus, Niger, Columbia and others, carving out the submarine canyons opposite their present mouths if the land were raised sufficiently. This will be accepted by all, of course, but they will all need a satisfactory explanation of the present position of these gorges so far below the ocean surface:

#### WEGENER TO THE RESCUE!

And this is where my old friend Wegener comes in. Perhaps I may be excused for my great familiarity with the distinguished geographer, when I say that the Wegener Hypothesis of Drifting Continents has been of very great service to me in my geographical and biological studies in many years past. For the uninitiated reader, it should be



stated, as the late Professor Sir Edgeworth David put it, in *The Australian Geographer* (August, 1928), that:—

“The Wegener Hypothesis puts forward the probability that at one time the main part of that part of the earth emerging from the oceanic waters was *one* connected mass—the Pan Gea—and that no dismemberment into continents took place until the latter end of the Palaeozoic Epoch. At that date a great rift was originated that developed into the Atlantic Ocean.”

David gives a general discussion on the pros and cons of the Wegener Hypothesis, and then—rightly, as I would say from my own experience—concludes with this:—

“Wegener’s Hypothesis is welcomed by botanists and zoologists. It explains also innumerable knotty problems of the geologist and others.”

#### RIFTS CAUSE ADJACENT SUBSIDENCES.

If we accept only the theory of drifting land masses here, and leave out the very knotty question as to when such drifting started, we get a picture—a very true one, I think—of continental and other masses ever floating at the earth’s surface. When these masses move away from one another, or even from the former position held by them, a rift or crack is left adjacent to their edges. This rift undermines, so to speak, the foundations of the coastal formation of the time, and the continental or other land mass edges or borderlands sink—sometimes rapidly perhaps, geologically speaking, sometimes more slowly, but in any case, inevitably, as the weight adjustment takes place.

Where the rift is an extensive one, then the corresponding drop in adjacent coastal lands is equally extensive, and down go the canyon-bisected or intersected mountainous coasts; and not only the mountainous areas, of course—though, with their extra weight and mass, we should expect a greater subsidence to take place. Previously, such canyon-filled areas may have been rapidly rising as the canyons were cut through by the powerful streams; but that is another part of the story, and need not be discussed here.

#### HUDSON AND MURRAY CANYONS CAUSED SIMILARLY.

I suggest then that the great canyons opposite the Hudson and the Murray embouchures were brought about

in exactly the same manner: The high coastal or near-coastal tablelands of a geologically-recent period were cut through by the Hudson and Murray Rivers of that time—in the same way as we have seen in the case of the river in the Grand Canyon of the Colorado, as it has carved its way down hastily towards base level—and the consequent Hudson and Murray Canyons, so formed, then subsided as the oceanic rift formed and widened before them.

A homely instance of this type of subsidence may be cited here, as having come under the notice of many people in various parts of the world: When a river or creek breaks away from its course in flood time, and cuts through stiff soil—especially of a clayey type—and in so doing makes a deep channel, it is often noted that the new banks bend down, often as much as several feet, after the current has stopped or slowed down, until the edges may be well under water. Similarly, when a silt dredge is working a deep channel through clay country, the banks cannot support their weight any longer in the vertical face, and have a strong tendency, first to break away at the edges, and then to cave in from under leaving the upper layers—often many feet in thickness—sloping down, apparently intact, to (and under) the surface of the water. While these familiar examples are not exact reproductions of what I suggest has happened in the formation of the great underwater canyons, they are sufficiently like them to draw something of a parallel.

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## NATURALISTS' SOCIETY OF NEW SOUTH WALES.

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*Proceedings.*

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OCTOBER, 1945.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, October 2, 1945, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 45 members and visitors present.

Nomination of Members.—Master K. Sankey, 75 Rangers Avenue, Cremorne. Nominated by Kevin Burns, seconded by Ian Adams. Mrs. Ey, "Tuxedo," Albert Road, Strathfield. Nominated by Miss Marshall, seconded by Mrs. Watson. Mrs. Campbell, Upper Avenue Road, Mosman. Nominated by Mrs. Mee, seconded by Mr. Davies.

Lecture.—Owing to the lantern being unavailable, the lecture, which was to have been delivered by Mrs. M. Morris, was postponed until the next meeting. A members' evening was held instead.

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NOVEMBER, 1945.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, November 6, 1945, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 40 members and visitors present.

Election of Members.—Master K. Sankey, Mrs. Ey, and Mrs. Campbell were unanimously elected members of the Society.

Lecture.—Mrs. M. Morris delivered an address, entitled, "The Flora of Western New South Wales." The lecture was illustrated with numerous coloured lantern slides.

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DECEMBER, 1945.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, December 4, 1945, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 45 members and visitors present.

Proposed Bird Sanctuary.—The President announced that the Society had been advised by the Canterbury Council that the area on Cook's River, which it had been

hoped, would be replanted to make a bird sanctuary, was to become a recreation reserve.

Lecture.—Mr. H. F. Whitworth, M.Sc., Curator of the Geological and Mining Museum, delivered an address, entitled, "Divining for Water and Minerals—Methods Old and New."

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#### FEBRUARY, 1946.

The ordinary monthly meeting of the Society, by courtesy of the Vacuum Oil Co. Pty., Ltd., was held on Tuesday, February 5, 1946, at 7.30 p.m., in their Theatrette, Kembla Building, Margaret Street, when most interesting films were shown to members.

The President (Mr. A. E. Watson), in the chair, with about 86 members and visitors present.

Nomination of Members.—Mr. and Mrs. G. E. Fisher, 99 Victoria Street, Potts Point. Nominated by Mr. Herriott, seconded by Mr. A. E. Watson. Miss K. Sherwood, 20 Webbs Avenue, Ashfield. Nominated by Mr. Herriott, seconded by Miss D. Dobbin. Junior Members: Miss Yvonne Gregor, 47 Gladstone Street, Bexley. Nominated by Mrs. Watson, seconded by Miss Dobbin. Miss Delphine Crockett, 82 Ourimbah Road, Mosman. Nominated by Mrs. Welch, seconded by Miss Dobbin. Masters Alan Wright, 3 Mung Street, Earlwood. Fred Phillips, 995 Liverpool Road, Bankstown. Bill Lewis, 21 Morgan Street, Earlwood. Spencer George, 27 Modern Avenue, Canterbury. Royce Frost, 29 Lucerne Street, Belmore. Eric Hughes, 28 Myall Street, Punchbowl. Ken Richards, 3 Knight Street, Arncliffe. Ray McDonald, 35 Kennedy Avenue, Belmore. Nominated by Mr. Thurlow, seconded by Mr. A. E. Watson.

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#### MARCH, 1946.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, March 12, 1946, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 56 members and visitors present.

Election of Members.—Mr. and Mrs. G. E. Fisher, Miss K. Sherwood. Junior Members: Miss Yvonne Gregor, Miss Delphine Crockett, Masters Alan Wright, Fred Phillips, Bill Lewis, Spencer George, Royce Frost, Eric Hughes, Ken Richards, and Ray McDonald, were unanimously elected members of the Society.

Nomination of Members.—Miss Margaret Briggs and Miss Barbara Briggs, 13 Findlay Avenue, Roseville. Nominated by Mrs. Morris, seconded by Mrs. Watson. Miss Bowden, 83 Beecroft Road, Beecroft. Nominated by Miss Thompson, seconded by Miss Luckie. Mr. J. D. Tipper, Box 2770, G.P.O., Sydney. Nominated by Mr. E. Cheel, seconded by Mr. A. E. Watson. Master Robert Wright, Flat 2, 35 Murdoch Street, Cremorne. Nominated by Mr. Watson, seconded by Miss Dobbin. Master Peter Barclay, 51 Cremorne Road, Cremorne. Nominated by Miss Dobbin, seconded by Mr. Watson.

Lecture.—Mr. Charles Noakes delivered an address on various Australian and other plants and herbs used for medicinal purposes.

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APRIL, 1946.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, April 9, 1946, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 45 members and visitors present.

Election of Members.—Miss Margaret Briggs, Miss Barbara Briggs, Miss Bowden, Mr. J. D. Tipper, Master Robert Wright, and Master Peter Barclay, were unanimously elected members of the Society.

Nomination of Members.—Mr. A. Ingram, 228 Bexley Road, Earlwood. Nominated by Mr. C. K. Ingram, seconded by Mr. K. Thurlow.

Lectures were given by various members.

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MAY, 1946.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, May 7, 1946, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 45 members and visitors present.

Election of Members.—Mr. A. Ingram was unanimously elected a member of the Society.

Lecture.—Mr. Norman Chaffer showed and described a number of his beautiful colour films of birds in their natural haunts of the north-west, Doonside and other districts, and also colour films of wildflowers growing in the Coal and Candle Creek Area.

## JUNE, 1946.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, June 7, 1946, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 45 members and visitors present.

Lecture.—The Froggatt Memorial Lecture, which was to have been delivered by Mr. K. C. McKeown, was deferred until the July meeting, and instead—

Mr. Hansen delivered an address on astronomy, which was illustrated with lantern slides, showing photographs and drawings of planets, etc.

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## JULY, 1946.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, July 2, 1946, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 45 members and visitors present.

Froggatt Memorial Lecture.—Mr. Keith C. McKeown, F.R.Z.S., delivered the Froggatt memorial lecture, which was entitled "Nature and Man." This address is published in the present issue of this Journal.

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## AUGUST, 1946.

The Annual meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, August 6, 1946, at 7.30 p.m.

The Superintendent of Education (Mr. Martin), was in the chair. About 60 members and visitors were present.

Nomination of Members.—Mrs. Carter, 23 Victoria Road, Bellevue Hill. Nominated by Mrs. Watson, seconded by Miss Dobbin. Mrs. Jean Lefebvre, Macquarie Street, Sydney. Nominated by Miss Luckie, seconded by Miss Dobbin. Master John Woods, 45 Cabramatta Road, Cremorne. Nominated by Mr. R. Wright, seconded by Keith Sankey.

Resolution re Council (Rule 8).—The Hon. Secretary announced that some members considered a Council of 15 members was too large, and the meeting was asked to decide whether 15 or 12 or even less councillors would be sufficient. On a vote it was decided that Council should consist of 12 members.

Secretary's Report.—The report of the activities of the Society was presented by the Hon. Secretary (Miss D. Dobbin).

Treasurer's Report.—The report and balance sheet of the Hon. Treasurer (Mrs. R. J. Watson) was presented to the Society and received as correct.

Election of Office-Bearers for the year 1946-1947:—

President: Mr. A. E. Watson.

Vice-Presidents: Messrs. F. J. Ludowici, E. A. Hamilton, and E. H. Zeck.

Hon. Treasurer: Mrs. R. J. Watson.

Hon. Assistant Treasurer: Miss D. Ross.

Hon. Secretary: Miss D. Dobbin.

Hon. Assistant Secretary: Mrs. R. J. Watson.

Hon. Editor: E. H. Zeck.

Hon. Lanternist: Mr. Searl.

Hon. Assistant Lanternist: Mr. G. White.

Hon. Librarian: Miss M. Quinn.

Hon. Assistant Librarian: Miss M. Davidson.

Other Members of Council: Messrs. C. S. Ashley, W. Campbell, E. S. Davies, C. K. Ingram, S. T. Turner; Mesdames P. Messmer, M. Morris, B. Welch; Misses Boulter, Hughes, and N. Jefferson.

Address.—Owing to the absence of Mr. Forde, Chief Chemist, Vacuum Oil Co., through illness, an illustrated address on various types of oils and motor spirits was delivered by another member of the company.

Exhibition of Specimens.—At the conclusion of the business of the meeting members inspected the varied exhibits which were on display.

#### SEPTEMBER, 1946.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, September 3, 1946, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 50 members and visitors present.

Election of Members.—Mrs. Carter, Mrs. J. Lefebvre and Master J. Woods were unanimously elected members of the Society.

Nomination of Members.—Miss Kathleen Ardill (junior member), 90 Warrane Road, Willoughby. Nominated by Miss D. Dobbin, seconded by Mrs. R. J. Watson.

Resolution, Rule 8.—The resolution concerning the re-

duction in the number of councillors from 15 to 12 placed before the annual meeting was confirmed.

Members' Evening.—Mr. K. Ingram exhibited a collection of pressed plants from New Guinea. Mrs. M. Morris gave a lecturette, illustrated with lantern slides, on salt bushes, and Mr. E. H. Zeck gave a lecturette on flies, which was also illustrated with lantern slides. Mrs. Messmer discussed the work of early botanists in their study and classification of plants and trees.

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OCTOBER, 1946.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, October 1, 1946, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 50 members and visitors present.

Election of Members.—Miss K. Ardill was unanimously elected a member of the Society.

Lecture.—Mr. E. J. Bryce delivered an address, entitled, "A Trip from the Cape to Cairo." The lecture was illustrated with numerous lantern slides.

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NOVEMBER, 1946.

The ordinary monthly meeting of the Society was held in the Assembly Hall, Department of Education, on Tuesday, November 4, 1946, at 7.30 p.m.

The President (Mr. A. E. Watson), in the chair, with about 50 members and visitors present.

Nomination of Members.—Mrs. A. Glynn, Riverina Flats, Palmer Street, City. Nominated by Mrs. Clarke Chambers, seconded by Miss Dobbin. Miss T. Pitt, 141 Artarmon Road, Artarmon. Miss B. Mill, 141 Artarmon Road, Artarmon. Nominated by Miss Dobbin, seconded by Mrs. Watson. Mrs. M. Harmer, 6 Wallaringa Avenue, Neutral Bay. Nominated by Miss Dobbin, seconded by Mrs. Watson. Mr. Baxter, West Ryde Road, West Ryde. Nominated by Mr. Watson, seconded by Mrs. Watson. Mr. W. G. Hanson, 92 Marsden Street, Parramatta. Nominated by Mr. Watson, seconded by Mr. Davies.

Lecture.—Mr. S. N. Wheeler, Secretary, Manly Historical Society, gave an address on "Old Pittwater." The lecture was illustrated with numerous lantern slides.





# The Australian Naturalist

Vpl. XI

MAY, 1957

Part 8

## INSECT LARVAE

*Abstracts from Presidential Address, given at the Annual Meeting of the Naturalists' Society of New South Wales, August 7, 1956.*

By E. H. ZECK, F.R.Z.S.

In this address, the term "larva" has been used to include immature insects in their active feeding stages, which exist between hatching from the egg to the resting pupal or chrysalis stage. Biologically, the term larva means an immature stage which differs sufficiently from the adult animal to require a marked change or metamorphosis before becoming an adult, and their wings develop internally during larval life. A life-cycle of this type, in which there is a resting or pupal stage, during which no food is taken, is referred to as a complete metamorphosis.

In the other main groups of insects, such as the bugs, grasshoppers, dragon flies and many others, the wings grow as external "wing buds" or "flaps" during their development, and there is no resting or pupal stage, and therefore, the immature forms, which in general resemble the adults are usually referred to as nymphs, and life-cycles of this kind are referred to as having an incomplete metamorphosis.

There is a very great diversity of form amongst insect larvae, and numbers of larval insects that live concealed from light have no eyes, but this is not remarkable as numbers of adult insects, some of which live in ants' nests or other secluded places, are without eyes. Many fly larvae, such as those of the blowflies, house flies, and numerous others which are without eyes are repelled by light.

With few exceptions, the only eyes present in insect larvae are the lateral ocelli or simple eyes, and these are located on the sides of the head. The number of lateral ocelli is variable, and sometimes,

not always constant in the same species. In some groups there is a single simple eye present on each side of the head, while in others there may be 6, 7 or more ocelli. In the sawflies there is only a single ocellus present on each side of the head, and these are almost identical with the dorsal ocellus of certain adult insects. In beetle larvae, such as those of the water tigers, whirligig beetles and others, the lateral ocelli show the same essential structures but differ in their more detailed features. Amongst the larvae of butterflies and moths, caddis flies, and also in the ant lion larvae and other insects, each lateral ocellus has the same general structure of a single facet of a compound eye.

In many larvae, particularly those living in partial darkness, the ocelli show varying degrees of degeneration, and in some sand flies, they are reduced to a pair of visual cells with two overlying pigment cells. In the larvae of some aquatic flies, mosquitoes, and related species, the lateral eyes are comparatively unimportant, as the compound eyes are present in varying degrees of development, in close association with them, and these eventually become transformed into the completed organs of the adult.

It is well-known that many insects are capable of sound production, and the possession of organs for this purpose indicates the probability that they may also possess some mechanism for sound perception. As a rule, there is a pair of auditory organs in most of the abdominal segments and nerves from these run to the main nerve centres of the ventral nerve cord. Auditory organs have been observed in many larvae including those of the water tigers, certain scarab beetle larvae, longicorn beetle larvae and also amongst some wasps. The larvae of some scarabs have stridulating organs either on their legs or on their mouth parts, but as they live in concealed positions in the ground the significance of their sound-producing apparatus has not been adequately explained.

Numbers of insect larvae are provided with photogenic or light producing organs. In the fire-fly beetles the luminosity is known, in some species, to occur in all developmental stages and is a character of their plasma. There is a small group of fungus gnats, the larvae of which are known as glow-worms on account of their luminescence.

**BEETLES:** Beetle larvae are mostly terrestrial, but the larvae of all species of many genera, and families, are aquatic.

Most species are plant feeders and live on or in parts of many kinds of living plants, either above or below the ground. Others feed on decaying vegetation or animal matter, and numerous species

feed on stored foodstuffs and by-products from plants and animals. Some live on fungi, and many of both the terrestrial and aquatic larvae are predaceous on other insects or small animals, and some are parasitic.

There is a great variation in their body shapes, and these various forms have been given group names in order to separate them, and thus it is comparatively easy to arrange them into a graduated series of larvae.

In most instances, there is a marked similarity amongst the various species of an individual family of insects, and this is well seen in the carnivorous ground beetles, the jewel or buprestid beetles, the weevils, and the larvae of the longicorn beetles. Amongst the larvae of the leaf-eating beetles there is, however, a great dissimilarity of form.

The larvae of aquatic beetles, the whirligigs, hydrophilids or water scavengers and others have special adaptations which fit them for life in the water. The very hairy larvae of the skin or hide beetles and carpet beetles, with their dense tufts of hairs, are completely different from those of other beetle larvae.

In the jewel and longicorn beetle larvae, the head may be quite small, but in general the heads of beetle larvae are usually well-developed, and most have distinct jaws fitted for chewing, crushing or grasping. They never have abdominal legs but most species have thoracic legs which usually end, either in a single claw or a pair of claws, but in the weevils and many of the buprestid and longicorn larvae they are legless. The ends of the abdomens of many beetle larvae often bear structures which are useful in classification.

Amongst the larger aquatic beetle larvae are those of the water tigers, and these are predaceous or cannibalistic. Their prey consists of aquatic insects, tadpoles, small fish and other aquatic life. They are elongate, and active, and breathe by rising to the surface of the water to take in air through their posterior abdominal spiracles. Another group of aquatic beetle larvae are those of the whirligigs, and these have paired, elongated, lateral gills on their abdominal segments. They are predaceous and live mainly on soft-bodied aquatic insects such as the nymphs of dragon flies, may flies, or on small fish.

The larvae of the group of beetles, known as water scavengers or hydrophilids, may be found living in stagnant water in pools, lakes, or in the shallow quiet water of streams containing plenty of vegetation. Not all of the larvae of this group are aquatic, some

are sub-aquatic, and although referred to as "water scavengers", many are carnivorous.

The larvae of the carnivorous ground beetles are predaceous and are mostly active at night. The jaws of most species are sickle-shaped, and they feed on soft-bodied insects and other small animals found in, on or near the ground. Some few species live under the bark of trees, others live in burrows under stones or in the ground.

Jewel beetle larvae and longicorn beetle larvae are wood borers, chiefly in woody plants or trees. Some tunnel in the trunks and branches and in the roots, and others live just near the bark. Some species excavate oval flattened galleries throughout the sound or decaying sapwood, or heartwood of forest or cultivated trees, and some of their burrows become packed with particles of chewed up wood. Some of the longicorn larvae may be of great size.

Amongst the legless larvae of the weevils, there are numbers that tunnel into and destroy many herbaceous plants, shrubs and trees, and some species live in galls or tunnel into and feed within flower buds and prevent the development of seeds. Other species live in the soil where they tunnel along and feed upon the roots of various trees and plants. There are those, also, which feed within maize, wheat and other seeds.

The larvae of the ladybird beetles are mainly predaceous on various soft-bodied insects, such as aphids and mealy-bugs, and mites. They are frequently spiny and wrinkled, and often have yellow or orange bands on their bodies. In some species the entire body is covered with a white cottony secretion.

There are numbers of species of beetle larvae that feed on fungi, others that feed on decaying fruit and vegetable matter, and many that live almost exclusively in seeds.

The skin beetles and carpet beetles destroy fabrics made from wool, silk, leather and other animal tissues.

Click beetle larvae usually have hard, cylindrical, glossy bodies and the ends of their abdomens generally terminate in variously shaped processes, which are useful in determining the species. They are mostly soil-dwellers, and live on decaying vegetable matter, but many species are predaceous on other insects.

The larvae of the furniture beetle attack pine and other softwoods, and those of the powder post beetles attack the sapwood of hardwood and brushwood timbers.

Amongst the leaf-eating beetles are some that feed on roots, others produce galls, and some are sub-aquatic. The larvae of the hunting beetles feed mainly on insects destructive to bark and wood, and attack the larvae of shot-hole borers, longicorn larvae and others.

*ANTS, BEES, WASPS AND SAWFLIES:* The larvae of these insects may be divided into two main groups. Those in which the larvae are leaf-eating or wood-boring, and have large rounded heads and well developed thoracic legs, and those in which the larvae either live as parasites, or in cells or nests and combs and have small heads and are legless grubs.

The larvae of the leaf-eating sawflies feed upon the foliage of eucalyptus, tea trees and various other plants. Many of these larvae, during the day, cluster in a mass on the end of a twig and are commonly referred to as "black caterpillars". They have only three pairs of strong thoracic legs. Some of the other members of this group of leaf-eating larvae feed individually on the foliage, and many have a long tail-like end to their bodies. There is one species that feeds on brambles, that has two long tail-like elongations from the end of its abdomen. A small species of sawfly larva at times almost completely defoliates cypress pines in some areas.

Another species of sawfly larva lives within the tissues of eucalyptus foliage and causes leaf blisters to form.

The introduced cherry slug larvae feed upon the foliage of cherries, pears and hawthorns. These larvae become covered with a dark slime-like exudation. Many of the foliage-eaters, in addition to the thoracic legs, have 7 or 8 pairs of prolegs, but the ends of these never have the little hooks or crochets found in moth caterpillars.

Amongst the legless larvae that live in social colonies in cells, or combs are the honey bees, and these are fed on honey and pollen by the adults. The paper nest wasps also live in communities, and their legless larvae, which develop in cells of the nest are fed daily by the worker wasps with masticated caterpillars, and other small insects.

The larvae of the evaniid or hatchet-bidied wasps are parasitic on the larvae of longicorn beetles, and the eggs of other insects, and those of the ichneumon and braconid wasps are mainly parasitic on caterpillars. The larvae of many species of wasps feeds upon paralyzed spiders which are stored for them in burrows, and the larvae of the hairy flower wasps feed upon the body fluids of scarab beetle larvae in the soil.

The larvae of the solitary mason wasps develop in clay cells which are stocked with caterpillars, and the larvae of certain cuckoo bees in the well-stocked nests of the larvae of solitary bees. The larvae of the leaf-cutter bees fed upon pollen and nectar stored in nests made in old stumps and posts. The legless larvae of ants are carried from place to place in the nests as conditions require, until fully-fed. The larvae of carpenter bees develop in cells, usually made in the dead flower stalks of grass trees, and each cell is stored with a large ball of bee-bread consisting of pollen and honey.

In the order **NEUROPTERA**, which includes the nerve-winged insects, contains the ant lions, lace wings, dobson flies and alder flies, the larvae in general are active and predatory and have well-developed legs. This group may be divided into two main sections. Those larvae which have normal biting mouthparts, and in Australia, are aquatic and have a series of paired abdominal gills, and—those in which the larvae are mostly terrestrial or live on plants, although some are aquatic or semi-aquatic, and these are all remarkable in having the jaws and the second pair of jaws or maxillae co-ordinated to form a pair of sucking organs for the extraction of the body fluids of their victims.

The larva of the dobson fly (included in the first group) is a fiercely carnivorous cylindrical grub, found under rocks in streams. It has 8 pairs of abdominal gills. In the alder flies the larvae have only 7 pairs of segmented gills and a terminal filament.

In the second group, that are mostly terrestrial, the larvae are predatory and active, and have well-developed thoracic legs. A few species are aquatic or semi-aquatic. The silky lace wing larvae are somewhat broad, and flattened, and covered with greyish pubescence. They have large calliper-like jaws and live under the bark of eucalypts. The larvae of the green lace wings, and the brown lace wings, are amongst those most frequently seen on plants. They wander at large, and seize aphids and other soft bodied insects with their jaws and suck their body fluids. The larvae of the sand dwelling ant lions are stout bodied with large jaws curved inwards at their tips, and having at least 3 teeth on each. The pit forming ant lion larvae bury themselves at the bottom of their pits to await for unwary insects to fall in, to be impaled by the sharp waiting jaws.

**SCORPION FLIES:** The larvae of the scorpion flies are caterpillar-like, with biting mouthparts and 3 pairs of thoracic legs. They are terrestrial, except in one group which is considered to be either wholly or partially aquatic. Their popular name has been given to them, as in the adult males the abdomen is curled over the back in a somewhat similar manner to that of the scorpions.

*FLIES:* In the true flies the adults may be recognised usually by having only a single pair of wings. The variety of shapes amongst the larvae is extremely great, but they have one character in common, and that is that they never have true thoracic legs. Some of the hover fly larvae which live in ants' nests, and feed on ant larvae, closely resemble crustaceans or slaters. There are other hover fly larvae that develop in liquid decaying substances and these have cylindrical bodies, the posterior ends of which terminate in long tail-like breathing tubes which they push through the water surface to take in air, and there are also flat strap-like larvae which live in decaying vegetable matter, and elongate slender-bodied therevid maggots which are parasitic on various soil dwelling insects.

The most primitive types of fly larvae are those with well-developed heads or head capsules, and this is well shown in the larvae or wrigglers of mosquitoes. Numbers of fungus-feeding and other fly larvae also have well-developed rounded heads, and rather narrow, parallel-sided bodies.

In the crane flies only the front portion of the head is well-developed and the head can be completely withdrawn into the prothorax. In many of the other groups their heads are greatly reduced and usually they have only hook-like jaws which are capable of great retraction into the prothorax, these forms are true maggots.

The number of breathing pores or spiracles may vary from an anterior pair, in the true maggots, to as many as 8 pairs, or sometimes more on the abdomen in the primitive types. Some species have no breathing pores, but take in air through their body integument.

Many fly larvae are plant feeders, others are scavengers and feed amongst decaying vegetables or animal matter, and numbers are true parasites either of insects or larger animals, and some feed on rust spores which develop on plants. Some of the plant-feeding larvae are amongst the most serious pests that orchardists and horticulturists have to cope with.

The larvae of many midges inhabit slow streams and ponds and even water troughs. Two pairs of elongate blood-gills may be present on the 11th segment, and 2 pairs of small anal gills are usually present at the end of the abdomen. A pair of false legs may be present on the thorax. Numbers of these larvae are red owing to the presence of haemoglobin dissolved in the blood plasma, and these larvae are known as "blood-worms". The larvae of surface frequenting midges are usually green. The small black-headed larvae of fungus gnats are common pests of cultivated mushrooms.

Amongst the flies there are larvae known as "glow worms". They spin webs in damp crevices and on moist rocks, and move about actively. Some of their colonies are of great size and their luminescence in the famous Waitomo caves in New Zealand is considered to be unequalled elsewhere in the world. They also are found in vast numbers at Bundanoon in New South Wales.

The larvae of mosquitoes can only live in water, and have to rise to the surface to take in air through their two main tracheal tubes which open at the end of the siphon situated at the tip of the abdomen.

There is one interesting group of flies known as "bladder flies" on account of their large thorax and abdomen, or sometimes as the small-headed flies on account of their small heads. One American entomologist expressed the opinion that, "One might expect that with such a tiny head they would be so utterly brainless that they could do neither good nor bad." These small flies lay their eggs in masses on the ends of twigs, usually in the vicinity of spiders' webs, and when the humidity becomes high the eggs hatch and the young larvae cluster together to await for a spider to come within their reach.

There are numerous other fly larvae, amongst which are those that infest cheese and meats, fermenting fruits, jams and pickles, and there are also fly larvae that live in the nasal cavities and cranial sinuses of sheep and other animals and one that lives in the tracheae of kangaroos, and some live naturally as parasites within the bodies of herbivorous animals. There are fly larvae also that live in the nests of various birds, and are subcutaneous parasites. They pierce the bodies of the nestling birds with their jaws and feed upon their blood, thus causing the young birds to die. Some species of mosquito larvae have developed predatory habits and feed upon other mosquito larvae. There are also flies, such as the wingless blood-sucking sheep ked, that at intervals produce fully-fed larvae or maggots, which then enter the pupal stage attached to the animal.

*FLEAS*: Flea larvae are active and worm-like. They have well developed heads, but neither eyes nor legs, and their bodies are sparsely covered with hairs, and their jaws are toothed. At the end of the abdomen there is a pair of spine-like processes. In this stage they are non-parasitic and feed upon particles of organic matter found in resting places of animals, or amongst the dust which collects around them, or under the edges of carpets or linoleums and in floor cracks. The larvae dislike light and when disturbed move rapidly with writhing movements. After feeding and moulting twice the larvae spin cocoons which are covered with particles of dust or other substances on the outside. It appears to be necessary, for the larvae



of some species, to feed upon undigested blood passed through the bodies of adult fleas.

*CADDIS FLIES*: In this group the larvae are sub-aquatic and are mostly more or less caterpillar-like in form, and usually live in cases. Their bodies are generally terminated by hooked appendages, and in some species the larvae are somewhat silverfish-like in form. The cases in which they live are formed of silk to which particles of sand, leaves and stalks, or pieces of sticks and other substances are attached to the outside.

*BUTTERFLIES AND MOTHS*: Practically all the larvae of butterflies and moths are of terrestrial habits, but a few species of pyralid moths live in moving water under webs or on stones or submerged vegetation. Most feed on the foliage, stems, roots, buds, blossoms and fruits, but some species tunnel in leaves or feed in seeds. Many, which may be of great size, tunnel into the trunks of trees. Other species feed in dried fruits and cereal products, animal products such as wool, feathers and other substances and some are predaceous on scale insects.

All butterfly and moth larvae have a distinct head with chewing mouth parts, and most species have several simple eyes or ocelli, small antennae and spinnerets. The ocelli are arranged in a semi-circle, and are situated on the sides of the head close to the base of the mandibles. They also have 3 pairs of thoracic legs and, depending upon the particular family, a number of prolegs which may vary from 2 to 5 pairs on their abdominal segments. In many of the leaf-mining moth larvae all the prolegs and even the thoracic legs may be absent.

The bodies of caterpillars are usually covered with simple hairs, but in some families dense groups or tufts of hairs are to be found, and there are many species that have stinging hairs. Numbers of caterpillars have rosettes of stinging spines which they are able to erect when disturbed, and some have tubercles on their bodies which bear small non-stinging spines. The larvae of many species of moths have a characteristic attitude when resting or walking and often by this, one may recognise the particular group to which they belong.

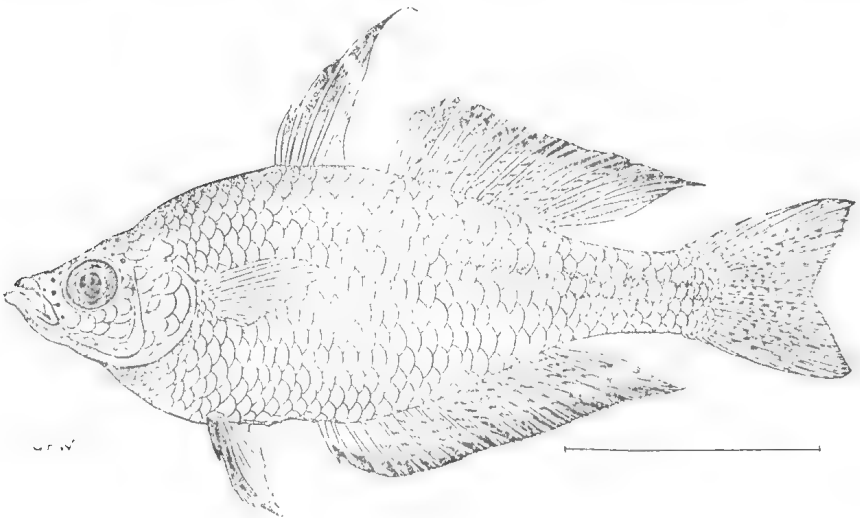
The larvae of one species of blue butterfly feed on the foliage of the black wattle and the golden wattle. The eggs which are laid mostly about the base of the tree are covered over by ants, and when the eggs hatch the caterpillars, at night, are guided up to the foliage by the ants, and after they have obtained sufficient food, they are guided back again to their byre at the base of the tree. The ants obtain a sweet secretion from glands on the bodies of the larvae.

## FRESHWATER SUNFISH FROM WESTERN NEW SOUTH WALES

By GILBERT P. WHITLEY

(Contribution from the Australian Museum, Sydney)

The freshwater sunfish (*Melanotaenia*) from the Murray-Darling river-system has been confused with *M. nigrans* (Richardson) from the Northern Territory. Rendahl<sup>1</sup>) demonstrated that the two were separate species when he named the New South Wales one *M. neglecta*, but Castelnau<sup>2</sup>) had previously bestowed the name



*fluviatilis* which must be used for it. I have examined numerous specimens of both species in the Australian Museum to confirm Rendahl's findings and now offer an illustration of a specimen of the same standard length as Rendahl's type and from the type-locality. The Murray-Darling sunfish may be distinguished from the northern Australian one as follows:—

- A. Predorsal space more than 46 per cent. (mostly 48 to 50 per cent.) of distance from snout to joint at base of tail (standard length); anal fin inserted at about the same level as first dorsal origin. Depth of caudal peduncle (the butt of the tail) rarely less than 12 to 15 per cent. of standard length (northern Aust-

- ralian rivers) ..... *M. nigrans* (Rich).
- B. Predorsal space less than 46 per cent. (40 to 45 per cent.) of standard length; and fin inserted below middle of first dorsal fin. Depth of caudal peduncle rarely more than 9.5 to 12 per cent. of standard length (Murray-Darling system and river-captures in northern New South Wales and southern Queensland).

*M. fluviatilis* (Cast.)

FOOTNOTES:

- (1) Rendahl, Medd.Zool.Mus.Kristiania v, 1922, pp. 179 and 181. Cudgegong River at Rylestone, New South Wales.
- (2) Castelnau, Proc.Linn.Soc.N.S.Wales iii, 1878, p.141, as *Aristeus*. Murrumbidgee River (type) and Rope's Creek, N.S.Wales.

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EXPLANATION OF FIGURE

Sunfish, *Melanotaenia fluviatilis* (Castelnau). Topotype of *M. neglecta* Rendahl, from Cudgegong River, New South Wales; collected by Mr. A. G. Hamilton in 1886. Australian Museum no. 1B.3380. The line represents one inch to the same scale.

G. P. Whitley del.

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## Editorial . . .

**T**HIS ISSUE of the "Australian Naturalist", Part 8, completes volume XI. The index to this volume will be issued later.

It is hoped that further issues of the Journal will be produced at regular intervals, and that members will contribute notes on original observations of interest to naturalists generally. The manuscript submitted, preferably typed and double spaced, or otherwise written very legibly, should be on only one side of the paper.

The first issue of the "Australian Naturalist" appeared in January, 1906, some fifty-one years ago, and since that time, many articles and notes of both popular and scientific interest, together with other items, have appeared in its pages.

The early meetings of the Society were held in various places, but for over a period of some 30 years, prior to about the end of 1949, the monthly meetings of the Society were held in the Assembly Room of the Education Department, but owing to this room being required for office space the Society had to find other accommodation. Various meeting places about the city were tried, but for diverse reasons were found to be unsuitable, and since early in 1950, the meetings of the Society have been held in the Salvation Army Headquarters' Building.

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## INSECTS AFFECTING BURRS IN WESTERN NEW SOUTH WALES

By C. E. CHADWICK (*Department of Agriculture, Sydney*)

Native burrs, *Bassia*, spp., are occasionally subject to attacks by insects, and sometimes suffer extensive damage.

In October 1951, the attention of the Department of Agriculture was drawn to extensive damage to burrs on "Quabathoo" station, north-west of Coonamble. It was stated that thousands of acres of the burr had been devastated and that damage was continuing.

The burrs were first noticed to be affected in July, and a larva, said to be working from the roots upward, was considered to be responsible for the death of the plants. The damage continued to be obvious in the following month, and by the middle of October, it was considered that two-thirds of the burr on the station was dead. The devastation continued for some months and in November 1952, the manager of the station reported that:- "Of approximately 11,000 acres of burr there are only about 10 acres of green burr left on the place, and as the grub is still in this, it also is commencing to die. I have noticed from time to time, an individual plant shooting again, but it eventually dies off. In addition to the *bassia* burr, the black roly was also attacked and cleared right out. The latter grub was slightly different from the former, although it appeared to work in the roots in exactly the same way."

Specimens from the districts showed that the plants attacked were Galvanised Burr, *Bassia birchii*, and Black Roly Poly, Buckbush or Electric Burr, *B. quinquecuspis* var. *villosa*.

Further reports in February 1952, indicated that similar damage had occurred on other stations in the district, e.g. Wingadec to the north and Bimble to the east of Coonamble. In the Bimble area it was estimated in May 1952, that at least 75 per cent. of the growth had been destroyed. Damage to burrs was also reported at Collarenebri, and from Collarena station, north-east of Bourke. In March of that year it was reported that large areas of galvanised burr had died out on "Uloma" station at Baan Ba, but the cause of the plants dying had not been ascertained.

Damage in all instances was said to occur in the butts of the plants just above and below ground level.

Examination of a large number of roots resulted in the recovery of several species of insects, the most common being the weevil, *Elaeagnu doddi* Marshall, of which adults were found in October 1951, from Carinda and Coonamble material and in November 1952, from Coonamble. A specimen of *E. humeralis* Marshall, was obtained from Carinda in October 1952. The weevil, *Belus bassiac* Marshall, was found in material from Coonamble in January 1952. In October 1952, a longicorn beetle, *Corrhencs picta*, Pascoe, was recovered from Coonamble material. An ichneumon wasp, *Netelia gracilis* Morley, emerged from a pupa found in material from Coonamble in October 1952, but it could not be associated with any particular host, and its presence may have been accidental. Roots of *Bassia birchii*, obtained from Coonamble early in April, contained large white moth larvae which could not be reared to maturity. The wood moths, *Xylcutes amphiplecta* Turn. and *X. cremonoma* Turn. have been bred from native *Chenopodiaceae*. Pupae, from which an undescribed robber fly, *Laphria* sp., family *Asilidae*, later hatched, were obtained from galvanised burr from "Quabathoo" in December 1952.

The life histories of the insects concerned could not be deduced from the material available, but in the case of *E. doddi*, larvae, prepupae and pupae were found early in October 1952. One insect pupated overnight, between October 8 and 9, and was a freshly emerged adult on the morning of 29. Another larva pupated between the afternoon of 10, and the morning of 13, and became an adult on 30. G. H. Hardy considered that the life history required more than a year for completion.

About 20 years ago Hardy studied the insects associated with the *Chenopodiaceae* in southern Queensland, and delivered an address on the subject to the Entomological Society of Queensland in November 1936, but unfortunately this paper was never published.

In more recent years, the Biological Section of the Queensland Department of Public Lands has been carrying out work on insects affecting *Chenopodiaceae* in that State, but no results have yet been issued.

## ANIMAL MIGRATION

By J. E. ROBERTS

Wherever life exists in the mass there is a tendency to movement. In some cases the whole population vacates the area in which it lives to move to another, which may be a thousand miles away. Here they spend perhaps half the year and then return to the original site. We call this true migration. In other cases there is no return or they may move only a short distance and remain in the same vicinity.

In the insect world there is usually no return. Our grasshoppers or plague locusts, assemble and set out on a journey from which there is no return; it ends in extermination for that particular assembly, but they leave the seeds of life behind them to carry on the next generation. The lemmings (small rodents like miniature rabbits) in the northern hemisphere, set out on a journey over mountains, lakes, rivers or even towns, till they reach the sea. Here they plunge bravely in and swim out to the unknown; they are never heard of again.

The story of the eels too was a mystery for many years. We saw them in our rivers and ponds, grow to maturity and one day set out on a journey from which they have never returned. A Swedish naturalist undertook research on the question and followed them to the mid-Atlantic and there the young eels were born in the depths of the sea. The strange part was that when they left Europe there was no indication that they had reached sexual maturity. The adults never returned, but the young, like transparent leaves, soon embarked on a return journey of thousands of miles and reached Europe two or three years later, grown from six inches to eighteen or more, and entered the river mouths to repeat the life-cycle of their ancestors. Perhaps, in these cases a better term would be to call it an emigration. The great whales, seals and other denizens of the sea make successful migrations of thousands of miles also, and so afford mankind an opportunity to take heavy toll.

The migration of birds has always attracted the attention of man and in the days when no scientific attempt was made to solve the problem's mystery, some queer reasons were advanced to account for the phenomenon. Dr. Samuel Johnson is quoted as saying "Swallows certainly sleep all the winter. A number of them conglobulate together, by flying round and round, and then all in a heap throw themselves under water and lie in the bed of the river."

We are wiser now and know where many of them go, when they set out and when they return. The modern idea of banding birds has given us certain definite knowledge and information, and we have discovered that many of the birds from northern Europe undertake a journey as far as South Africa. A swallow banded in England for instance has been seen in that country and known to return to the same roof under which it was born in England. In all migrations the custom is to winter in the warm zone and to return to the colder to nest and rear the young.

All this is quite definite, but when we try to follow, (mentally), these birds and ask ourselves how they find their way, and many other questions, there is no answer. Some of the young birds do not leave till all of the older ones have departed so there is no one to show the way. How do they maintain direction once started? How do they know they have arrived at their destination? Why do they not keep on flying in the same direction? We say they "inherit a sense of direction", but we are just acknowledging the fact that we have no answer. We leave it to "The Giver of all Gifts".

Scientific inquiries are not satisfied to leave it at that and set out to unravel the mystery. Man is an inquisitive atom and wants to know what lies beyond the farthest stars. Human beings have certain organs with definite functions, eyes to see, ears to hear, and there must be a sensory organ to convey all impulses to the brain; and he searches in vain for such in the bird. So we have to admit that the so-called lower animals have something so far beyond our comprehension that we cannot conceive its existence. Nevertheless, men are still searching for the answer.

It has been proved that bats can fly in darkness because they emit sounds in flying which impinge on objects ahead and echo back a warning, ants orientate themselves by polarised light from a clear sky, bees guide their fellows to a newly discovered source of nectar flow in the same way, and birds released to fly home will succeed if the sky is clear, but fail badly when it is cloudy. By using a glass pavilion, Von Kramer found that birds tend to fly in the correct migratory direction by using the sun as a guide and when by artificial means he moved the sun through 60 degrees, the birds altered the direction to the same degree. The inference being that they orientated themselves in migration, by using the sun as a guide.

"Others have tried the theory of their flying by using a magnetic field and Cariois force. An American scientist experimented with this last idea and after many experiments announced that he had proved the theory. but very soon it was found that he had erred in his assumptions.



Migrations in the northern hemisphere attract much attention as they are on a grand scale and easily seen. In Australia they are seldom noticeable and only seen by a few. We have the birds with us for a certain time and one day realise that they are absent. Most of them set off at night and return in small groups, and one is fortunate to be in the line of flight. Sea birds around our coast are often visitors for the summer. They do not nest here and we assume that they go north and rear their young in Japan or Siberia, because that is where the young are found. Some work has been done in banding mutton birds on the Tasmanian coast, but to date not one has been picked up in northern latitudes, so we are not sure where they go. We do know that they leave at a certain time and many return to the same burrow.

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**“SHANGI”—A MUCH TRAVELLED CRICKET**

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By A. M. LUDOWICI

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En route to Japan and north China, we visited Shanghai, and while searching for essentials and novelties in the shops along Bubbling Well Road, I espied a small Chinese boy holding a wee wicker cage measuring about 2 inches square, wherein was enclosed the subject of this article—a “long-horned-cricket”, or “grasshopper”.

The lad seemed loth to part with his pet, but the sight of my proffered dollar proved the deciding factor, and “Shangi” started on an eventful voyage through Japan, north China, Mongolia and back again through Shanghai to Manilla-Singapore, where the ants attacked it, and I lost a much prized companion, whose journeyings with me covered more than half a thousand leagues—possibly the longest journey ever of a live cricket.

From a wee cricket measuring little more than an inch in length, it grew to be a sturdy specimen, 4 inches in length, whose slender feelers folded back beyond the tip of its body and were extended forward to greet me when I approached to proffer food, and it would respond to my call with cheery notes and poke its nose through the cage and muzzle up and rub noses with me in friendly Maori fashion.

No liquid refreshment passed its “lips” but a constant supply of titbits, such as cooked chicken and greens, lettuce and eschalots and fresh fruit provided the fuel whereby its bulk was trebled in three months, so necessitating increased accommodation from time to time; and as it grew, as if in return for the careful feeding, we were regaled by its quaint antics during its daily grooming at “peep of day”; and with staves of music, so cheerful and unusual as to provide a welcome change to the strident notes emanating from the ship and hotel orchestras. It never performed at night. Aboard ship and in trains our apartments were often visited by curious minded fellow travellers attracted by the quaint musical notes of this, one of nature’s greatest instrumentalists. Placed in my handbag it remained discreetly silent as if sensing danger when entering customs and railway barriers. During its performance the “undercarriage” of its body was inflated and thus made contact with the frontal horns on the hind legs, much to our delight.

It must have been a Chinese cousin of our Australian longhorned grasshopper or tree cricket, *Paragryllacris combusta*, for there was a similarity in size and conformity, though I have never heard of any music or noise emanating from the Australian species.

Our short though very pleasant acquaintance came to an untimely end at Singapore, where during a period of indisposition, supervening on vaccination, my little friend had become slightly entangled in a piece of cotton wool attached to the cage. Some bleeding occurred and this attracted myriads of tiny brown ants. In my feverish condition I was powerless to heed plaintive cries for help that night, and by the morning little remained of a treasured pet.

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## A WHITE WREN

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By C. V. NATHAN

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In my Sydney suburban garden, about mid-February, 1953, I noticed a brown wren, *Malurus cyaneus*. Nothing unusual about that, but on further examination I saw that this little bird had a whitish tail tinged with blue.

At the end of that month an observer next door remarked that there was a curious wren with white in its "make-up". From then on I began to take more notice of it, and by April its wings were becoming very white at their bases, and also the nape of the neck had a white patch. By this time I had come to the conclusion that it was a male bird, because a slight trace of blue persisted in its tail. At the end of September the only brown that remained was in the tips of the wing feathers. It was a brave little bird and stood up for its "food-rights" with other contestants.

Early in 1954, I was informed that it had been seen feeding a young wren and came to the conclusion that this was its first offspring.

During the dry winter it became quite dirty in appearance and had also acquired the habit of flying direct to the highest branches of tall trees, and even settling on to overhead cables. Following on rain, this animated speck of bird life, became quite clean.

At least three times a day; it comes to the lawns; at about 7 a.m., 12.40 p.m. and 5.20 p.m., in search for food.

A further observation made on April 30, 1956, has shown that both the white wren and the female are still alive and that they have two offspring, a female and a male which has blue and brown plumage; both offspring being normal in colour.



ROYAL BOTANIC GARDENS MELBOURNE



RBGM00009737

