THE TRANSACTIONS

OF THE

SOUTH AFRICAN

PHILOSOPHICAL SOCIETY.

VOLUME VI.

1889—1890.

CAPE TOWN:
PRINTED FOR THE SOCIETY BY MURRAY & ST. LEGER.
1890.

COUNCIL

OF THE

South African Philosophical Society

FOR 1889—1890.

L. Péringuey, F.Z.S., *President.*

Hon. C. A. Smith, M.A., *Treasurer.*

David Gill, LL.D., F.R.S., F.R.A.S., *General Secretary.*

J. H. Meiring Beck, M.D.

H. Bolus, F.L.S.

W. H. Finlay, M.A., F.R.A.S.

Rev. G. H. R. Fisk, C.M.Z.S.

F. Guthrie, LL.B.

P. MacOwan, B.A., F.L.S.

R. Marloth, M.A., Ph.D.

R. Trimen, F.R.S. F.L.S., F.Z.S.

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Ordinary Monthly Meeting.

WEDNESDAY, AUGUST 28, 1889.

MR. L. PERINGUEY, F.L.S., PRESIDENT, IN THE CHAIR.

Dr. Waterston and the Rev. R. R. Vyvyan were duly elected ordinary Members of the Society.

The following donations were announced and the thanks of the Society voted to the donors :

Journal and Proceedings of the Royal Society of New South Wales, Vol. XXII, Part II.

Proceedings of the Royal Physical Society of Edinburgh, 1887-88.

Annual Report of the Leeds Philosophical and Literary Society, 1888-89.

The Rev. G. H. R. Fisk exhibited a remarkable Ribbon Fish which had been picked up dead on the beach at Kalk Bay.

Special Meeting.

MONDAY, SEPTEMBER 16, 1889.

Professor H. G. Seeley, F.R.S., gave a most interesting account of his tour through the Colony in search of fossils.

Ordinary Monthly Meeting.

WEDNESDAY, NOVEMBER 27, 1889.

MR. L. PERINGUEY, F.L.S., PRESIDENT, IN THE CHAIR.

The Rev. J. Hyndson and Mr. Advocate Juta were duly elected ordinary Members of the Society.

The following donations were announced and the thanks of the Society voted to the donors :

Litteratur der Landes und Volkskunde des Königreichs Sachsen.

Jahrbücher der K. K. Central Anstalt für Meteorologie und Erdmagnetismus, 1887.

Victorian Year Book, 1887-88, Vol. III.
Report of the Trustees of the Australian Museum, N.S.W., 1888.
Bulletin de la Société Imperiale des Naturalistes de Moscou, 1889, No. 1.
Feuille des Jeunes Naturalistes, No. 226.
Feuille des Jeunes Naturalistes, Catalogue de la Bibliothèque.

Dr. Gill, in the absence of Mr. Finlay, gave notice that at a Special Meeting to be held immediately before the next ordinary Monthly Meeting he would move: "That the Annual Subscription of Members residing more than twenty-five miles from Cape Town be reduced from £2 to £1.

Mr. Melville Smith, Electrician to the Harbour Board, exhibited a Graphophone which he had recently received on loan from the inventors.

Dr. Gill gave an interesting description of the instrument, and the Members then availed themselves of the opportunity of listening to the sound of music, &c., reproduced by it.

The Rev. G. H. R. Fisk read several short communications upon Natural History and asked Members to do their best to place him in the way of obtaining specimens of the mole-rat for forwarding to the Zoological Society. He also read some notes upon Sea-snakes with especial regard to one particular variety, the *Pelamis Bicolor.*

Special Meeting.

WEDNESDAY, JANUARY 8, 1890.

MR. L. PERINGUEY, F.L.S., PRESIDENT, IN THE CHAIR.

Mr. F. C. Selous exhibited a map of Zambesia and gave a most interesting description of the country and its inhabitants.

At the conclusion of the address, Mr. Justice Buchanan made some remarks to which Mr. Selous replied, and the Meeting closed with a hearty vote of thanks to Mr. Selous for his valuable address.

Special Meeting.

WEDNESDAY, JANUARY 29, 1890.

MR. L. PERINGUEY, F.L.S., PRESIDENT, IN THE CHAIR.

It was resolved, on the motion of Mr. Finlay, that the following be substituted for the first sentence in Rule 6:

"Ordinary Members residing within twenty-five miles of Cape Town shall pay £2 annually in advance. The annual subscription for Members residing beyond that limit shall be £1."

Ordinary Monthly Meeting.

WEDNESDAY, JANUARY 29, 1890.

MR. L. PERINGUEY, F.L.S., PRESIDENT, IN THE CHAIR.

The undermentioned gentlemen were duly elected ordinary Members of the Society :

DR. W. J. DODDS,	MR. P. RYAN,
REV. C. ATKINSON,	MR. M. TAIT, JUN.,
MR. J. A. LIEBMAN,	MR. W. G. FAIRBRIDGE,
MR. G. T. AMPHLETT,	MR. R. W. S. GIDDY.

The undermentioned Books were received and the thanks of the Society voted to the donors :

Bulletins de l'Academie Royale des Sciences des Lettres et des Beaux-Arts de Belgique, 1888-1889. 2 volumes.

Annuaire de l'Academie Royal des Sciences des Lettres et des Beaux-Arts de Belgique, 1889.

Memoirs and Proceedings of the Manchester Literary and Philosophical Society, 4th series, vols. I and II.

Results of Meteorological Observations made in New South Wales during 1887.

Results of Rain, River and Evaporation Observations made in New South Wales during 1888.

Estudio de la Filosofia y Riqueza de la Lengua Mexicana por el Presb. Augustin de la Rosa.

Annales del Ministerio de Fomento de la Republica Mexicana, Tome VIII.

Feuille des Jeunes Naturalistes, Nos. 229, 230.

Transactions and Proceedings and Report of the Royal Society of South Australia, Vol. XI, 1887-88.

Contributions to Canadian Palæontology, Vol. I.

Nouveaux Memoires de la Société Imperiale des Naturalistes de Moscou, Tome XV, Livraison 6.

Prodromus of the Zoology of Victoria, Decade XVIII.

The President exhibited a possible stone weapon of singular shape—hatchet shape—which had been found on the beach at Simon's Bay.

Professor Cleveland Abbé, of the United States Signal Service Weather Bureau, then delivered an address on "The Modern Weather Service."

Ordinary Monthly Meeting.

WEDNESDAY, FEBRUARY 26, 1890.

MR. L. PERINGUEY, F.L.S., PRESIDENT, IN THE CHAIR.

Dr. Schönland and Mr. H. W. Struben were duly elected ordinary Members of the Society.

The undermentioned donation was announced and the thanks of the Society voted to the donor :

Contributions to the Micro-Palæontology of the Cambro-Silurian Rocks of Canada, Part II.

Mr. Bolus exhibited some sketches of Orchids found in the Cape Peninsula.

Dr. Marloth then read his paper on "Some Adaptations of S.A. Plants to the Climate."

After a vote of thanks had been passed to Dr. Marloth for his paper.

The President exhibited some long-horned Beetles which had been devastating the orange trees of the Eastern Province.

Ordinary Monthly Meeting.

WEDNESDAY, MARCH 26, 1890.

MR. L. PERINGUEY, F.L.S., PRESIDENT, IN THE CHAIR.

The following donations were announced and the thanks of the Society voted to the donors :

Proceedings of the Canadian Institute, Toronto, October, 1889.

Feuille des Jeunes Naturalistes, No. 232.

Second Systematic Census of Australian Plants, Part I.

The President exhibited some eggs of a tick (*Ixodes Libræus*) found in the Eastern Province. In answer to a question by the Rev. G. H. R. Fisk, the President said he was of opinion that particular animals were affected by special ticks. In Madagascar there was one which specially affected fowls. Mr. Fisk further asked if there was any animal not subject to ticks, but none was known to anyone present.

The President also exhibited some figures of Beetles which were to illustrate his work on S. A. Beetles.

Mr. T. Stewart read a short note on an example of "Denudation and Weathering."

The thanks of the Society were voted to Mr. Stewart.

Ordinary Monthly Meeting.

WEDNESDAY, MAY 28, 1890.

MR. R. TRIMEN, F.R.S., IN THE CHAIR.

Mr. C. Cochrane, Mr. W. T. Webb and Mr. G. Trill were duly elected ordinary Members of the Society.

The undermentioned donations were announced and the thanks of the Society voted to the donors :

Journal and Proceedings of the Royal Society of New South Wales. Vol. XXIII, Part I.

Catalogue of Scientific Books in the Library of the Royal Society of New South Wales, Part I.

Report of the First Meeting of the Australian Association for the Advancement of Science.

Mémoires de la Société Académique Indo-Chinoise de France. Vol. I, 1877-78.

Feuille des Jeunes Naturalistes, Nos. 233, 234.

Bulletin de la Société Impériale des Naturalistes de Moscou, 1889, No. 3.

Annual Report of the Geological and Natural History Survey of Canada. Vol. III, Parts 1, 2.

Annual Report of the Canadian Institute, 1888-89.

Prof. MacOwan exhibited a specimen of the *Welwitschia Mirabilis* from Walfish Bay.

Mr. Trimen exhibited two female specimens of a saturniid moth, *Heniocha Grimmia*, recently presented to the South African Museum by Mr. W. Ellerton Fry. This species is of much interest, owing to the long period which has elapsed since its original delineation by Hübner about the year 1820, until its re-discovery in 1889. Hübner simply noted the insect as a native of South Africa, and as far as Mr. Trimen was aware, no specimen of it had occurred in any collection made since Hübner's time. The specimens exhibited were taken at Cape Agulhas by the Lighthouse Keeper, Mr. T. Steel, who stated that they flew into the light-room one evening near the beginning of the year 1889. Mr. Trimen had seen Mr. Steel, who had promised to look out for other specimens of *Grimmia*, and hoped to secure the male insect.

Prof. MacOwan read Dr. Schönland's paper on *Cyphia volubilis*.

Messrs. Trimen, MacOwan, Marloth, Atherstone and Mr. Justice Buchanan made some remarks upon the paper, and the meeting closed with a vote of thanks to Dr. Schönland.

Ordinary Monthly Meeting.

WEDNESDAY, JUNE 25, 1890.

MR. L. PERINGUEY, F.L.S., PRESIDENT, IN THE CHAIR.

The Rev. A. A. Dorrell was balloted for and duly elected an ordinary Member of the Society.

The undermentioned presents were announced and the thanks of the Society voted to the donors :

Victorian Year Book, 1888-89, Vol. I.

Boletin del Instituto Geografico, Argentino, Vol. X, Parts 10 11, 12.

Records of the Australian Museum, Sydney, Vol. I, No. 1.
Feuille des Jeunes Naturalistes, No. 235.
Feuille des Jeunes Naturalistes, Catalogue de la Bibliothèque.
Journal of the Cincinnati Society of Natural History, Vol. XII, Parts 1, 2, 3.
The American Anthropologist, Vols. II, Nos. 2, 3, 4; Vol. III, No. 1.
Annual Report of the Geological and Natural History Survey of Minnesota, 1887.
Proceedings of the American Philosophical Society, Vol. XXVI. Nos. 129, 130.
Proceedings and Transactions of the Nova Scotian Institute of Natural Science, Vol. VII, Part 3.
Annual Report of the Canadian Institute, Toronto, 1887-88.
Proceedings of the Canadian Institute, Toronto, Vol. VII, Parts 1, 2.
Smithsonian Report, 1886, Part 1.
Proceedings of the California Academy of Sciences, 2nd Series, Vol. I, Parts 1, 2.
Proceedings of the Davenport Academy of Natural Sciences Vol. V, Part 1.
Bulletin of the United States National Museum, Nos. 33—37.
Proceedings of the United States National Museum, Vols. X, XI.
Bericht des Vereines für Naturkunde zu Kassel, XXXIV and XXXV.

Mr. R. Trimen, F.R.S., exhibited some South African specimens of the Death's-Head Moth (*Acherontia Atropos*), of Africa and Europe, and remarked on the special adaptation of this species and its Asiatic congeners (one of which, *A. Satanas*, Baird, was exhibited for the purpose of comparison with *A. Atropos*) for gaining access to honey stored in the combs of the various species of honey as "Hive" Bees, of the genus *Apis*. He called attention particularly to the proboscis of *Acherontia*, which—unlike those of most of the family *Sphingidæ*—was short, broad, stiff and acutely pointed, so as to be exactly fitted for piercing the waxen cells of the bee's honey-comb and pumping out their store of nectar.

After reference to the evil reputation which this moth had, for at least two centuries, undeservedly borne, owing apparently to its great size, skull-like mark on the thorax, and shrill squeaking cry—Mr. Trimen gave instances of the dread with which it was regarded both by Europeans and the native Africans in the Colony, many of whom stoutly alleged that the "Bee-Moth" (as they term it), could kill a man with a single sting!

It was a most interesting question how *Acherontia*, a creature without offensive weapons of any kind, can with impunity invade and plunder a hive guarded by such alert, active, pugnacious, well-armed insects as honey-bees. The accepted opinion hitherto had to all appearance been that the cry of the moth, from its resemblance to that emitted by the queen-bee under certain circumstances, exercised a restraining influence on the bees ; but the recent detailed observations in Madagascar, published by the Rev. C. P. Cory (*Antananarivo Annual, &c.*, 1889, pp. 47, 48), seem to show that, as far as the Malagasy honey-bee (*Apis unicolor*) is concerned, the cry of the Death's-Head, so far from deterring or subduing the owners of the hive, rather excited them to attack the assailant. Mr. Cory, indeed, concludes that the immunity of the moth consists partly in its bulk and strength, but mainly in the absolute inability of the bees' stings to pierce its dense coat of woolly hair and tough smooth skin, as he has seen crowds of bees clustering on the insect and vainly endeavouring to sting it. Mr. Trimen inclined to think, that while the harder parts of the moth's body might effectually resist the stings, the joints of the abdomen would not be impervious. However, this may be, the fact that *Acherontia* is by some means thoroughly protected from injury by the bees is well established.

The dependence of the Death's-Head on the Honey-Bee was also pointed out ; and in illustration of it, Mr. Trimen quoted a note by Mr. Melliss (*St. Helena*, p. 181), to the effect that the moth is said to have first appeared in St. Helena in 1835 and to have been afterwards very plentiful until 1854, when it disappeared almost simultaneously with the Honey-Bee. In 1874, when Mr. Melliss wrote, the moth had just re-appeared, Honey-Bees having been re-introduced a few years previously.

In regard to the singular cry emitted by the moth when irritated, or molested, Mr. Trimen stated that the mode of its production, so long a matter of dispute, was not yet certainly determined. Among the earlier observers, Réaumur had put it down to friction of the palpi with the proboscis ; Rösel to friction of thorax with abdomen ; Lorey to passage of air through the tracheœ at the base of the abdomen ; while Passerini placed the seat of the sound in a cavity of the head with contractile muscular walls. Recent authorities had differed much on the subject, and many different parts of the insect had been thought to be instrumental in producing the squeaking cry ; but there was room for further observation, and the hope was expressed that some members of the Society would be able to give their attention to the question. Mr. Trimen mentioned that his own experience rather militated against the view that the head contained the sound-producing apparatus, as he had found when holding the living moth by the sides of

the thorax, with the wings erect and prevented from moving, the squeaking, which was continued under moderate pressure, ceased when pretty strong pressure of finger and thumb was applied, notwithstanding the simultaneous application of irritation to the insect's head and unrolling its proboscis—a proceeding which, in the absence of strong pressure on the thorax, invariably led to loud squeaking. An observation which the speaker had not seen recorded was that *Atropos* commonly, when persistently irritated, did not pretend death or endeavour to escape, but assumed a threatening attitude by throwing up its spiney forelegs, at the same time emitting its shrill cry ; and this no doubt had something to do with the dread of the insect so widely entertained.

In evidence of the fact that *Acherontia* is sufficiently formidable or fear-inspiring to its enemies to be a "protected" group, it was mentioned that a direct and unmistakeable "mimicker" of it existed in *Macrosila Solani*, another large moth, belonging to the same family but to a different sub-family. Specimens of the latter insect were exhibited, showing that it more closely imitated *A. Satanas* than *A. Atropos*.

Dr. Gill read some notes on recent improvements in Celestial Photography. His remarks were illustrated by transparencies from Celestial Photographs exhibited by means of the lantern.

Annual General Meeting.

WEDNESDAY, JULY 30, 1890.

MR. L. PERINGUEY, F.L.S., PRESIDENT, IN THE CHAIR.

The reports of the Secretary and Treasurer were read and adopted.

The Members present proceeded to the election of a President and Council for the ensuing year, with the following result :

President : L. PERINGUEY, F.L.S.
Council : J. H. M. BECK, M.D.
H. BOLUS, F.L.S.
REV. G. H. R. FISK, C.M.Z.S.
W. H. FINLAY, M.A., F.R.A.S.
DAVID GILL, LL.D., F.R.S.
F. GUTHRIE, LL.B.
R. MARLOTH, PH.D., M.A.
P. MACOWAN, B.A., F.L.S., F.H.S.
HON. C. A. SMITH, M.A.
R. TRIMEN, F.R.S., F.L.S., F.Z.S.

In consequence of there being so few Members present, the President was requested to postpone the delivery of the Annual Address until a future occasion, and he consented to do so.

The Meeting then terminated.

REPORT OF THE PROCEEDINGS OF THE SOUTH AFRICAN PHILOSOPHICAL SOCIETY

DURING THE YEAR ENDING 31ST JULY, 1890.

1. Since the last Annual General Meeting seven Ordinary and two Special Meetings have been held. The average attendance of Members has been fourteen, and of visitors six, making an average total of twenty.

2. At the Ordinary Meetings six papers have been read on the subjects Botany, Geography, Geology and Meteorology. Notes and communications on a variety of subjects have also been brought before the Society; brief accounts of these will be found in the Notes of Proceedings.

3. A large number of presents of books has been received during the past year. A list of these will be published in the Proceedings of the Society.

4. During the year eighteen ordinary Members have been elected, and seven have resigned; the Society has lost one Member by death, and the names of seven Members have been removed from the list for non-payment of subscriptions. The total number of ordinary Members is seventy-nine.

5. At a Meeting of the Council held on October 3rd, 1889, it was resolved that the papers read before the Society should be printed as soon as possible after they are read, that a sufficient number of extra copies be printed to be circulated amongst Members at once, and that a volume be published annually as soon as possible after the Annual Meeting, including the papers read during the past year, minutes of proceedings, President's address, &c. Two papers have been circulated in this way, a third is in the Press, and a fourth will follow as soon as the necessary arrangements can be made. Some of the papers read in the conclusion of 1887 and during 1888 still remain unprinted, their publication having been unavoidably delayed, but it is expected that they will soon appear.

DAVID GILL,
General Secretary.

July 30, 1890.

THE TREASURER in Account with the "South African Philosophical Society," for the year ended the 30th June, 1890.

1889.	To Balance :	£	s.	d.	£	s.	d.		By Clerical Assistance to Hon.	£	s.	d.	£	s.	d.
July 1	Mortgage Bond ...	200	0	0				1889-	Treasurer and Secretary		...		33	0	0
	Bank Balance ...	118	19	5				1890	„ Printing	7	3	1			
					318	19	5		„ Advertising	8	12	6			
	„ Subscriptions ...	111	0	0									15	15	7
	Overpayment on Subscriptions ...		6	0					„ Hire of Side Room of Exchange		...		15	0	0
					111	6	0		„ Expenses connected with Lectures :						
	„ Interest on Mortgage Bond ...				7	0	0		Rent of Mutual Hall	3	0	0			
	„ Sale of Copies of Transactions ...				1	15	6		Shorthand Reporter...	2	2	0			
									Blackboard and Easel	1	11	6			
									Hire of Chairs ...	2	0	0			
													8	13	6
									„ Sundries		...		5	8	8
								1890							
								Jun. 30	„ Balance :				77	17	9
									Mortgage Bond ...	200	0	0			
									Bank Balance ...	161	3	2			
													361	3	2
					439	0	11						439	0	11

Cape Town, 28th July, 1890.

C. ABERCROMBIE SMITH, Hon. Treasurer.

We, the undersigned, Members of the South African Philosophical Society, hereby certify that we have examined the above Account, compared the Cash payments with the Vouchers, and the Balance with the Bank Pass-Book and Mortgage Bond, and found the same correct.

Cape Town, 29th July, 1890.

JOHN E. B. ROSE,
W. HAMMOND TOOKE, } Auditors.

ANNUAL ADDRESS TO THE MEMBERS

OF THE SOUTH-AFRICAN PHILOSOPHICAL SOCIETY,

On Thursday, August 28th, 1890,

By the President, L. Peringuey, F.L.S., F.Z.S.

PARASITIC BEES AND WASPS AND THEIR OWN PARASITES.

Most *Hymenoptera* in the adult state live on vegetable substances. The true male has only one *rôle* to accomplish, *i.e.*, to fecundate. He leads apparently an easy life, sunning himself, flying from flower to flower, half intoxicated with sun and pollen ; but let a female of his own species appear on the scene ; the behaviour of the dandy changes immediately. Fights of a severe nature will ensue between him and his numerous rivals ; he is victorious at last ; he fulfils his functions, but as a rule does not long survive.

On the female now rests the responsibility not only of laying the eggs but also of providing for the wants of the future *larva*, the small grub which will issue from the egg. She has lived hitherto in a secluded state, gorging herself upon the provisions stored for her by a mother, as careful as she herself will be, to ensure the nourishment of her progeny. She has quietly and unconsciously waited during a long period of somnolence for the attainment of her mature state. Now she must needs repeat the same cycle of existence her mother has led, and follow the same method which has insured her existence, parasites permitting.

She will not herself be a parasite, but her *larva* will. That *larva* will live at the expense of a host selected by its mother, either from provisions prepared for another *larva* or even from the host itself.

If the mother is an *Ichneumon*, let us follow her. First her passport, so that she may be identified. Head short and rounded ; eyes globular, generally very bright, three *ocelli* on the head, waist long and tri-partite, on the sides four wings of gauze, more or less mottled, abdomen very slender at the base (wasp-waist in fact), elongated, and with an appendage at the tip consisting of two long *setae* covering an ovipositor. If you do not recognize her after this description it is because, as in all passports, descriptions vary ; just as noses are differentiated in length and breadth so are the ovipositors of the

Ichneumons. But whereas noses, either long or short, do not imply a greater or lesser keenness of scent, we can from the length of the insect's ovipositor judge what kind of prey she will select for her progeny.

Let us choose this one with an ovipositor nearly two-thirds of an inch long and follow her. She is agile, supple, with legs made for running ; the *antennae* or feelers are constantly vibrating ; she walks by jerks, her wings are slightly moving and half expanded. What is she looking for ? why this continual vibration of the *antennæ*, these half-expanded wings ? Is she listening to a sound audible only to herself ? The most skilful physiologist has not been able, as yet, to find a special auditory vesicle (with otoliths) in an insect, and yet that power exists.

Can it be that the expanded wings act as an auricular drum, and the *antennae* as an olfactory organ ? It may be so, but we have to be very careful in building theories. While I am indulging in these conjectures I have lost sight of the insect. Has she flown ? Where is she ? I look at the other side of the bough. There she is ; but what is she doing ? She stands firmly fixed, her front legs apart, her head on the bark, her long pedunculated abdomen raised high, and the ovipositor at a right angle with the body. What a curious position ! Can it be that the insect is also affected by the stupendous heat of the sun, which sends large beads of perspiration coursing down my cheeks ? Now she changes her place, goes a few inches further, comes back, the vibration of the *antennae* ceases, the same position is again assumed, and, behold, the ovipositor disappears, with difficulty evidently ; the two blades of the sheath are open at the tip, little by little all is inserted ; with a brusque effort it is extracted again, and the *Ichneumon*, after brushing her *antennæ* with her fore legs, is off before I have time to bring my net in action. Where did she insert that long ovipositor ? I cannot find an aperture, and yet there must be one. My knife is soon at work on the half-rotten bough. I tear away with great caution. Alas ! for the caution. My last cut brings to light a small gallery, and within a grub which my knife has badly damaged. Mutilated as it is, I very soon conclude that it is the *larva* of a weevil. With the help of my magnifying glass I soon observe some slight puncture, most minute spots on some of the segments, and when I dissect it at home I find some eggs under the epidermis.

I shall now by analogy reconstruct the sequel of the evolution of the parasitic egg, and of the weevil which my knife has so soon sent to limbo. The eggs are soon hatched, and the grub will begin either sucking or gnawing all the non-vital parts of the host, and, only when it feels that its time has come will it perforate the outer teguments and spin a cocoon, generally, but not always, adhering to the skin. It

happens, however, that the weevil *larva* has already reached an advanced stage. It spins its cocoon also ; this cocoon is not made of fine silk, but of earth or agglutinised wood, and impervious to the feeble jaws of the *Ichneumon*. Both host and parasite will in that case never emerge. But, if the *Ichneumon* is able to tear itself away from its host, it will emerge on a fine day, wait a few moments to dry its teguments ; opening its gauze wings it flies, awkward, partly unconscious, with an effort that sends it against the first obstacle it meets. It soon rights itself, however, and there it flies, heedless of anything else but to seek a mate or wait for one, which will not be long.

I have just inspected a wine-farm. Seated on the stoep, my host the farmer calls my attention to the state of his oak-trees, the leaves of which are being devoured by a caterpillar. "I do not care for the damage done to the oak-tree," quoth he, "but the rispers"—I am afraid he added an adjective—"are attacking my guava-trees also." Let us have a look ; and a look we have. There in clusters are the caterpillars of *Pachypessa Pythiocampa*.

"But what are these little white appendages on the body ? Are they the eggs ?" asks my farmer friend.

"Oh no ! Each of these little bags, cocoons in fact, contain a little chrysalis of a four-winged fly. It was in its earlier stage a parasite of the caterpillar, and at or about the time when it will come out of its cocoon the caterpillar which is still alive will die."

"So !" says my friend, looking rather incredulous. Yes, it is so, and the caterpillar is carefully removed in a glass tube. Four weeks afterwards the *Ichneumon* comes out ; it is a little fellow 10 mm. long. But why an ovipositor two-thirds the length of the body ? The eggs are to be laid under the skin ; why such a length ? I build an hypothesis. Let us find out whether observations *in situ* will vouch for its accuracy. Here I have before me several clusters of the caterpillars. I espy an *Ichneumon* ; there she comes, alights upon the back of the caterpillar, and moves about a little, but with signs of awkwardness. Why ? Because the future host is covered with long tufts of hooked hairs. Were the ovipositor too short the *Ichneumon* could not reach the skin. My hypothesis proves true. I have not seen the *Hymenopteran* insect actually laying the eggs, nor have I been able to detect the eggs under the skin of the host, but I saw her puncturing and the caterpillar proved by its sudden jerk that the puncture was felt. The action is repeated three times.

These clusters of *Pythiocampa* caterpillars are capital subjects for observation. Here comes an *Ichneumon*. She makes her punctures and, certain that her progeny will find an abundant and suitable store of food, flies away, contented, I presume. I capture her before she has

gone far. There she lies dead in my killing-bottle, while I wonder whether I shall be able to classify her. I look at the caterpillar again, and there, busy puncturing, is another *Ichneumon*, only this one is longer at her work. The fourth puncture is followed by a state of semi-coma. I seize her by the wings and wait, not long ; on comes another, inflicts another puncture, followed by convulsive jerks from the caterpillar. It is time to turn homewards. I consign the caterpillar to a glass tube. Has the ovipositor touched a nervous centre, a ganglion ? Have the punctures been too numerous ? Is the somnolence of the host caused by the weather ? I cannot find out, but my caterpillar does not outlive its capture more than ten days The parasitic *Ichneumon* did not probably realise such a result for her progeny. But has she laid all her eggs within one host only ? It is doubtful. Then we have seen several eggs of parasites laid in by several parents ; but, if too many insects lay their eggs in one caterpillar, it follows that all the grubs cannot get enough sustenance from the host.

I do not believe that the *Ichneumon* is able to detect a puncture made a short time before she appears on the scene, in which case it is very probable that the host not affording sufficient nutriment to all the parasites, they will either perish before they can spin the cocoons or be a weak brood, more or less incapacitated from fulfilling their part in the economy of nature—a thing to be regretted, because of the immense services rendered to agriculture by these useful auxiliaries.

Ichneumons vary much in size, some of them reaching a length of an inch and a half, irrespective of the ovipositor. Some, the *Hybrizonites*, are so small that they lay their eggs in the bodies of the Rose Aphides.

The family *Chalcididae* is composed of an extremely large number of parasitic species more useful to us perhaps than the *Ichneumonidae* themselves. They are parasites of almost all kinds of insects ; even the *Ichneumon* are preyed upon by these diminutive flies. I remember trying to rear some caterpillars, the identity of which I was anxious to know. In due time the typical cocoons made their appearance on the back of some of my prisoners. The *Ichneumon* was rather long in emerging, one did appear at last. No more coming out, I opened the cocoons. Instead of *Ichneumons* tenanting them I found some *Chalcididae*, some of them ready to emerge and with the remnants of the skin of the *Ichneumon* in the cell. The mother *Chalcis* had deposited her eggs in the cocoons. Some species of that family are even credited with the remarkable habit of laying their eggs in the eggs of other insects.

The *Chrysididæ*, or ruby-tailed flies, bear probably the most sumptuous livery in the insect world. No gem can bear comparison with the brilliancy of their teguments. Always in motion, darting

with a velocity which baffles the eye of the observer, having the appearance of a ruby or an emerald fleeting in space, they are generally met with on flowers in summer days.

Singularly enough, they always abandon the *corolla* of a flower when another *Hymenopteron* alights on it. Could it be that they are aware that they are held in abhorrence by other *Hymenoptera* on account of their evil reputation which is so justly deserved. I do not think so. Intelligence in insects does not reach that point even among bees or wasps. The brilliancy of its coat would betray the *Chrysis* anywhere. In truth, that coat of mail is extremely hard to perforate, and the ruby-tailed fly can at will roll itself into a ball. Be it as it may be, a *Chrysis* in possession of a flower abandons it the moment another *Hymenopteron* alights on it.

Unable to build or dig, the *Chrysis* must deposit her egg or eggs in the cells of solitary bees and wasps. The *larva* must have animal food. It will not touch the honey carefully stored by the mother of its host. It will devour the host itself, little by little, of course, or absorb the live provision intended for the young *Sphex* or *Odynerus*. We are not quite certain which is the real process of the two in cells containing stores of animal food. The result is the same. Either starved or eaten, the host will never complete its evolution.

I have before me my old wall close to the farmhouse. On one side of the wall is a large cluster of tall fennel in blossom. On the rugged and dilapidated surface are a dozen *Chrysidae*, the long-pedunculated *Pelopoeus*, and two species of *Odynerus* unknown to me. The *Chrysidae* go about quickly, but without that jerking motion so peculiar to the *Sphegidae* and *Ichneumonidae*. They peer in every hole, go half-way in, enter bodily at times, and are rather long in coming out. Do these holes contain nests either partially finished or partially stored? We shall know very soon. There comes a wasp, an *Odynerus*, carrying something in its flight; this is the provender nothing less than the caterpillar of a noctuid moth. The place is evidently inspected by the insect, which soars a little above the entrance. There is nothing suspicious about; the caterpillar and the insect disappear in the crevice; a short time after, the *Odynerus* comes out and is off again. The entrance is not closed. A few minutes later on the wasp comes back carrying another caterpillar. It goes in again, remains longer than before, flies out afresh, and returns with a pellet of clay, with which it begins closing its hole. Alas! you have left your door open; have you not seen the parasites lurking about the entrance? The cuckoo has got into your nest during your absence. You have striven hard to accumulate food for the maintenance of the grub which will issue from the egg which is the means of propagating your species; heap pellets of clay over pellets of clay

and smooth them with your jaws so as to resemble the surface of the old wall; all these precautions are now in vain, instead of an *Odynerus*, a *Chrysis*, the metamorphosis of which is shorter, will issue from it.

I shall later on revert to that *Odynerus*.

A *Sphex*, a *Scolia*, a *Pompilus*, or an *Odynerus* provides living insects for the sustenance of its progeny. The choice varies much: caterpillars, grasshoppers, flies or beetles, but spiders predominate. With these they store their nest or gallery, and the minute grub issuing from the egg is able to devour the large piece provided for its use before reaching its pupal stage, which is never of very long duration, the transformation from the pupa to the perfect state always taking much more time than the first metamorphosis.

That grub is very small, very fragile; a single contortion of the prey provided by the motherly instinct will reduce it to pulp; the powerful jaws of the *Orthopteron*, the *Coleopteron*, or the spider are not less to be dreaded than the kick of legs bristling with spines. Were it shaken off by the victim that is to be, its legless condition, its unprotected covering, militate against all possibility of crawling back to its prey, of fastening again its mandibles on the succulent morsel, hence starvation and its correlative—extinction of the species.

Why does the mother select for its future progeny such a redoubtable host? Because before the cell is stored with a living prey that prey has been paralysed.

I take a *Sphex*. Armed with powerful jaws, having legs eminently adapted to fossorial purposes, and with an abdomen articulated on a long peduncle and provided with a powerful sting, this insect is really a formidable foe, one that is eminently adapted to tearing its prey and making mincemeat of it; but, unlike some *Vespidae*, it feeds on the pollen of flowers.

Yet the whole of the energy it is capable of will be expended on providing for its progeny, in ensuring it such a store of food as will last until it is able to spin its own cocoon and undergo its metamorphosis. One condition, however, is essential. The food must be always fresh; if dried up or beginning to decompose, the grub will not touch it, will rather die of starvation. It follows apparently that if the larva is to be fed on living organism, it must needs be supplied regulary, daily, nay hourly. But the *Sphex* does not proceed thus. It stores the cell, lays its egg, and closes the door—the same to be opened by its progeny when it reaches the adult stage.

I am going to tell you now the process used for obtaining that result, and I consider it one of the most marvellous cases of adaptation to a purpose displayed in the whole of the insect world.

I am in the Hex River Valley. I have captured several *Harpactopus*

tyrannus as they come out of their burrows. One is alighting on a small mimosa-bush. She is not attracted by flowers, although the bush is in blossom. She goes straight to a small bough where several medium-sized caterpillars of a *Bombycid* are resting. She alights on the back of one and seizes it behind the head with her mandibles. The caterpillar objects evidently, raises the fore part of its long body ; the long pedunculated abdomen of the *Sphex* is curved under the poor creature. I stand underneath and have a very good view of it ; the *Sphex* is evidently feeling her way with the last segment of her abdomen ; all at once there is a contraction of the peduncle, and I see the sting drawn out from the wound. The process is repeated lower down this time, another segment is punctured. The abdomen is now hidden from view. I must turn to see what has become of the *Sphex*. There she is still on the back of her victim, whose struggles, however, have partially ceased, busy munching the back of its head. Four or five minutes have been sufficient for the completion of this drama. The caterpillar now can with difficulty adhere to the branch ; it is partly dragged and partly carried by its victor. After a long journey the nest is reached. The *Sphex* abandons the caterpillar and enters the den, re-issues, drags the caterpillar a little nearer, enters again, stays inside a little longer than the first time, and at last grasps her burden and enters with it. That *Sphex* has unawares given me a lesson on the anatomy of the nervous system of the caterpillar.

If you look at this diagram you will perceive that the nervous system consists of two cords intersected by swellings (*ganglia*) from which spread ramifications. This is really analogous to the spinal cord of the superior animals. The brain is represented by several pairs of ganglia massed together, and it is very probable that each of these ganglia corresponds to the number of primitive segments which, fused together, have formed the head.

Now it may be said that each ganglion is adapted to each segment ; still some of them have special functions ; in fact, during the metamorphosis some of them become partially absorbed, and their function is more localised. If by means of an extremely fine needle I puncture any of these ganglia, the segment becomes paralysed ; but if I touch the cerebral ganglion, death ensues forthwith.

The *Sphex* has not punctured the brain, oh no ! but its stiletto has destroyed the 3rd, 4th, 5th, and 6th ganglia, which supply the nerves to the legs, the 7th, 8th, 9th, 10th, 11th and 12th which supply the nerves to the long abdomen, and it has done so in a masterly fashion. One might think that it would be much easier to puncture through the back instead of twisting the abdomen and insert the stiletto underneath. No, the *Sphex* is too good a physiologist to make such a grievous mistake. She knows very well that the chain of ganglia lies on the

floor of the body, on the ventral surface, not the dorsal one, and that the insertion of its sting from above could only result in the puncture of the dorsal vessel or heart—hence death and decomposition—the very thing she guards against. However skilful the stiletto may be, the caterpillar has not yet quite given up all hope of a struggle, the effect of the paralysing operation is not yet wholly obtained, and this is why the *Sphex* proceeds further by means of its powerful mandibles to compress the cerebral ganglia. General paralysis is now obtained, the bulky prey can now be dragged to the cell with comparative ease. A feeble, very feeble, twitching denotes that the animal is still alive. The egg of the *Sphex* is deposited on the ventral surface and the grub will now be able to devour its prey at ease.

Sphegidae do not always select caterpillars for storing their nests with. *Cerceridae* use beetles. *Phylanthus* attacks the honey-bee, a foe not to be despised ; *Ammophila* prefers caterpillars, but I have seen one carrying young crickets. The very large group of *Pelopœus* and *Pompilus* feed their *larvae* on spiders. But in each one of these insects the nervous system has undergone a change ; the ganglia are not disposed in the same manner, they are more or less distant, more or less concentrated. In the bee we have a large complicated brain, an oesophageal ganglion, two thoracic ganglia instead of three, and five or six abdominal ones. In the beetle they differ much in position, but may be said to have agglomerated in the thoracic region, with the exception of the cerebral one, of course ; in the spider, besides the brain, there is a single ganglionic mass in the thorax, none in the abdomen. But no matter where these ganglia are placed, the fossorial hymenoptera know where to insert their stings with due effect, and seldom fail.

As I have already said, many *Pompilidae* select the spiders for their prey. The *Arachnid* knows very well that it is as well armed as its adversary, if not better. Its chelicerae are not only sharp and strong, and articulated by powerful muscles, but they are also provided with a gland supplying a most virulent poison. The struggle between a *Pompilus* and an *Arachnid* when it is a *Lycosa* or a *Mygale* is a very serious affair. The tactic of the spider is to seize the *Pompilus* by the head and to pierce the cerebral ganglia with its chelicerae ; she does not require any nutriment for her progeny, what she wants is food for herself. The *Pompilus* again is very careful not to thrust her head in the den of rapine and murder ; she knows very well that the enemy must be got outside her shelter. I have never been able to witness closely the *modus operandi*, but I believe it allows the spider to seize hold of its leg, and then by a jerk draws it out. The spider may turn and face its foe now ; it is too late, the *Sphex* is already on its back, with a firm hold of the *cephalathorax*,

and the abdomen curving under the victim punctures the ganglionic mass. The deed is done.

It is no longer an unarmed prey that the *Pompilus* has paralysed at leisure ; it is during a sharp struggle where the assailant has not always the best of it that the fatal thrust must be given, and it is a very common occurrence to see the *Pompilus* carrying a spider often considerably more bulky than herself, stop and insert her sting again in the ganglionic region. Has she felt a renewal of activity in the paralysed mass she is now dragging, which makes her fear for her own safety ? I should say it is so, because on four different occasions small *Pompilid*, caught immediately after the end of the fight and placed together with their victims in a glass tube, were found dead the following morning ; the spiders had recovered from their lethargy, and being nocturnal had had their revenge ; never, however, were the *Hymenoptera* eaten. *Pelopoeus spirifex* is sometimes seen attacking spiders on their web. Doubtless she is well armed, and if she only succeeds in inserting her sting the spider lies at her mercy. But the *Arachnid*, beside her own weapons, is an expert at throwing her threads, and great has been the number of *Pelopoeus* I have seen, the corpses of which, sucked dry and lying entangled in a web, testify to the heroism of the maternal instinct.

I think I have now substantiated what I told you a little while ago about the degree of adaptation to a purpose displayed by these solitary wasps, and yet they cannot be credited with the same amount of intelligence in all their actions. If you meet a *Pompilus*, *Sphex*, or an *Ammophila* carrying her prey to the hole, you will generally see that she leaves it on the threshold, and enters her gallery. Remove the caterpillar or spider a few inches from the entrance, she will drag it back to the opening, and will abandon it on the same place and go in again for her subterranean inspection ; remove the spoils altogether, and you will often see the wasp, instead of flying away, setting to close and cement the aperture. I have often succeeded in repeating here that experiment of Fabre with *Pelopæus spirifex*, and *Ammophila capensis*, as well as with several species of *Pompilus*. The closing and cementing of the hole is done with too much care not to lead us to believe that the insect has come to the conclusion that its task is finished. I have found by reopening the cells, either an insufficient quantity of caterpillars or spiders, or, oftener, no provender at all.

As for the repeated entrance to the hole, after leaving the provender on the threshold, I thought at first that it was to enlarge the cell according to the size of the victim which was going to be stored in it ; but, as I never saw the *Sphex* carrying out the excavated material, I am induced to suppose that it is in order to see if no intruder in the shape of a parasite has already taken possession. If my surmise is

true the insect might very well have saved herself this trouble. The enemy is everywhere round her. Close by her galleries I see the *Chrysidae* ; the *Anthrax* and *Bombylius*, these elegant and conspicuous flies with their thick coating of high-pile velvet are also numerous, and these small *Tachynaria* flies are not watching her for nothing.

Let us sit at leisure before this sand-bank, where I have spent already so many hours. Two species of *Bembex* are very common here, and it is easy to observe them.

There comes one ; without any hesitation she alights on a spot where no aperture is visible. She carries a fly, a good-sized one. The fore-legs so well adapted for the removal of sand are at work ; the insect disappears ; the sand behind it falls again. At a short distance from the surface the ground is damper, and therefore firmer ; here is the gallery, and near the bottom a legless grub surrounded by the *débris* of several varieties of flies.

The provender is deposited close to the grub, and apparently time is precious, because, as soon as the fly is in its proper place, the mother is off ; the fore-legs brush away the sand, which, falling again behind her, forms a screen in front of the entrance.

Unlike the *Hymenoptera*, whose habits I have been explaining to you, the *Bembex* supplies her *larva* daily with food. She will come again when she thinks that the larder is empty, bringing with her another fly, and she serves out the ration according to the appetite of her offspring. There is now no necessity for the skilful use of the poisoned stiletto ; paralysis is no longer required. If the food has dried up before the *larva* has consumed it, there will be another insect brought to replace it. One can easily conceive the labour involved by this habit so dissimilar to that of other solitary bees and wasps, because the *Bembex* has more than one burrow to supply.

A mother watching over her young, regulating the amount of food destined to it ; there is indeed a highly-developed sense of intelligence. Yes to be sure ; but . . . Here also we must point out deficiencies. In some galleries the grub is not alone. Here it lies, fat, yellow, gnawing away at its provender. But gnawing at the same morsel there are also several other grubs, smaller, and much more active. Any doubt at their identity is soon set at rest ; they are, doubtless, grubs of a fly, *dipterous larvae*. But where do these parasites come from ? It is not easy for an insect unprovided with the powerful rakes of a *Bembex* to penetrate the screen of sand. The mystery is soon explained ; and, like the *Odynerus*, like the *Sphex*, the *Bembex* gives us a proof of the possession of a very limited intelligence after all.

Dotted on that sand-bank are a good many *Tachynaria* flies. They are squatting on the ground near the entrance to the galleries. The *Bembex* arrives carrying her fly. She must first effect an entrance,

and the fly is fixed under the abdomen, although still held by the mandibles while the rakes are at work. Now is the time! As quick as lightning one *Tachynaria*, sometimes two, is on it. The deed is done. An egg has been deposited, glued, along the corpse; from that egg will issue a grub, a messmate of the young *Bembex*, and the mother must needs increase the number and size of her supplies to feed her progeny and the parasites which she has been instrumental in bringing into her nest.

Fabre has justly said that the *Bembex* is perfectly aware of the presence of the flies lurking about her nest. She shows it by a shriller sound than usual when she perceives the flies too near the entrance. I have also seen her darting away with her burden and coming back again; poised in the air above her burrow, she takes another survey; the flies are there still, they take good care not to move away; they know, of course, that the mother must enter; she is aware that her progeny is perhaps waiting for its dinner; are not the inner parasites also waiting?

Now, here is an insect which preys on flies of different varieties, for the debris of the nest prove that clearly, and which has not the common intelligence to pounce upon the *Tachynariae*. She sees the parasites increasing daily in size and numbers, and it is solely by dint of heaping daily a larger quantity of food that she will keep them from attacking and devouring forsooth her young.

The only explanation I can suggest is that she preys on flies only; the grubs are repugnant to her.

These *Tachynariae* are not parasites of the *Bembecidae* only. I have already told you of that *Odynerus* whose galleries were so often visited by the *Chrysidae*. That unfortunate wasp is, perhaps more than any other I know victimized by parasites. From that dilapidated wall where I first discovered it I got no less than nine kinds of these deceitful ruby-tailed flies. The *Tachynaria* was there in plenty manœuvring in the same way; a sudden dart and the fly is again on the wall, and looking most innocent. However quick the movement, the egg has been glued on the body of the *Noctuid* caterpillar, and what with the visit of the *Chrysidae*, the eggs of *Tachynariae*, and the singular nymphal case I see protruding from a hole, the young *Odynerus* will have no easy time of it.

It is the first time that I have seen this sheath. It is nothing else than the nymph of a fly—either a *Bombylius* or an *Anthrax*. That old wall is indeed a great friend to me; often have I seen *Anthrax (Exoprosopa) venosa* alighting on it. Too much preoccupied with the *Chrysidae* or the two *Odynerus* which tenant it, I had hardly taken notice of this elegant insect. I should have remembered that the European *A punctata* is a parasite of an *Osmid*, *Heriades trun-*

corum; but this *Osmid* chooses generally as a residence a hollow twig, which it partitions with clay. I could hardly have suspected the *Anthrax*, when alighting on a ledge of the wall, to have also chosen the *Odynerus* larva for its progeny. Yet, there is no longer any doubt of it now.

There is the nymphal case projecting from one of the galleries, which, when explored, yields debris, which tell their own tale. But how could such a feeble insect as an *Anthrax* choose to deposit her egg on that cemented surface, so hard that it is with difficulty that I can make a breach in it. She is not provided with terminal auger; she has no mandibles, only an haustellum, her feet are unprovided with bristles or fossorial implements of any kind.

Thanks to the patience and keen power of observation of Fabre, we have now the key to that mystery, and larval dimorphism is now known to bridge the distance to hypermetamorphosis.

Upon the rugged surface of the wall the *Anthrax* has deposited her egg; that is all.

From that egg will issue the singular creature you will perceive in this diagram. It is only one millimetre in length. What its mother has not been able to do for it it must do for itself; it must fight its way through small chinks invisible to my eye. The mother has not chosen this place for it without good cause, and instinct warns it that there, at a greater or lesser distance, lies a fat grub or grubs. It has reached it at last, not without hard work; it may now consider the tempting morsel as its own, but it has still to pierce the silky cocoon wherein the *Odynerus* larva is about to undergo its metamorphosis.

When this is over the first change begins—larva No. 1 becomes larva No. 2, and she is now having her first meal.

We see now a legless worm which sucks its victim dry without perforating the skin. When this is over, there comes the third metamorphosis—*i.e.*, the nymph. Now among all insects undergoing such a process there is always a cessation of movement during the nymphal stage; life is apparently suspended, and, except for a few twitchings, the chrysalis is practically motionless. Not so with the *Anthrax*, however. The only easy time it has had has been in the secondary stage. In the primary one it has had to fight its way into the cell of its host. In the nymphal state it must manage to open for itself a way out of the cell, because the feeble fly, the full-grown insect, will never be able to perforate the walls. And this is why the head of the nymph is armed with pick and shovel, her segments with spines and bristles which she will use as a lever, and when the half of the body is out of the cell, when it is firmly anchored by the stiff ciliae and the terminal segment, the thorax will split in a crucial form and through that rent the *Anthrax* emerges into the light of day.

It would take me too long to enumerate all the series of parasites and their habits, to tell you of the *Scolia* who, instead of carrying her capture to the nest, digs her way to the *larva* of *Scarabæid*, and after the usual paralysing process fixes her egg on the fat grub ; of the *Crabro*, who makes use of hollow twigs for heaping in her supply of flies, of *Mutilla*, and of so many others ; but I must call your attention to the very singular insect shown in this diagram.

It is one of the *Strepsicera*, a *Stylops*. It is a parasite which attacks at random any *Hymenopteron*. I have found it on *Apidae* on *Vespidae*, on *Pompilidae;* it has been found also on *Formicidae*. But if I mention *Stylops* it is because that unfortunate *Odynerus*, I have so often spoken of, teems with them.

The difference between the male and the female is very striking. He has very large protruding eyes and long postical wings ; she is an eyeless, legless sack. He leads the life of other insects ; she lives and dies where she has affixed herself. She is provided with a dorsal tube, from which her young will exude, because she is viviparous.

The *larva*, provided with legs and two long caudal appendages, clings to the hairs of the bee, and is carried by its mother's host into the nest. It bores its way into the grub, and then changes into a legless, maggot-like creature, which becomes a *pupa* into the *hymenopteran pupa*, and taking advantage of the then moist state of the ultimate transformation of the bee bores its way from the abdomen. If it is a female, she will stay there until she dies ; if it is a male it will leave the pupal skin and search the female. These insects do not, however, devour the host, which completes its metamorphosis.

What deduction must we now draw from the habits of these solitary *Hymenoptera* which form the subject of my address ?

Must we consider them as endowed with superior intelligence ? Is their instinct limited ?

We must not forget that the young has had no lesson from the mother. She has grown solitary ; the moment she has reached her adult state, she has repeated unconsciously the same acts that her mother had accomplished, unknown to her ; or, in the case of the male, what his father had done. All her powers of intelligence have been directed to ensuring the future life of her grub ; but while admiring her intelligence in many of her doings, some of her actions reveal a very obtuse mind.

The *Ichneumon* is unable to discern before she is going to puncture her victim if the place has not been occupied before by another *Ichneumon ;* or if the *larva* of the *Curculio* has not reached such a state of growth, that her young runs the risk of being entombed in the cocoon of the host before it has completed its metamorphosis.

Odynerus takes no notice of the ruby-tailed flies which are actually

going to decimate her progeny. They are conspicuous enough, these *Chrysidae.* But let us suppose that the very brilliancy of the livery is the cause of their not being detected ; can the same be said of the large, velvet-clad *Anthrax?* of the dingy-looking *Tachynaria* flies, which she evidently sees, since she displaces them in her movements ?

Bembex does, undoubtedly, prove that she sees the same *Tachynaria,* and is aware of her presence. She, a destroyer of flies, never thinks of pouncing upon them, and yet she, alone among solitary bees and wasps, attends to the wants of her young until it reaches the pupal stage. She must therefore be credited with a higher intelligence truly, but still it is a very limited one after all.

Quite equal to the zeal of these *Hymenoptera* and also to their intelligence are the zeal and intelligence of the dipterous flies, which, like *Tachynariae,* have acquired the power of laying their eggs at will, and, like *Anthrax,* have developed in the larva the means of reaching the prey.

The whole intelligence of these insects has been directed in one groove, and in one groove only.

Parasites lead a solitary life ; they have not the advantage of the community. The parasitic life, which they have slowly been induced to assume, has strengthened, has increased their development in one direction only, viz. : " Safe multiplication of the species."

This, intensified by heredity, has improved the means of obtaining that result ; but just as, if one limb alone is used at the expense of another, it increases abnormally, while the other decreases or remains stationary, in the same way the intelligence of parasitic *Hymenoptera* has been directed in a groove in which it has sunk deeper and deeper, so deep in fact, that it cannot rise to the comprehension of other ways, of other channels, of, perhaps, other ideas.

29th July, 1890.

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THE TRANSACTIONS

OF THE

SOUTH AFRICAN PHILOSOPHICAL SOCIETY.

SOME SCIENTIFIC RESULTS OF A MISSION TO SOUTH AFRICA,

By Professor Seeley, F.R.S.

[Lecture delivered September 16th, 1889.]

Your country of South Africa has been heaved up from the sea by a great compressing force, coming from the south, in consequence of which all the older rocks come to the surface of the country towards the southern shores. These older rocks, owing to the intense pressure to which they have been subjected, have become folded, and heated by conversion of the mechanical pressure into heat; so that the water, which they originally contained, has slowly, during the long past ages, dissolved a very large part, if not the whole, of the substance of the rocks, in consequence of which these rocks have crystallised and acquired a new texture, totally different from that which they originally possessed, when laid down as sediments at the bottom of an ocean. In my survey of the country I have necessarily omitted the most ancient and most altered rocks, which lie upon the extreme south of the Colony, and my object has been to study the region which we know as the Great Karoo, and accordingly my attention was directed in the first place to the range of mountains which lie to the south of them, and which we know as the Great Zwartberg Range. These rocks I traversed, under the guidance of Mr. Thomas Bain, who made the Zwartberg Pass road, and having gone along the northern side of the mountains and observed the strongly-inclined condition of the top and of the strata, I passed along the southern side of the mountains, and came up in the Oudtshoorn district, by Schoeman's Poort, through Meiring's Poort, which carries the Olifant's River to the southward, and there I saw the wonderful structure of this range, and admired the rocks, folded in complex folds, turned up on end, and pointing upward and downward, again and again, due south, in three grand schemes of contortion; so that as the range spreads out, it consists of a comparatively moderate thickness of rock, repeated over and over again, owing to the manner

in which the rocks have been crushed together laterally by this intense power coming from the south. And when I had passed through this range (where I found the ancient limestones completely crystallised, limestones which themselves have been worn into pebbles and laid down as sure deposits, cemented into marble, which pebbles had acquired crystalline structure,) then upon these marbles I found altered rocks, ancient clays greatly altered, now converted into the condition of cleaved slates by the pressure, and upon this sandstone, rested and changed into quartzite, stones formed of pebbles in the same way, rolled down ancient shores, which pebbles were themselves bound together by a cement, formed in consequence of the intense heat, due to the process of compression. I then turned towards the rocks in the Prince Albert region, to those newer rocks which rest upon the Zwartberg, and which form the base of the series which we know as the Karoo rocks. Now what those lower beds may be which intervene between Prince Albert and Zwartberg, I will not now stop to discuss, but I will say that just to the south of Prince Albert you come upon a marvellous rock which has amazed every one who has examined it, and defied the skill in interpretation of every one who has brought the powers of the microscope to bear upon it, and that rock we know as the Ecca conglomerate, which was sometimes called by your earlier geologists, (especially by Mr. Andrew Bain, that wonderful genius to whom we owe the first interpretation of the geological structure of Africa), the trap conglomerate, and presents the aspect of a trap on the one hand, and a conglomerate on the other. But when we come to consider what variance there is in these terms, that a trap means a lava flow forced out from a volcanic centre flowing over the surface of a country, and that a conglomerate means a rock rolled into the form of pebbles by the action of the breakers on shore, which boulders have subsequently been united by some kind of cement, you will see that the old name of "trap conglomerate" implies such a contradiction that in the interests of science we lay it one side, fully recognising the discrimination which recognised its true character, and we adopt the name "Ecca conglomerate" instead. Now by this term Ecca conglomerate, which I believe we owe to Mr. Dunn, we mean a rock in which you find rounded boulders and angular fragments of all kinds of rock, for the most part crystalline, and very frequently perfectly altered from their original condition, and embedded in a cement which resembles different forms of volcanic ash (ash such as that which was thrown out in the wonderful eruption of Krakatoa), which apparently fell upon a shore where pebbles and boulders were brought down in great quantity, and which have become cemented into a rock, which now, after the long lapse of ages, presents the aspect of a trap,

of a volcanic lava flow, owing to the manner in which its parts have been cemented together, so as to resemble a basalt. That Ecca conglomerate ranges through the Colony ; I have seen it here in the western part, I have seen it in the eastern part at Graham's Town, and it forms the base upon which the series of rocks rest which we know as the Karoo basin.

Having determined this base for our investigations, we proceeded northward, always, I may say, under the friendly guidance of Mr. Thomas Bain, who, knowing the country so well, saved me many and many an hour of what might have been fruitless wandering by so freely placing at my disposal the knowledge which he had gained in a life-time of work in the public service, and this journey northward brought us ever upon newer and newer layers of rock, which were not in a horizontal position, but they too had felt the effects of the great southern compression which had thrown the slightly-inclined deposits into undulation, so that I may say that south of the railway, which we struck at Prince Albert Station, between Prince Albert town and Prince Albert road, there are at least six great undulations of the rock, that is to say six bends downward, or synclinal folds, and the corresponding upward or anti-clinal folds, so that the folds succeeded each other in a manner that you may describe as parallel, the troughs and the saddles running east and west through the country in the whole of this area south of Prince Albert road. We found no fossils, but I am told that in the extreme east of this area, in the neighbourhood of East London, Mr. McKay has been fortunate enough to find some bones, which I have not yet had an opportunity of studying, in some of the lower beds which have hitherto proved unfossiliferous in the west. This is a matter that may be of some importance eventually, because all the lower part of the series has hitherto been regarded as forming a distinct group of rocks, separated, under a distinct name, but in so far as I can see from the structure of the beds themselves, or from their relation with each other, there is no character whatever by means of which the lower division, which has sometimes been called Kimberley shales, can be separated from the group known as the Karoo rocks. But as you leave the line of railway towards the east of Mr. Luttig's farm and Jan Willemsfontein, you pass bones, and these are the bones of large animals, sometimes to be seen in the roadway, which have been rolled down by the wagon wheels passing over the roads, and indicating animals fashioned in the main on the type of the common European Salamander, with comparatively long bodies, large rounded heads, moderate length of limb, but which vary in length and attain to something like 10 or 12 feet. These animals have been secured, I may say, almost entirely by the energy and peculiar skill in that kind

of work of Mr. Thomas Bain, and his collections have been sent partly to the British Museum, where they remained unworked and unnoticed for a period of 10 years till, on the retirement of Sir Richard Owen from his connection with the museum, I felt myself at liberty to turn attention to a branch of study which he had made peculiarly his own by the great contributions to knowledge which he had elaborated in relation to South African geology, and then I learnt the wonderful natures of the animals among which Mr. Bain's collections had been made. I have here some diagrams which may serve to give you an indication of the form of some of these animals but the diagram will give no conception of the size. This figure, in the transactions of the Royal Society of London, represents the upper and under sides of an animal which Sir Richard Owen had named the *Pareiasaurus bombidens*. It is, you will observe, known by its skull and vertebral column, the vertebræ being incomplete from the beginning of the neck to some distance down the tail; there are also parts of the bones connected with the shoulder's girdle, but very imperfectly preserved, so that we knew a little, but not much, of the apparatus by means of which the anterior limbs were supported; then there are slight indications of the ribs, and further on an indication of those bones of the hip girdle by means of which the hind limb was supported. Well, that figure is about one quarter the natural size, so that this animal, in the condition in which it is preserved, is something like 11 feet in length. We were very anxious to obtain better knowledge on this, as on the other kinds of fossil life, and as we travelled to the northward of Prince Albert-road Station, and entered the region of the Karoo rocks by the neighbourhood of Tamboer and the country which extends northward, to the Nieuveldt range, we found these *saurians* very widely distributed. The Dutch farmers, ever on the alert for natural history phenomona, had anticipated my coming, and at the first indication that we were likely to visit a certain spot, every specimen that could be in any way of interest to us was obtained, so that our labours were very much lightened. However, we were somewhat anxious on the score of this collection of specimens. For what has been done hitherto has been this: whenever a bone has been found, such as a skull, the skull has been taken away, and as the skull has been disconnected from the rest of the body, the consequence was that we found that there were about fifty skulls in the British Museum, and no indications of the bodies to which the skulls belonged, and so we were desirous of coming across the animal with which the skull might be connected, and we went on very well, owing to the friendly co-operation of a gentleman of Tamboer, Mr. John Marais, whose labours in the cause of science will, I am sure, receive full recognition hereafter. We had

the good fortune, owing to his help, of coming upon one of these animals complete, in the skeleton, just as it had been complete in the flesh, left upon the surface of the country, lying embedded in the rock and only needing to be taken out and carried away. This carrying away was perhaps a little more difficult than we in Cape Town had imagined. We were in the open veldt, where there is no possibility of getting assistance, where you have to hunt along the mountain side until you come to the bones of which you are in search; there are very few facilities for bringing away the specimens in the best possible condition, but owing to the aid which was never wanting and never grudged in the least, we were able to gather up the fragments, which filled several large cases, and a procession of mule wagons bore away what I trust will some day be one of the most prized ornaments of the British Museum in London. Why were we so anxious to carry away these? I will tell you. It was because the animals present in the external form of the skull all the characters of the frog tribe, all the characters of that low grade of amphibian life which we place below the reptile, display in the configuration of its shoulder girdle and of its hip girdle the characters of a higher mammalian type. We knew, as I say, nothing whatever of its limbs, and were anxious to contribute this element of knowledge in order to see whether there was that connection which seemed to be probable between the amphibian and the mammal, to see whether there had been a development of the higher mammal from the lower amphibian, without passing through the intervening grades of reptile and bird, and the result was that when the *matrix* was cleared away—and I may tell you it was no easy matter, for the rock was very hard—as the *matrix* was cleared away and the bones laid bare, and I secured them, I found to my amazement that although the proportions of the bones and the fore-limbs were extremely heavy, heavier perhaps than in any other known mammals, yet the forms of the bones were entirely mammalian. Let me say exactly what this means; there is, in the hinder and the lower end of the upper part of the arm, in what we call the *humerus*, a great cavity, into which a projecting bone of the elbow fits, which in England is popularly known as the funnybone, but which is correctly known as the *olecranon process* of the elbow which works into the cavity. Now no reptile shows that process, yet we found not only was that process developed in this animal of the Karoo fully, but as fully so as we find it in any mammal. It was fashioned exactly upon the mammalian plan. There was another point of great value and interest, which is this: in reptiles the *ulna* is usually the stouter bone of the lower arm, and the *radius* is the smaller bone of the fore-arm, whereas in mammals the reverse proportions obtain, and the *radius* is the strong bone and the *ulna* the more slender, so

that when I saw the *radius* was the stronger bone, I felt I could have interpreted the limb, if it had been brought to me whole and separate from the skeleton, as probably a mammalian limb. The time went on, and the sun rose higher ; we cleared away the hind limb, and I then had the pleasure of laying bare what was hitherto unknown ;—the bones of the ankle joints. Now there is absolutely nothing in the skeleton of an animal which is more instructive of the higher types of life than the condition of the ankle joints. In the reptiles, the ankle joints are for the most part two series of small bones, ranged in parallel series, in rows. When you come to birds, the structures are modified in consequence of the wonderful mode of progression of the bird, by hopping, in consequence of which a large amount of labour is done by the hind limbs, which result in a concentration of ossification as a result of which you find that the upper ankle bone is blended with the end of the drumstick, and the other with the metatarsal bones, so that there appear to be at first sight in the birds no ankle bones at all, but when you come to the mammal you find a much nearer approach to the reptile. The lower row consists of a series of small ossifications, while the upper rows usually consist of two or three bones. Now when I laid bare these bones to draw their contours, I found they presented forms which were of this kind :—here came the lower end of the bone, which forms the outer bone of the leg, which we term the *fibula* and here came downward the bone which forms the inner bone of the leg, which we call the *tibia*, and to my surprise there was a single great bone extending downward in this way, which passed underneath the lower end of the *tibia*, and which corresponded to the heel bone and pulling bone of the ankle, that is, corresponded to the *oscalcis* and *astragalus* blended together. Now this is a perfectly new type of ankle formation, and as the excavation went on, we found there were other bones indicating a lower row in this manner, and these came on the *metatarsal* bone, the bones of the *phalanges* succeeding, and we found that the feet terminated in great curved claws, so that although I only represent to you one digit, because there was only one undisturbed, owing to the action of the weather, yet from this we were able to make out the structure of the foot and prove that these animals were not only capable of swimming in the sea, but possessed that modification of limb which adapted them to move upon land. I should weary you if I went into detail as to the history of this particular animal, and I have only gone into the story of some of the points we have made as to the structure of the animal, because it serves as a type of those wonderful problems connected with the history of life upon the earth, with which your country teems. It contains riches on every side for the naturalist who will take the treasures as they lie near to the surface of the country ; and I will venture to say

that wonderful as are the remains of extinct animals which the old world has yielded in its northern regions, and wonderful as are those amazing collections which Prof. Marsh, by the expenditure of a princely fortune, has gathered together from North America, your country, within comparatively a few miles of Cape Town, is capable of yielding to any naturalist, with a moderate and judicious expenditure of money, treasures in a complete form of the extinct natural history of the country, which are not to be surpassed by any specimens in the world.

But I must now leave the *Saurians*, and pass on to some of the other discoveries which we made. On we went towards the north ; we passed through the Nieuwveldt range, passed that wonderful example called the Oude Kloof, and there saw what to me was perfectly new—a range of mountains which were nothing more than a gigantic range of hills—for you are aware that we are accustomed to define a mountain, or a range of mountains, as being a mass of rock which has been heaved up from the surface by compressing force, so that the structure of a mountain range always shows more or less of this plan :—rocks, originally horizontal, have been thrown together so as to be condensed and hardened,—but in the case of the hills we found that although the contour of the hills might closely approximate to that of the mountains, they consisted of masses of rock, which have not been materially disturbed from their original horizontal position ; they have never been folded, so as to leave the more durable beds in a compressed position. We thus say that the mountain has resulted from a process of compression and upheaval, whereas a hill is due to denudation. We saw this range seventy miles off ; saw it stretching clearly on the horizon along the Zwartberg presenting its flat, table-topped hills almost level, with jagged peaks, which bounded the horizon. I found, on coming upon it, that there had been no compression, no thrusting of the rocks at all, but that everyone of the layers which spread over the country we had been traversing was disturbed in comparison with the horizontal position of the beds of rock in the Nieuwveldt range, and this was marked ; the range which was perfectly unbroken, having been riddled and pierced and crossed with spider's web-like interlacings of volcanic rock. The rocks are very little disturbed by the upheavals to which they have been subjected, and there is not the crumpling of the rock to which we are accustomed in Europe. The result is that wherever a dyke is between two superimposed masses of sandstone or shale, it has resulted that in the long space of time in which this land has been moulded from the original state, so that the tidal waters came to wear the rock down, all the area which had been pierced by the old lava streams became durable, set up in a mass of jagged heads, the pieces

arising straightest where the lava spread most continuously ; and this is the history of the mode of formation of the range. Clearly an amount of wear has been carried on by the action of rain, &c., which has worn the softer clay, so as to leave the harder layers of sandstone jagged and standing out in masses on the slopes of the inclined plane. Well, as we went up this range, we recognised different zones in the Karoo rocks, as we went from the lower beds to the higher, and when I tell you that at the time of my leaving England, no one there had the faintest conception of there being any such divisions, no one knew whether any fossil which had been sent to England came from the lower or the upper beds of the Karoo, or whether it were possible to determine if there were lower or upper beds, you will see we were on the track of investigations which presented the possibilities of some great results, and we found as we passed upwards that the kind of life changed. We left these *saurians*, such as the *pareiasaurians* behind ; *saurians* which presented the semi-circular form of head, with the comparatively short tail, though not quite so short as that of the lizard, but which do not differ essentially from the type of the lower mammals at all, in proportion as we see in the *ornithorhynchus*, (which represents the lowest type of mammals laying eggs and suckling its young) with which we are acquainted. The upper beds of the rocks which we examined now began to yield to us *saurians* of a somewhat different nature ; the limbs were longer, the head somewhat different in form, and furnished with marvellous tusks, whilst the body was somewhat more arched in its contour ; the hind limbs were better adapted for walking on land, the tail apparently shorter than had been the case before, and these animals possessed tusks which at first sight resembled the tusks of the dog tribe—the type which came to be known as the dicynodon family, or the family of animals with the dog-like teeth. Now these occurred in the zone of rock which goes immediately above that which yields the large type of *pareiasaurus*. Going up higher still, we lose these large animals, for many of them were large, some with skulls almost rivalling the size of our largest terrestrial mammalia, and which pointed to another group of animals altogether, in which you will recognise a different type of teeth, as seen in the example before you. Here you see dicynodons in which are a single pair of tusks, lying at the side of the jaw, without any teeth in front or behind, but here you will observe that there are the tusks still, and in addition there are teeth, incisors, and teeth which correspond to our grinders, or molars. These are at the back of the jaw. Well, these showed the character of the rocks, and defined them, and the most important discovery we made perhaps, or at all events one of the most important, was that there is a succession of these types through

the whole of the Karoo rocks, up to the zone in which the coal is found, so that if a geological survey of your country should be ever made—and I may say that I can conceive of nothing more desirable in the interests of the population generally than such a survey—it would be possible to examine these rocks thoroughly and economically by means of the fossils to which I have referred. And see the importance of this. When we were on the flank of the Zwartberg, just at the base of the Karoo series, there were in the neighbourhood of Prince Albert some thin indications of coal beds, which were at the time in process of examination ; well, if those coal beds occur in the lowest zone of the country, in which we find vertebrate fossils at all, there is therefore the possibility of that seam at Prince Albert following on the line of country, and elsewhere proving more valuable, more useful, more capable of ministering to the wants of mankind, than is the case at Prince Albert. Now these newer coal beds present this character ; they are in the position in which the coal grew ; we were able to establish this in a very remarkable way. At one spot in the neighbourhood of Cyphergat we entered what had been once an open working, and there found the trees standing in the position in which they grew, with their roots still in the position in which those roots were extended through the life of the tree, the trunk of the tree being broken off. And this leaves a fact of extraordinary character, which I have never seen in any tree, either alive or fossil ; its roots presented when they were examined this detail an internal case which was divided by *nodes* in this way internal surface, and ribbed longitudinally, so as to present almost the character of the *calamites*, which is associated with coal throughout the greater part of the world ; externally was a covering which was thickened over the *nodes*, so that the external roots presented not a constriction, but a thickening in the position in which these *nodes* were situated ; and the character may perhaps, when I get into the land of scientific books once more, enable me to find out the nature of this tree, and throw some light upon it, as it is associated with coal in the other parts of the world. This was no isolated condition, for immediately beneath were the fragments of another tree so situated as to show that the tree had grown and had become broken off and accumulations of sand had set in over the country, the country had increased in range, and then a new forest had grown on top of the old one. The importance of this lies in the fact that your coal has hitherto been regarded as being, to a large extent at least, drift coal, which from its position has been swept along by moving water, and if so, your coal would be of accidental occurrence, not to be relied upon ; but if your coal has been under such conditions as that in which I found it, under the same condition as that in other parts of the world ; that is, if your forest tree has lived,

and then fallen so as to dam back the water which led to the growth of those water-loving plants which eventually became what we call bitumenised, then the growth of that matter gives you coal, which must be spread as far as that forest growth is to be found. Hence I have no hesitation in saying, and this is a scientific fact of some importance, we found about the coal on the horizon of which these fossil trees occur, enormous ferns beautifully preserved, as fresh as those we had just seen, with the details of structure perfect when first laid bare, but rapidly dissolving away when exposed to the warm temperature of a room, and we found that, in specimens brought to us from the Indwe locality they were united into a compact mass by a siliceous cement. When I tell you that in the neighbourhood of Colesberg we found forest trees mineralised with silica so that frequently there were many trees lying parallel to each other, all converted into this substance, and when I further say that the record which the farmers gave was that at a few feet beneath these trees they came across a black substance, which burnt—they had no name for it—it cannot be denied that there is a relation between the occurrence of these trees here reserved in sandstone, and those trees which I have referred to in the Colesberg country, which are converted into silica. That connection establishes this fact, that over the country you will find spread a layer of coal, and near that coal vegetable matter, which did not last sufficiently long to permit of its growth to form another layer of coal, of stronger coal, on a higher level, but the occurrence of these silicates, by their obvious character upon the surface of the country, point to the coal which grows beneath, and when we went northward, after having made this travel through this country up to Fraserburg, we extended our course eastward, and set to find as far as we could the northern limits of the rocks which contain the coal. We found we had never anything to rely upon when we got away from the region which yielded our bones, and so, stopping at Aliwal North, one of the most northern points of the Colony, which borders upon the Free State, we had the good fortune to come upon one of Nature's born naturalists,—a gentleman who has devoted his life to the study of living and fossilised reptiles, Mr. Alfred Brown—who showed us the specimens he had collected during some twenty years and took us to the locality from which they were obtained, and these reptiles proved to be several examples of those theriodont reptiles which we could only compare to the mammalia, and I have very little doubt some of them would prove to be true mammals. They possessed teeth, with all the elaborate modification of formation which we find only in the higher warm-blooded animals which suckle their young, but there were a number of others which I feel sure are reptiles allied to the *lyco-*

saurus. I have here something to represent at least one of these mammalian characters, and although these are new and I can therefore give you no name for them, they served afterwards to aid us very materially in our investigations ; because, as we got on and had the pleasure of seeing specimens collected by Dr. Kannemeyer, (who has been a liberal contributor to the Cape Town Museum,) we found tha the too was upon the zone in which these mammal-like reptiles occur, and then, when we went further south still to Queen's Town, there we found exactly the same forms as those which occur at Aliwal. We were told they came from Lady Frere, and accordingly the horses were put in, and away we went to Lady Frere, because we were told that these things occurred just below the Indwe coal-field. Now this is a point which would suggest that coal should be looked for in the country between Queen's Town and the Orange River, and it meant that if by this means we had come upon the beds of the Indwe coal, we may very well look for the northern extension of that coal, for the beds of coal in which we found these mammal-like animals—and here I say that if science is able to furnish a grammar so to speak by means of fossils in this way, it only needs the organisation of these laws to prevent the waste of money by fruitless search for the treasures which the earth contains, and obtain at the least possible cost the wealth with which the earth teems, to those who seek those precious results.

Now having sought thus for the history of the gradations of life as they were distributed, and found that inseeking the history of life we came upon matters of practical importance in the way of coal, it became desirable to gather up, somewhat more fully than we had done hitherto, the story of the structure of the animals which had came to our hands ; and when we took the skulls of these wonderful animals which Dr. Kannemeyer had collected and we found subsequently that he had presented to the Albany Museum at Graham's Town, we found also that, reptiles though they may be, they had lost all the distinctive characteristics in the skull of the reptilian, with one or two possible exceptions that we could not examine into, and had acquired in other cases the character of the skull of the mammalia. Even in the form of a crocodile's skull were those typical characters of the mammalian skull seen, which distinguish it from other types by the way in which the lower jawbone is united to the wall of the brain case by the *squumosal* bone. We know that in between the *squamosal* bone and the lower jaw there is a large bone called the *quadrate* bone, occupying an intervening position. In birds you find there is a bone of this kind, which fits into a cavity at the side of the skull, behind the eye, which acts perfectly freely, and which gives attachment to the lower jaw. In the reptile

there is exactly the same bone, and you call it, as I have said, the *quadrate* bone, and when you come to these fossils of South Africa, the *theriodonts* which lie immediately beneath your coal, you can see no quadrate bone at all, because the *squamosal* bone, with which it articulates, grows down, hides it, and obliterates it. Now if you will examine the mode of articulation in the mammal you will find there is nothing whatever between the lower jaw and the *squamosal* bone, and it is precisely the same in the fossil animals, though of totally different structure of skull and mode of union of the lower jaw with the skull, two distinct types of the mammal kingdom being here represented. The one, the *theriodont*, has teeth like the dog, and the other, which has two long teeth, we term the *anomodontia*, and these two orders of animals are the orders which furnish the bulk of the fossil life which found spread over the Karoo rocks.

Now I have spoken thus far upon the bones, and a few of the problems connected with them, but there are yet higher beds of rocks that I have not had the opportunity of examining: those which contain reptiles, extending far into the northern part of the Colony and into the Free State; such, for example, as the example in Cape Town Museum, which shows a small animal of the same family as these reptiles, but very much more on the plan of those which occur in the *triassic* rocks of Germany and the secondary rocks generally of Europe, and although it had a tusk, I have been able by impressing a substance in which the mould reproduced the form of the bones so that the configuration of the skeleton can easily be made out; frequently we have been obliged to adopt this method because the bones of the animals have been dissolved, but the tusk yields the evidence of the structure of the animal. Now when we turn from these most interesting matters concerning the history and evolution of life and the distribution of coal through the country, we have by no means exhausted those matters of interest which come under our notice. One of the problems which we imposed upon ourselves at starting was to examine upon such occurrences of gold which came in our way, and I may mention, as the papers have already done so, that we visited Cradock, and also Barkly. I am not going to tell you exactly what we found, because the details of the examination belong to the Government, but the scientific facts we found are the property of science, and the general principles of the occurrence of gold I may allude to, because it opens a new chapter, so far as I am aware, in the history of science. We went to Cradock and examined a number of workings, some in the immediate neighbourhood, and some at a greater distance, and we found that in some cases people were working intrusive sheets of lava, under the impression that they had got the gold reefs, and in other places they were

working a kind of rock quite different to the masses of prehnite in the country which occur in the curious V-shaped troughs, spread over the surface of the land. Well, these things were so extraordinary that they called for very careful examination, and we found that spread over the surface of the land in that district you have volcanic rock, and this volcanic rock has yielded on its decomposition, as a volcanic rock does, a mineral or minerals which consist essentially of decomposed felspar. All volcanic rocks are thus decomposed, and re-crystallised in combination with a certain amount of water. Wherever the rock is porous, this mineral has entered, with the result that you have a network and nests of occurrences of the mineral, spread through the volcanic rock. Now we are not able to give you the estimate of the quantity of this prehnite, but I may say it is a result of the decay and decomposition of the felspars in the volcanic rock spread over the country. I do not mean to imply that it is a type of the existing surface of the country, but what I would wish you to realise is this, that in the sea water you have at the present day sea weeds, which sea weeds separate from the sea water a great many mineral salts ; as those sea weeds decay, the mineral salts are deposited on the bottom, and you may be aware of the extraordinary fact that a ship sailing through the ocean collects upon its copper bottom a deposit of gold, which is obtained from the ocean. Well, these salts, which are separated in the sea, come to be embedded in the rock, and when, in process of time, these rocks are compressed a great depth beneath the surface, and are raised in temperature by the compression, and subsequently burst away upwards through the fissures produced by the foldings, which become dykes, they are poured out as lava sheets, the lava contains the sediments from which they were formed. When, subsequently again, the land which contained these varied mineral salts comes to undergo decay and decomposition, under the effects of the atmosphere, so that enormous thicknesses of rock are cleared away, and nothing but heavy insoluble substance is left at the surface, it results that while many other things are washed away, the gold, if it were originally contained in the rock, is left behind. Although I am not able to tell you the probable quantity of the gold at Cradock, I may say that the gold is there, but not in the *prehnite* in sufficient quantity to make Cradock a rival to the Transvaal just at present. When we went into the neighbourhood of Barkly, we found something new, most interesting to us, in relation to gold ; we brought away specimens to analyse, and the analyses will eventually be placed before you, but I may now mention this, that while a great many of the layers of quartz which are commonly called reefs, which are deposits of quartz, were found to contain gold in combination with iron pyrites, most extraordinary circumstances were associated with some of

the intrusive sheets of lava, in which, in some instances, substantial traces of gold were found, and this led us to the thought of whether it would not be a matter of the greatest importance to survey the whole of the sheets throughout the country, so as to ascertain which are really valuable, and capable of mineral wealth, and which are worth marking off so as to be avoided.

Now our studies of gold led us to travel over a great deal of country which was badly in want of water. I am sorry to say that not only was the land impoverished for want of water, as very much of the land we traversed frequently had had no rain upon its surface for something like a year, and when after this long period rain came, frequently periods approximately from threequarters of a year or more would pass without rain again, yet I could not but reflect that there were two or three things to be borne in mind in relation to the geological structure of the country. In the observations which we had made much might be properly utilised by means of a geological survey of the country, which would be of greatest value. For example, wherever rocks are folded in the manner in which we found them to be folded in anticlinal and synclinal folds over the whole of the land every basin of this sort necessarily absorbs the rain which falls upon the edges of the rock ; water, then, is stored beneath the surface, and yet there is none at all upon the surface of the land itself. The rocks beneath the surface are as full of water as they can hold, and while the cattle on the farms are dying for want of water while the land is parched up so, yet there is water in abundance beneath the surface. This is pretty well-known to every geologist all over the world, and I may mention that the Government of Victoria, in Australia, have for a long time past made maps, in which they have marked down every well which was known in the Colony, for Victoria has a climate not altogether unlike your own, as the evaporation is greatly in excess of the rainfall, and the water under the ground has to be utilized, and so borings are made. The structure of the country makes it desirable to undertake such work, and when such a survey of this country is made, then every farmer will readily appreciate the position in which the structure of the country enables him to relieve his pressing necessities by tapping these springs. There is another source of water supply which Mr. Bain fully appreciated by observing the conditions of irrigation, which I may say he was ever alive to as we journeyed over the country, and that is the fact of these intrusive sheets of rock which you may see all all over the country, acting as a natural dam, a subterrannean dam, so that if you have all the rocks possessing this common feature of contour, horizontally, if you have an intrusive sheet of lava making its course to the east, it is perfectly clear that all the rains which fall upon these rocks

are obstructed by the sheet of lava, so that it is unable to flow down this inclined plane and all that is necessary is to find a suitable spot where this natural dam can be utilised with the view of yielding a permanent water supply for a large area of country, and without doubt it is of the highest importance that these dykes, when they hold back water, should be used in a proper and practical manner. If this be done, a water supply is assured for the benefit of the country. Now there is one other matter in the way of regulation of water supply which strikes me as important, and it is this, that I have observed in England the extraordinary fact that in the early morning in winter, soon after the frozen dew drops from the trees fall upon the ground you find accumulated beneath the tree a mass of material like hail, which is a measure of the quantity of moisture which the tree condensed from the air on the previous evening, and I have observed that when the air has been saturated with moisture, that the tree condenses so much that the water drains away from the tree in a continuous rill. If a tree then condenses moisture in this way, the moisture necessarily helps to saturate the rock beneath, and I take it as a fact beyond all question, after looking over various parts of the Colony, that so far as I am aware, without restriction, everywhere the farmer allows his trees to be barked, with the result that the trees die and the whole of the moisture to the land which the trees have been in the habit of drawing, is ended from that moment. The trees no longer possesses leaves which had caused the condensation of rain. The farmer is prepared to sell his trees as a matter of business, and is prepared to sell as many as seventy trees for the price of a single sheep, the consequence being that if you take it, at this rate, in ten years 700 trees have gone, and the moisture has gone with them. Well, the land has been destroyed in this way by the ruthless, thoughtless cutting down of trees, and unless some law to the contrary be enforced, many parts of the country will be converted into the ruinous condition in which you find it round about Colesberg, where I was told the country was formerly clothed with the wild olive, and there were so many trees you could not see a bare rock at any time, whilst now all is barren. Wherever trees are planted water will accumulate, and once this fact is fully recognised my belief is that the public spirit of the people of the Colony would enforce the planting of trees as a condition of universal prosperity.

Now these are the subjects upon which I have been engaged; bones, coal, gold, and water supply, these were the four great ideas in which the observations I have made seemed to gather into a focus. I came out seeking nothing but bones, I am now quite enthusiastic with regard to the condition and welfare of your country, and I am so far enthusiastic, that I venture to say, if this country is to prosper

in the way in which I should like to see it prosper, for it is really a beautiful country, a glorious country, as anyone who has seen so much of it as I have will fully recognise, if it is to prosper in the way in which I believe every inhabitant of it desires it to prosper, it can only be by the more full and universal utilisation of science in the service of man, and one of those lessons which science seems to me especially to enforce is that we have now found a means of marking down upon charts, which would become readily intelligible, a few cardinal facts of the geological structure of the country, and these charts will mark the area over which profitable industries may be carried on, and will in the long run, be a large saving of labour and money, and lead to the initiation of new industries which depend upon the minerals which obviously lie close at hand, as consequence of the distribution of gold, coal and water (applause.)

THE MODERN WEATHER BUREAU.

By Prof. Cleveland Abbe, M.A.

[Read Wednesday, January 29th, 1890.]

This broad title may imply that I am to give a comparative study of the various weather bureaus of the world; but I shall to-night only have time to give some account of the Signal Service at Washington. It will be very gratifying to me if anything I may say or do shall contribute toward the founding of a similar organisation for the prediction of wind and weather in the South African States.

The study of the weather and the efforts to predict its changes are matters of most ancient and universal custom. History shows that the world has passed through several stages of weather science in its progress from barbaric ignorance to our present beginnings of a rational scientific meteorology. At the present stage of this science we wholly disclaim any belief in the special influence of the stars, planets or moon. We do not believe that plants or animals can furnish indications of the future weather. We have given up endeavouring to discover recurring cycles of storms and weather. We attach no especial importance to electricity or sun spots as a means of prediction. The modern meteorologist defines *climatology* as the study of averages in their relation to animal and vegetable life; but restricts *meteorology* to the study of the motions and phenomena of the atmospheric air and its moisture; this is therefore a study of the dynamics of gases and vapours; it requires the solution of a series of complex problems in fluid motion and thermo-dynamics. The forces that govern the atmosphere are numerous; the principal ones that I have been accustomed to consider in my daily predictions are as follows: (1) the sun's heat; (2) the radiation from the earth, the air and the clouds; (3) the moisture in the air; (4) the evaporation from the land and water surfaces; (5) the differences of density of hot and cold, or of dry and moist air; (6) the horizontal flow of air on a spherical earth whose diurnal revolution causes the well-known deflection to the right in the Northern Hemisphere, but to the left in the Southern, whence the equatorial and the polar depressions; (7) the influence of continents and mountains and especially of plateaux in causing upward deflections and consequent cooling and cloud with rain; (8) the cooling of ascending expanding air up to the level of cloud formations, and the influence of condensing vapour on the subsequent history of the cloud; (9) the less important influence of the variations of gravity with altitude and with latitude; (10) the variations in insolation due to the diurnal and annual changes in the position of the sun with reference to the zenith; (11) the less important conduction of heat from below the surface of the ground;

but the very important convection of heat up to the surface of the lakes and oceans ; (12) the consumption of heat in the evaporation of water and snow.

The preceding may not be a complete list of the items to be considered, but suffices to show the complexity of the problems that confront the student of our atmosphere ; doubtless most weather predicters attempt to avoid the laborious working out of atmospheric laws by simply utilizing our general knowledge of atmospheric changes, especially since we have now had ten or twenty years of tudy of the weather maps and of the areas of high and low barometer ; but the foundations for a true deductive and philosophical treatment of these problems have already been laid. The motion of a storm centre is a more complex problem and presents more mathematical difficulties than the motion of the moon does to the astronomer, it is in fact only capable of being handled by a mixture of analytic and graphic methods, since no algebraic formula can represent the irregular resistances of the earth surface so simply as can be done by graphic methods, and the same may be said of our thermo-dynamic problems for which graphic methods have also been specially devised. The last decade has seen important additions to the ranks of those who are studying the atmospheric problems. I will stop only to mention the memoirs of Sir William Thomson on the stable flow of fluids, of Helmholtz on discontinuous movements in the atmosphere, of Oberbeck on the general currents and on the whirlwind movements ; memoirs by Hertz and Berold on the thermo-dynamics of the atmosphere ; by Poincaré on the atmospheric tides due to the moon ; and even from Japan comes an elaborate paper on atmospheric motions by Diro Kitao, President of the College of Agriculture in the University of Tokio, in which he has elaborated such views as I suppose must have been communicated by Helmholtz or Kirchoff, in their lectures to their students. But these most recent contributions must not make us forget the work done by the fathers of the new deductive meteorology, and as such we must hold in high esteem two American citizens, James P. Espy and Wm. Ferrel. Espy is frequently quoted as the author of the centripetal theory of storms as opposed to Redfield's circular theory, but the fact is that both of these students were fully aware that in nature the winds blow neither directly towards nor circularly around a storm centre. It was only in the heat of a personal discussion that each was led for a moment to characterise his idea of storm winds as centripetal and centrifugal respectively ; meaning thereby simply that this was the most prominent feature in his mind. Espy's special claim to our gratitude is his clear appreciation of the thermal processes going on in the clouds. He was always in search of the reasons why, and it was a great step forward

when about 1833 he announced the latent heat evolved in the condensation of vapour into cloud and rain is the sustaining power of the storm. We owe to Espy the practical introduction in 1830 of the whirled Psychrometer, a table for use with it for obtaining dew points, the determination of approximate rate of cooling of ascending air, the correct explanation of the diurnal period in the velocity of the wind and a series of daily weather maps for the United States based on an hundred stations for over 15 years (with occasional gaps) ; a selection from these maps is published in his reports, and the whole work led him to a long series of generalizations as to the movements of storms over the United States. In this latter work he was the pioneer of the world, and to the present day no one man has, so far as I know, accomplished any greater work in meteorology. I wish I could stop to tell you more about him, for he was personally one of the most interesting figures in the annals of science. His ancestors were Huguenots who had fled to Northern Ireland and thence emigrated to Lancaster County, Pennsylvania, where their descendants held distinguished positions in public and private life ; he was himself thoroughly educated in the languages and law ; he received his title "professor" from being at the head of well-known academies ; first in Cumberland, Maryland, afterwards in Philadelphia. Very early in life his attention was drawn to the study of storms, and from 1817 to 1857 he observed, studied, wrote, and lectured everywhere on this subject. Being so far in advance of his time it was natural that the community should seize upon and exaggerate some features of the views maintained by him ; but his soubriquet, "*The Storm King*," correctly pictures the impression he made upon all his hearers. His enthusiasm was intense and led him to talk, write, and lecture upon his views whenever occasion offered, hoping thereby the sooner to convince his fellow-citizens that storms and weather can be predicted.

In 1847 Prof. Joseph Henry, in his first report as Secretary of the Smithsonian Institution, publicly came to the support of Espy, with whom he had for ten years had frequent intercourse in Philadelphia and Princeton. In 1849 Henry obtained from the Electro-Magnetic Companies the privilege of receiving at Washington daily weather telegrams free of expense, the same to be used for the purpose of studying storms and of demonstrating to the members of Congress that the weather can be predicted from day to day. This gratuitous assistance was rendered by the telegraph companies all the more readily because it was well recognised that the electro-magnetic telegraph, as it then existed, would not have been possible but for the discoveries in electric science made just previously by Prof. Henry, in his laboratory in Princeton, and which had been utilized by Morse and his assistants. Henry's interests in meteorology now came to be

a prominent feature in his activity, and his lectures on the subject, which have been lately published by the Smithsonian show him to have been far in advance of most writers at that time. From 1851 to 1860 Prof. Henry maintained at Washington a daily weather map based on his morning telegrams, and he continuously used this chart as an argument for the establishment by Congress of a National Weather Service. His contract with the telegraph companies only allowed him to use his gratuitous telegrams for this and for scientific purposes, otherwise he would doubtless have made public the predictions which were frequently made at the Smithsonian for the use of Congress. You must recall that in America the telegraph belongs to a private business corporation, and the latter was not willing to transmit telegrams for the general public benefit unless in some way the public should pay for it. Prof. Henry's object was humanitarian, *i.e.*, to so familiarize Congress with the possibility and advantages of the system as to induce that body to establish and support a proper system for the public welfare. But our Congress generally follows rather than precedes the expressed will of the people and it delayed action until popular opinion should seem to demand it.

Henry's weather map was interrupted during our "War for the Union" and when in 1868 I took charge of the Astronomical Observatory in Cincinnati I resolved to revise the work in some such way as to make it useful both to the community at large and to science. I had already paid much attention to the study of atmospheric refractions, and in order to perfect our knowledge, I saw that we must not only understand the motions of the atmosphere but must surround the Observatory by a system of weather stations, and have the data for drawing daily maps showing the positions of the storms with reference to the astronomical observer. With the consent of the trustees of the Observatory, I presented my plans to the Chamber of Commerce in that city, many of whose members had long been accustomed to utilize weather telegrams in their daily business. The response of this important body of business men was immediate and favourable, so that on the 1st of September, 1869, I began publishing for the use of the Chamber of Commerce "The Weather Bulletin of the Cincinnati Observatory."

This bulletin gave full statistics of the condition of the atmosphere at numerous stations from the Rocky Mountains to the Atlantic States, and from the Gulf of Mexico to Canada ; its observations were at 8 a.m. Cincinnati time, and it was published at noon daily. At the bottom of the sheet was a prediction, which I called "Probabilities," for the next twenty-four hours. Although the nickname "Old Prob" subsequently followed me to Washington, yet by courtesy it has come to be now generally given to the Chief Signal Officer, *ex-officio*.

In the weekly bulletin of the French Association for the Advancement of Science, you will find a letter of mine written at this time to Leverrier offering him a daily synopsis of American weather for use in European predictions. A project that has since been realized, although of course we have not yet learned how to make the best use of American weather synopses in the predictions of European storms.

While my work in Cincinnati was in the first months of its infancy, it was everywhere well spoken of by an appreciative public press as a step in the right direction. My correspondent in Milwaukee, Prof. J.A. Lapham, not content with sending me his daily weather telegram, determined to, if possible, secure predictions for the benefit of the commerce of Lake Michigan. I had myself some months earlier presented the same subject to the Board of Trade in Chicago and also to the daily newspapers in New York, and the better success of Prof. Lapham's efforts was largely due to the counsel of his friend, Gen. H. E. Paine, the member of Congress from Milwaukee, who, as he himself has told me, advised that the memorial prepared by Lapham for use in the West, should instead be addressed directly to Congress; he also suggested that the "National Board of Trade," as representing all the business interests of the country, should be asked to support the project of a National Weather Bureau for the benefit of commerce and agriculture The next meeting of this Board occurred at Richmond, Virginia, in November 1869, and on that occasion the delegates from Cincinnati united in the support of the resolutions favouring a national system that were introduced by the delegates from Milwaukee. In December, Gen. Paine submitted to our Congress, at Washington, the memorial prepared by Prof. Lapham and a "Bill" that proposed the establishment of a National Weather Service to be conducted by a high scientific authority. Immediately that this step became public, the Secretary of War authorized the Chief Signal Officer of the Army to present his views on the subject of storm and weather signals, the outcome of which was the passage on February 4, 1870, of a "Joint Resolution," authorizing the Secretary of War "to organize a system of telegrams and reports for the benefit of commerce and agriculture." On this comprehensive base, the Secretary authorized Gen. Myer to build up a great meteorological system, which his successors, Generals Hazen and Greely, have developed and modified until at present it constitutes a near approach to the ideal Weather Bureau, and as such invites our attention to-night.

The original organization of the Signal Office is due to Gen. A. J. Myer, and it was conceived by him before 1860, but during our four years of war received its greatest development. Established as a separate corps of the army, the signalmen and officers were required

to be expert in all manner of signalling, in cypher writing and decyphering, and in building and manipulating all forms of telegraphs. It was a very perfect organization for gathering information from all parts of the country for the use of the Commander-in-Chief. And now Gen. Myer proposed in times of peace to devote its energies to this new work of charting and predicting the weather. Every officer was at once ordered to study meteorology. Circulars were issued inviting the co-operation of scientific institutions. I recall sending him the instructions, forms, cypher-code and other material used at Cincinnati. By the use of this cypher all needed data for any one station could be telegraphed in five or ten short words with small chance of any troublesome telegraphic error. New Signal Service observers were especially enlisted for the weather service, and devoted their whole time to the various kinds of work that it was soon found necessary for the service to engage in. The problem as it presented itself to Gen. Myer embraced at least three main features: (1) Observation and telegraphy for the formation of a weather chart at Washington, the chart to be finished within two or three hours after the observations were taken simultaneously throughout the country. (2) The preparation of prediction and ordering of storm signals. (3) The forcing of these predictions to the attention of every one interested as quickly as possible. This last, which might seem at first the most difficult, was easily arranged through the co-operation of the various Press Associations and railroad and telegraph companies. In addition to the weather the important river floods in the Ohio, Missouri and Mississippi were observed and predicted. In 1874 the scope of the Signal Service organization was greatly enlarged by the addition of the observers who had hitherto reported to the Smithsonian; these are known as the voluntary observers. About the same time also we began to receive the monthly reports of the military observers that had hitherto reported to the Surgeon-General of the Army. By means of all this new data the monthly weather review, that I had started for Gen. Myer in January 1873, and that had hitherto dealt principally with the phenomena of storms, was enlarged so as to cover the general climatology of the States. My own connection with the office began in January 1870, and was as I then supposed only temporary; in a short interview with Gen. Myer, he stated that having organized the observers and the telegraphy he now wished me to come to Washington and organize the system of probabilities and storm warnings. My first work was to chart the observations, draw in the isobars and write out the predictions for the day. These predictions began to be published by the office about the middle of February 1871; they owe their success largely to the fact that I was not required to predict for public use *every* feature of wind and weather and temperature, but only such

decided changes as I could foresee as highly probable ; subsequently the rule was established that every feature must be predicted, and it was under this arrangement that about 85 per cent. of verifications was considered as attained. In May 1871 I compiled for the service a little pamphlet entitled " How to use Weather Maps." This served to show that the predictions were in no sense empiric ; but were based on deductive processes of reasoning, that utilized the laws that had been established up to that time by such men as Espy, Ferrel and Wm. Thomson. A few months' experience gave me an opportunity to show Gen. Myer that the proper study of the storms on the coast required the charting of additional observations from vessels at sea. Accordingly during our first year he issued a circular asking that simultaneous observations be made on all vessels at 12·43 Greenwich time ; in September 1873 he secured from the Meteorological Congress at Vienna a vote to the effect that simultaneous observations throughout the whole Northern Hemisphere were desirable. This vote he construed as an endorsement of the requests independently made by him to every nation of the world asking for the interchange of simultaneous observations.

In 1874, such simultaneous observations began to be made by our American Navy, and now this widespread international request was very generally acceded to, so that in 1875 I had the pleasure of organizing and editing the first issues of the " *Bulletins of Simultaneous International Meteorological Observations made at 7.35 a.m. Washington time.*" To this was subsequently added the corresponding daily chart for the Northern Hemisphere. Such a chart as this constitutes the true and only sufficient basis for the study of the movements of the atmosphere. The only serious defect of the S.S. charts of the Northern Hemisphere resulted from the fact that very few systems of observation except that of the United States pay sufficient attention to the appearances and movements of the clouds, although every one recognises the fact that the clouds have a controlling influence in all our phenomena. Both lower and upper clouds were observed with the greatest pains by myself at Cincinnati and by many of my observers ; such observations began to be telegraphed to Washington and inserted on the manuscript tri-daily Signal Service Charts toward the close of 1871, when a cipher code similar to that used at Cincinnati was adopted by the Signal Office. It must be apparent to any one that the study of the clouds down to the very horizon gives one a comprehensive knowledge of the atmospheric conditions an hundred miles away. We often speak of the temperature and the wind as being very local phenomena but of the barometric pressure as a more general phenomenon. What shall we say, then, of the clouds which, as carefully observed by one man, will enable him to say whether the air currents

are ascending, descending or horizontal, or whether the distant clouds are moving parallel to those near by, or whether all are moving in curved lines around distant areas of high or low pressure? I am at present engaged in a close study of cloud movements on the Atlantic Ocean, and can safely state that without a single exception the clouds have revealed to me the presence of distant storms and the proper steering course to avoid them, and the same may be said of the minor changes in the direction of the wind. Your "*Table Mountain*" has afforded me many beautiful illustrations of motions in the atmosphere, such as I knew must take place, but had never before seen exemplified; your mountains in the interior, with their accompanying great cumulus clouds and their overflowing cirrus-tops, have given invaluable data as to the general circulation of air on the coast of Africa. I cannot too earnestly urge upon you the observation of the growth and decay and movements of the clouds.

But to return to the Signal Service. The most important step of progress taken by General Myer's successor, General Hazen, was I think the recognition of the fact that by introducing civilian scientists into the organization there would come a more rapid assimilation of the nerves and best thoughts current in scientific periodicals. He therefore engaged the services of Ferrel, who had long been employed in our "*Coast and Geodetic Survey*" and of Mendenhall, who is now the Superintendent of that survey. Among the younger men he secured Messrs. Upton, Hazen, Waldo, Curtis, Marvin, and Russell, all of whom have reflected credit on the service. To General Hazen we owe the carrying out of a plan that for many years had been near my own heart, namely, the organization of State weather services for the study of local details. Such independent services were not in accord with General Myer's policy, but their advantages were seen by General Hazen. After the preliminary steps were taken this branch of the service was entrusted to the senior military assistant Lieutenant Dunwoody, with whom some thirty local State Weather Services are now in correspondence; those have been the means of stimulating the study of meteorology and of rendering the Signal Service better appreciated. In 1881, when the work of the International Polar Commission needed a little stimulus, Gen. Hazen announced that the Signal Service could maintain two Arctic stations—an announcement that we had reason to think decided the wavering European Governments. One of these stations was that for which General Greely had been making preparations, whose work and energy have justly claimed the admiration of all. On the death of General Hazen the President appointed General Greely as his successor. He had long been familiar with every form of Signal Service work, and the volumes published by him fully attest his ability to do an enormous amount of work under most trying

circumstances. Under his hands the Signal Service is entering upon a new career; it has become even more decidedly a mixed military and civil organization, thereby responding to the evident desire of the people and of Congress. He has also succeeded in accomplishing a considerable reduction in the annual expenses of the office. Counting upon our long experience in the study of weather maps made up three times a day, namely, for 7 a.m., 3 p.m., and 11 p.m., he has made the experiment of diminishing the number of reports and maps, and our predictions are now based on two complete maps per day, namely, for 8 a.m. and 3 p.m.

But the history of the Signal Service will perhaps not interest you so much as an account of the preparation of the weather maps and predictions. I have exhibited upon the wall a series of the large 7 a.m. weather maps as published every day at 11 a.m., and which maps can be consulted here at any time in the archives of your Meteorological Commission. A series of such maps is a rarity even in the United States, and I hope the duplicate copies received by your Commission will stimulate some one in Cape Town to study American weather, at least as faithfully as Americans would be glad to study Cape Town weather. Our observers have their stations located in the large cities near the telegraph offices, and frequently on the tops of our highest buildings, so that some of them are from 100 to 150 feet above the ground. The morning observations that you see on these charts were made simultaneously at Greenwich noon, which corresponds to 7 a.m. by the clocks used throughout our Atlantic States, and to 4·00 a.m. by the clocks used throughout the Pacific States, for you must know that in October, 1884, our innumerable railroads lifted from us the great burden and bugbear of "MEAN LOCAL TIME," and gave to each section of the country a simple system of Standard Meridians at the successive whole hours of longitude west of Greenwich, to the great advantage of the public and the railroads. This is also a great boon to terrestial physics, since now whenever any one reports to us an observation of a meteor, an earthquake, an aurora, or a tornado, we easily find what standard time he used and the probable relation of his own to other observations. It was the hopeless impossibility of properly co-ordinating the observations of our voluntary observers that led me, while studying the aurora of 1874, to propose this simple system and subsequently to write the report published in the "Transactions of the American Meteorological Society" which report in the hands of the general superintendent of our railroad time service (Mr. H. A. Allen) enabled him to hopefully and successfully renew his efforts to bring about this great reform in our domestic clocks. At present the mean time of the 75th Meridian is that used in all Signal Service work and is the official standard of the Government at

Washington. In old Anglo-American law, however, the apparent noon and sunrise and sunset are still legal.

The simultaneous observations that are in the hands of our observers throughout the country by 10 min. after 7·00 are corrected, reduced and enciphered (five cipher words generally convey the whole message), and are personally carried to the adjacent telegraph office, unless, as most frequently happens, there is a special telegraph line between the two offices. The lines of wire passing through successive distant stations towards the central station at Washington are for a few minutes entirely at the disposal of the Signal office, and lead into a special room in our building, where some half-dozen operators are seated ; in a few minutes (rarely more than five) all the messages have been received from stations along any one line of wire, and in from twenty to thirty minutes all may be received from the whole country, including those from Canada. The total number of stations thus heard from is usually about 150 ; they spread over a region of 1,800 miles north and south, by 3,000 east and west. Copies of these despatches go simultaneously to other cities where maps and predictions are also made, but we will confine our attention to Washington. Adjoining our telegraph room is the room for charting and predicting ; here one may see at a central desk the so-called "translator" to whom telegrams are brought as soon as received. He, having our cipher code committed to memory, immediately reads aloud Meteorological items. Around the room are desks for the clerks who do the charting and for a type-setter, as also for a clerk who compiles a tabular bulletin of reports ; all listen to the translator and immediately write or chart such of the items as they individually need. Thus one charts the barometric departures and their changes ; another the temperature departures and changes ; another the clouds and their motion, the dew point and the maximum or minimum temperature ; but the principal map is considered to be that which shows the wind and weather. rainfall, temperature and reduced barometer. On this latter map the "predicting officer" or "Young Prob" draws the isobars and isotherms, then makes a tracing of them and sends that to the lithographic printer who is in the printing-room on the ground floor immediately beneath. Simultaneously the type-setter sends to the lithographer a copy in transfer ink off the columns of figures you may see in the lower right-hand portions of these morning maps. And at the same time the clerk sends a copy of the bulletin of full reports. Now the predicter without much hesitation dictates the synopsis and probabilities that you see printed in the lower left-hand portion of these maps. His dictation is not written down but is set up in type by the type-setter as fast as he cares to talk. And a print of this is made in transfer ink and sent down to the printing room.

In this latter room the lithographer has already prepared a supply of the blank base map. He has also a solid metallic form, of the size of this map, in which are cut slots for the insertion of square type or dies. He puts in each slot the type that represents the wind and weather as you see them here printed, and prints one copy of these symbols in "transfer ink." He then transfers this "symbol-print" to a large lithographic stone and also transfers to the same stone the isobars the isotherms, and the left and the right hand corner tables. All this work is being carried on simultaneously by several and he is ready to print the special morning map all that you see here in red on the green base map, in about 20 minutes after he receives the data from the prediction room. The schedule of time was formerly about as follows for these 7 a.m. maps: observation at 7 a.m., telegraphy 8 to 8.30, prediction finished at 9.30, map printing begun at 10 a.m.

For the 8 a.m. observation now employed the time is shortened and the printing begins about 9.30. You will understand that this same routine is again gone through from 4 to 7 p.m., and again from 10 p.m. to 1 a.m., and it has so gone on without a single intermission for holidays or Sundays, or a single failure since January 1871, so far as maps and predictions are concerned, and since June 1871 so far as printed maps are concerned.

In answer to a question from Dr. Gill I would say that the clerks rotate in their duties, but that the same predicter must be on hand for at least a month, when he may be relieved by another. It has been found quite impracticable to have different men do the morning and night predictions, one person must take the entire responsibility for the time being. He lives as it were in continuous contemplation of the weather; he comes to the study of each new weather map with a vivid remembrance of the conditions shown on the preceding map; the eight or twelve hour intervals do not allow him to forget anything, as might be the case with twenty-four hour intervals. He comes to the new maps expecting to find certain changes, and if any of these have not occurred then these are the features that demand especial attention and study. The Signal predicting officers were formerly never known to the public by name, but of late years their names have been published in the Monthly Weather Review in connection with a statement of the percentages of verification. I take pleasure in adding that Captain Robert Craig and Captain H. H. Dunwoody, who in 1872 began to alternate with me as predicters, are still engaged in the Signal Office, in that or cognate work. Captain Dunwoody is regarded as our best predicter at present.

But the printing of our weather maps is merely the official record of our work and does not suffice to make our predictions practically useful to the people; it is this latter result that is a most vital feature in the

organization of the office. Long before the maps can reach the people our predictions have been sent by telegraph to every part of the Union; they have been printed by enterprising newspapers, they have been bulletined at public places, such as telegraph and railroad offices and Chambers of Commerce; by means of signals, usually flags, the approach of storms, rain, blizzards, local and northern, have been announced; finally, the early morning railroad trains have displayed on the sides of the luggage vans signals embodying the midnight predictions, so that any farmer watching the train as it flies by in the gray dawn is put in possession of as much knowledge of the coming weather changes as we can send him from Washington.

All this organized effort to observe, concentrate, predict, and disseminate useful information about the weather employs the whole time of some 500 or 600 Government employés, and enlists the voluntary co-operation of thousands more. The expense or rather the outlay on the part of the people is not merely the one or two hundred thousand pounds sterling that is appropriated by Congress, but the vastly larger sum total of all that is done by the many friends of the service, and we think there is no shadow of doubt but that every fair-minded citizen concedes that it pays him to heed the weather predictions. We have, of course, many cases where spasmodic attention to them disappoints the farmer, the shipper, the railroad superintendent, the sea captain or others; but opposed to these few is an innumerable majority who uphold our work and testify in the most convincing figures that health, property, and business enterprises prosper in proportion as they study, understand and heed the predictions. It is perfectly plausible that this should be their conclusion, for I calculate that without our reports, one can in the United States predict the weather for the coming day for his own locality correctly about 65 times out of 100, but with the predictions certainly 85 times; we have therefore helped him 20 per cent. towards a perfect fore-knowledge, and on the average of the year he should be 20 per cent. better off in all his affairs. Such a gain fully justifies the expense of the signal service, and in general this percentage represents the ratio by which science enables civilised races to annually forge ahead of those nations that neglect the advantages that knowledge offers to mankind. It does not pay to be left behind in the race of progress.

I cannot close without showing you these daily maps of the weather in South Africa.

I was about to prepare some such maps in order to illustrate to you the weather and clouds that I have been observing here during the last week, and was wishing for maps to illustrate your winter weather, when to my delight I made the acquaintance of one of the most persistent students of meteorology that is anywhere to be found, your

fellow-citizen, Mr. A. G. Howard. It has been a high privilege to me to enjoy the study of the instructive series of maps compiled by Mr. Howard for the five years past. I show you now the volumes that he has kindly lent me, and can assure you I hope to have these published in America as an important contribution to meteorology, and one by which we in the northern hemisphere may profit almost as much as yourselves. Mr. Howard has rightly appreciated the recent advances in meteorology, and in this special series of twenty large maps he has located the position of the oval or wedge shaped area of low pressure towards which blew the heavy winds that formed your severe storm of July 22nd, 1889. On this final chart I have drawn what seems to me likely to have been the course of the centre of this low area. Mr. Howard has prudently avoided locating any such hypothetical centre, but I myself should not hesitate to say that the winds can be properly described as coursing toward and around a long oval depression. We have in the States observed many such long ovals, sometimes like troughs, but which eventually close up to nearly circular storm centres.

I may here caution you against a very common error, namely, that low barometer makes the wind. The fact is just the reverse and the true process is as follows : When air becomes buoyant and rises, there may be a slight barometric depression, but this is usually so slight as to be entirely unmeasurable. Air is so mobile that an imperceptible linear gradient sets it in motion, but once in motion the rotation of the earth causes it to deflect a little, and immediately there is set up a vortex motion ; now in all such vortex motions centrifugal force causes the flowing air to press outward and there is a corresponding diminution of elastic air pressure as we go towards the centre—in a storm of small dimensions it is the rate of this diminution that the barometer measures and that we call the gradient while in larger storms the rotation of the earth introduces a further cause for the fall of the barometer—such for instance as we see in the equatorial belt of low pressure and in the arctic and antarctic areas of low barometer. Thus in general the observed low pressures and the high pressure are the *results* of the movements of the air, while those movements are themselves the results of barometric gradients that are almost inappreciable and have never yet been observed by meteorologists.

A single experiment will illustrate my meaning. Let the water in a basin become very still and then carefully open a small hole at the centre. So long as the water flows in straight lines towards, down and out of the aperture, you will see no appreciable dimple at the centre of its upper surface, but so soon as the slightest whirling begins, the dimple appears and very soon becomes a funnel-shaped hole down to the bottom. This funnel is directly due to

the rotation of the water, not to its flow through the hole. Just so, a storm whirl occurs beneath a cloudy region where the buoyant clouds are ascending, and the colder air is flowing inwards, around and upwards. Within such a whirl the barometer measures the local pressure of the elastic gas and not simply the weight of the air above it.

The rectilinear and the vortex motions, or the direct, the sinuous and the spiral motions of fluids, offer most important but difficult problems to the meteorologist and mathematician. When the air is moving very slowly it can easily keep on in straight lines or very gentle curves, but so mobile is it that when moving rapidly, nothing can prevent its twisting into innumerable vortices, as shewn in the clouds and the dustwhirls.

But I was speaking of Mr. Howard, and his storm of last July. I find that the flow of *dry* air from the continent into this storm area has deflected the whirl away from the dry area just as it does everywhere in the northern hemisphere. Thus on the east coasts of North America and of Asia the whirls are pushed from the dry land towards the south and east; on the west coast of Europe they are pushed from the dry land towards the north and west, that is to say, these are the deflections from the normal or average. It is equally proper to say that the storm centre advances or grows towards the region where the maximum rain and snow occurs, *i.e.*, towards the supply of rising moist air. Apparently the north-west wind along your west coast was overlaid last July by a dry north-east, and the latter had little moisture wherewith to feed this whirl of last July, so it deflects to the south, passed east of Agulhas, and then moved north-eastward.

But you need stations further north, and possibly I have not fully appreciated all the forces at work in this storm, so that Mr. Howard may yet prove to have the more correct view. All that I would insist on to-night is, that storms and weather can be satisfactorily predicted twenty-four hours in advance by the proper use of the telegraph, that such predictions or even vaguer ones are far better than to have none at all, and that through Mr. Howard's knowledge you can in South Africa have as good a weather service as you are willing to pay for.

CLEVELAND ABBE.

SOME ADAPTIONS OF SOUTH AFRICAN PLANTS TO THE CLIMATE.

By R. Marloth, Ph. D., M.A.

[Read Wednesday, February 26th, 1890.]

Every living thing must be fitted to its environments or else it will cease to exist. This truth is so obvious with regard to animals that it hardly needs illustration. The fish is adapted to its life in the water as the bird to the air, and many peculiarities or special adaptions in the organisation of certain animals are regarded with interest even by the general public.

Few people, on the other hand, are aware that the vegetable kingdom illustrates the same law in no smaller degree, and that it does so is not surprising to us. While the animal is free to move about and to seek its shelter, the plant, which is also a living thing, has to endure the extremes of the climate on the spot where fate has placed it, and no life, whether animal or vegetable, is possible without water. It is not only the principal constituent of the sap of plants, and hence indispensable to all juicy parts, but during the growth of plants it is also necessary for the production of organic substance. The greatest part of the result of assimilation, whether it be finally turned into cellulose, starch or sugar, consists of carbohydrates, compounds which in respect of their percentage composition are carbon plus water, the former derived from the air, the latter from the ground. In regions with permanently moist soil or sub-soil, the plants require no special adaptions to secure the necessary amount of water. In localities, however, where the supply is irregular, only such vegetation can exist as is capable of surviving the drought. The means of resistance against the danger of dying by thirst are manifold, and it has been one of the greatest charms of my travels in South Africa to study the vegetation with regard to this question.

There is a large number of plants which have adopted the method of the badger; they produce their leaves, grow and accumulate organic substance during the rainy season and retire into the ground when it is over. Some of them also flower at the same time, thus accomplishing their yearly life. Others, concentrating at the period of rain all their energy on the formation of material, leave the display of their beauty for some later time when everything around them is dry and dead. To the former class belong most of our Gladioli, lovely Irideae, Amaryllideae, Liliaceae, Oxalides and Orchids, which turn our so-called winter into a most beautiful spring—at least to the visitor from northern Europe—and these are principally the plants which have gained for the Cape the designation of "the paradise of flowers."

The number of representatives of the second class is somewhat smaller, but among them are some especially noteworthy. The *Amaryllis Belladonna*, several species of *Haemanthus* and *Brunsvigia* are most remarkable for the size of their flowers or inflorescences as well as of their bulbs. They are usually called early flowerers, because it is thought that their blossoms, which appear towards the end of summer, belong to the leaves produced during the following winter, while it actually is the second stage of the plant's life, just as the European *Colchicum autumnale* (meadow's saffron) blossoms in October and November, hiding the fertilized ovary deep in the ground during the winter, and developing the fruit only in the following spring. This explains why it is useless to dig out a flowering Amaryllis bulb for the purpose of sending it to Europe with the expectation that it should blossom again during the summer. It has had no time to form its vegetative organs and to store up the material necessary for the production of the flower. Several handsome orchids, which are in blossom just now, belong to this group, namely the blue *Disa graminifolia* and the bright scarlet *Disa ferruginea*, both bearing their flowers on a reed-like stem, the leaves having died at the beginning of the summer.

There are a good many more very interesting questions connected with these bulbous plants; for instance, the various arrangements by means of which the bulbs and tubers are protected against the pressure of the hard ground, contracting during the dry season. This point, however, must now be left undiscussed, as it is necessary to pass over to that part of the vegetation which does not disappear at the end of the rainy season.

Leaving aside the annuals which die off altogether and spring up again from seeds as soon as rain has fallen, we have to mention those shrubby plants which meet the difficulty by tactics similar to those of the bulbs. They put forth their leaves only during the season which guarantees them a satisfactory supply of water, shedding them afterwards and passing the rest of the year in a dormant state. The celebrated *Testudinaria Elephantipes* is a plant of this description, whose wooden trunk resembles an immense tuber from which the thin trailing twigs spring only during the rainy season. Then there are several shrubby Pelargoniums and their nearest ally, the *Sarcocaulon* (the candlebush), which during the dry time of the year show only bare sticks, but when the rain happens to fall, it puts forth leaves and bears handsome flowers. The Cape Peninsula does not possess many such plants; very naturally they are more frequently found in the dryer parts of the colony, like the Karoo, Namaqualand, &c. One shrub of this group is also largely used here for hedges, namely, a *Lycium*, the so-called Wolf's doorn. I remember full well the impression these

shrubs made upon me on my arrival here. It was the middle of summer, they were then bare, utterly devoid of leaves or fruit, and to all appearance quite dead ; but, a few months later, they presented a very different appearance with their green leaves and red berries. This was the first observation which demonstrated to me the fact that, at least in this part of South Africa, the season of rest for the vegetation is not the winter, but the summer.

Thus far those plants have been discussed which avoid the hardships of the dry season by a judicious retreat ; let us now turn to those which face the enemy bravely.

Before doing so, however, allow me to remind you of a few facts connected with the physiology of plants. The organs that absorb the water are the roots. Thence it passes into the stem, branches and leaves. The leaves and other green parts of plants are the organs which assimilate, that is to say, which prepare organic substance from the carbonic acid of the air, the water and other materials taken up by the roots. They inhale the carbonic acid and exhale the oxygen through the stomata, the so-called breathing pores. This latter name is not well chosen, and I think that it is partly responsible for the popular idea, according to which the leaves are considered as the lungs of the plant, while they are in reality its stomach and organs of digestion.

Quite independent of assimilation is respiration. The breathing process goes on continually not only in the leaves, but throughout the whole plant. During the exchange of gases liberated by these processes some water also necessarily evaporates. Little or nothing of this vapour can be lost during its passage through the stem, but during the necessary ventilation through the proper outlets, the stomata, the water vapour also escapes ; besides this, if not prevented by special means, there is also the evaporation of water through the epidermis of the leaves. Hence it is necessary for the leaf to regulate its rate of evaporation according to the supply and to reduce it to a minimum during the dry season.

Plants not exposed to very trying conditions are enabled to do this by the automatically-acting mechanism of the stomata, for these little slits close when the tissue of the leaf loses too much water, and open again when the supply is sufficient. With plants, however, of dry localities, or plants which have to last through periods of drought, other and more efficient means to check the loss of water or to secure a sufficient supply are necessary.

The variety of arrangements for this purpose is very great. In the following description they are arranged in seven groups. I need hardly add that the formation of these groups is quite arbitrary and simply a matter of convenience.

1. The evaporating surface is considerably reduced, either by transferring the function of the leaves to green stems or by developing only leaves of small size or narrow forms. The former case is represented by the genus *Stapelia*, several species of *Euphorbia* and the imported *Opuntia* (prickly pear) ; the latter by the heaths with their needle-shaped leaves. In fact, South Africa is exceedingly rich in plants of this group. The order Bruniaceae and the genus *Phylica*, which, with the exception of a few members of the latter genus, are peculiar to this country, have such leaves, and there are a great many composites and others which resemble them *e.g.* ; *Metalasia*, *Stoebe*, *Helichrysum*, *Passerina*.

2. The surface of the leaves is impregnated with substances impermeable to water, so that the loss can occur only through the stomata. For this purpose either cork, wax or silica is used. By the word cork in this instance is meant the suberine, which changes the ordinary cellulose of the outer wall of the epidermis cells into the special layer called cuticula. This cuticula is often very thick *e.g.* ; the *Aloë*, *Protea*, *Welwitschia*, and many others with leathery leaves.

A coating of wax or resin protects a good many species of *Rhus*. *Cotyledon*, *Protea*, and it is principally this peculiarity, in connection with the many hairy plants, which gives to South African vegetation the bluish hue which we so often notice in our scenery. There are several plants which produce wax in considerable quantities. The berries of *Myrica cordifolia* are covered with so thick a layer, that it is collected and exported. The stems of the candle-bush (*Sarcocaulon Burmanni and S. Patersoni*) will burn even when green, because the outer bark consists of cork well saturated with wax. On older branches this layer is about one-tenth of an inch thick, but if one extracts the wax by repeatedly boiling it in chloroform, it swells, becoming ten or fifteen times thicker and showing 10—30 annual rings, each consisting of numerous layers of cork-cells. On the plant, however, they are glued together by the wax, and form a solid mantle entirely enveloping the stem.

Silica is found principally on rushes and desert grasses.

3. The communication between the atmosphere and the air within is greatly impeded. This is accomplished in various ways. Many plants are covered with hairs, which not only diminish the direct heating effect of the sun's rays, but compel the escaping water-vapour to force its way through a series of narrow channels, thereby necessarily retarding the process. Everlastings (*Helichrysum* and *Helipterum*) and the silver tree (*Leucadendron argenteum*) are the most familiar examples. But there are a great many Composites (*e.g.*, *Oldenlandia*, *Euryops*, *Tarchonanthus*),

Proteaceae (*e.g.*, *Leucospermum*, *Mimetes*), Leguminosae (*e.g.*, *Podalyria*, *Indigofera*, *Aspalathus*) and representatives of other orders protected by a similar coat of hairs or felt. It is interesting to notice how species of the same genus differ in this respect according to their locality. The genus *Hydrocotyle*, for instance, is a good illustration. Most of its species occur in moist places and possess round green leaves of delicate texture. A few, however, are found on dry ground and are well adapted to these different conditions of life. *H. virgata*, bearing cylindrical leaves, belongs to our first group ; *H. Centella*, having mostly narrow leathery leaves, to the second ; *H. Solandra*, which is well covered with white felt, to the third.

Some plants secrete mineral substances (Carbonate of lime, salt), which form a protecting layer either over the whole leaf [*Tamarix articulata*], or only over the little depressions in which the stomata are situated ; *e.g.*, *Statice*, *Vogelia africana* and other Plumbagineae.

Another peculiarity evidently serves the same purpose. The stomata are often placed in depressions or in grooves of leaves and stems, or the edges of the leaves are rolled so far back, that they nearly touch each other, turning the leaf into a tube, which bears the stomata on its inner side. All Aloes, many Proteaceae, Crassulaceae and the famous *Welwitschia* have such deeply depressed stomata, and many species of heath *e.g.*, *Erica cerinthoides*, *urceolaris*, *caffra* exhibit such rolled leaves.

More complicated and more efficient is the arrangement of the stomata on several grasses, on *Bobartia spathacea* and *Acanthosicoys horrida* (Naras). Leaves and stems of this *Bobartia*, which, as I may mention, are used for making the little strawberry baskets, are long and round like rushes. They are smooth but show longitudinal lines. These lines are deep grooves, the sides of which possess alternate projections. The stomata are situated only in the valleys between these ridges. If the heat is too strong and the loss of water too great, the sides of the grooves are pressed together by an automatic mechanism, the ridges fit in between each other, and the communication with the atmosphere is interrupted in a double way. Quite similar is the arrangement on the twigs of the Naras plant,* which grows on the sand-dunes near Walfish Bay.

4. The leaves assume the most favourable position towards the sun. The best example of this group is the Australian bluegum (*Eucalyptus globulus*), so largely cultivated here. It bears horizontal leaves only on its younger twigs, later on developing those hanging falcate leaves which turn the edge towards the sun

* See figure in **R. Marloth**, *Acanthosicyos horrida*, Engler's Botanische Jahrbucher, vol. IX, tab. 3.

This peculiarity is almost as strongly exhibited by our indigenous *Protea grandiflora* (waageboom). In this species only the very base of the sessile leaf is horizontal ; immediately above the base the leaf is so twisted as to become vertical and a mere edge is presented to the rays of the burning sun.

Some other plants, mostly belonging to the order Leguminosae, perform periodical movements with their leaves or leaflets. Most species of Oxalis, several Acacias *e.g. A. Giraffae*, *detinens*, *tenax*, *horrida* and *Cassia obovata* fold up their leaflets during the hottest part of the day and open them again in the afternoon.

5. Plants which possess reservoirs, either underground or in their stems and leaves. The *Elephantorhiza Burchellii* is a delicate herb, one or two feet high, but it possesses a huge watery rhizome, sometimes weighing ten pounds. Several asclepiads of the Kalahari region accumulate so much water in their large tubers that the Bushmen often depend entirely on it.

The *Stapelias* and *Euphorbias* store the water in their stems like the imported Cacteae and retain it with great tenacity. This is the reason why it is so difficult to kill such a plant, for every separate bit carries enough water and food material for the production of new roots and buds. A remarkable plant of this kind is the *Cissus Cramerianus* of Damaraland, a near ally of the vine. It has a fleshy trunk often ten feet high, with a diameter of two feet at its base, and forms only a few thick branches. A similar trunk of smaller dimensions has *Cotyledon fascicularis* of the Hex River district.

Most succulents utilise the leaves as a store room. A section through an Aloe leaf shows that the green cells form only a thin layer round a colourless watery tissue. We can make the same observation about many others. Almost all species of *Cotyledon*, *Crassula* and *Mesembryanthemum*, *e.g.*, *M. acinaciforme* (Hottentot's fig) possess a similar structure, not to mention *Augea capensis*, several *Zygophylla* and *Portulacaria afra*, the celebrated spekboom. But the water tissue is not always in the centre of the leaves. Many species of *Mesembryanthemum e.g. M. crystallinum* develop their epidermis cells into little vesicles, which give the leaves such a shiny appearance. Many orchids *e.g. Satyrium carneum*, *Holothrix* possess epidermis cells of such a height that this layer of water forms the greater part of the mass of the leaf. With *Haemanthus* it is the same. The little *Peperomia retusa*, an inhabitant of moist and shady places, provides still better for the times of drought, for its epidermis is multiplied, being several times thicker than the green tissue, covering it like a sponge.

6. The sap contains certain substances which prevent rapid evaporation. Such substances are slime, gum

or salt. All succulents are protected in this way, gum occurring in the Acacias, salt in *Augea capensis* and *Zygophyllum Marlothii* and slime in a great many others. The amount of salt is often so large, that during the drying of the plant it crystallises and forms a thick crust on it.

7. The plants possess special organs for the absorption of dew. Such organs are specially adapted hairs, glands or sheaths, and they will be particularly useful to plants occurring in localities, which are dry but often visited by fog or clouds. The hairs on the leaves of *Salsola Zeyheri* enable it to exist in the coast districts of the Kalahari region, where rain is a rare occurrence. I found the little shrubs on the rocks near Angra Pequena, and later on in numerous specimens in the Namib, the desert eastward of Walfish Bay. In the same way the Naras plant most likely derives some benefit from the water deposited on its branches by the thick fog which so often occurs along the Western coast.

The depressed glands at the base of the acacia leaves seem to serve the same purpose, for drops of dew running down along the rachis must moisten them. The handsome *Rochea coccinea*, which adorns the rocks of Table Mountain with its dark crimson flowers, has fleshy leaves like its allies, but the leaves are fringed with little teeth. Each tooth, however, is an inflated cell which absorbs the moisture deposited on it by the South-East cloud.

Another plant found on the South-Western mountains, namely *Watsonia Meriana*, utilises the water deposited on it in a different way. It grows at an altitude of 2,000 feet and more, is four to six feet high and flowers in December and January, the middle of our dry season, when rain is a very rare occurrence. The stem usually consists of five or six internodes, each surrounded at its base by a large inflated sheath, which is almost closed at the top. These sheaths always contain water, even many weeks after rain has fallen, and I have often been glad to meet the plant with its hidden treasure on my rambles over dry parts of the mountain, for there is sometimes an ounce of water in a single sheath.

It is derived from the clouds that cover the mountain during the South-East wind. As two other species of *Watsonia*, of similar size (*W. rosea and marginata*), which flower earlier in the season and occur mostly at a lower level where the mist rarely reaches them, do not possess such pitchers, the natural conclusion seems to be that the plant draws on this resource for the development of its flowers and seeds. This is, however, not the case. Anatomical examination and a series of experiments have shown me, that the stem cannot absorb this water, but that it is there only for the use of the sheaths. As the sheaths, however, protect the more delicate regions of the stem

the whole plant benefits indirectly from this arrangement. This case shows very clearly how easily the scientist may fall into an error if he judges from appearance only and does not base his opinions on experiment.

The attempt, which I have made in the preceeding pages, to group these means of protection does not in the least imply, as already stated, that the plants could be classified accordingly. On the contrary, many of them combine various arrangements to secure the same result, and it is very interesting to see how far this combination goes in extreme cases. One example of this kind is furnished by the Naras.

Unlike other cucurbitaceous plants, which usually possess a rich foliage, it does not produce any leaves at all, forming with its trailing twigs hedge-like shrubs on the sand-dunes. These twigs are protected by a thick epidermis, strongly covered with wax and in its younger parts by hairs. The stomata are situated in deep grooves, which close by an automatic arrangement when the loss of water becomes too great. In addition to this, there is a water reservoir (*hypoderma*) under the epidermis and a sponge-like tissue around the stomata through which the air has to pass before it can reach the green cells. Finally there are the hairs for the absorption of the water from the fog. Surely one can hardly imagine anything more complete, and we can understand how this plant is able to exist under such trying conditions, and to produce numerous juicy fruits on which a whole tribe of natives lives.

What I have brought before you to-night is only a flying survey of a large and for the greater part unexplored field. To treat such a question satisfactorily and especially in a country with such a rich flora as ours, would fill a volume. We should have no time for it, and I admit with regret that I have not had the time to study it more than superficially. Most of what I have said to-night is already the property of science, but I have felt obliged to include it in my paper in order to demonstrate the range of the subject.

To the popular mind, a botanist is still a man who carries a big tin on his back, collects all kinds of little weeds and calls them by long names. But such work is only the preparation for the real study. It is very interesting and also very useful to science, but, if the collector stops short there, he is a botanist only to the same extent as the sportsman who shoots birds and stuffs their skins is a zoologist.

Concluding these fragmentary notes, I beg to express the hope that more observers, who have taken up botany as a study or pastime, will devote their attention to these questions, and by accumulating more material from time to time will enable us gradually to obtain a better insight into the relations which exist between vegetation and climate in South Africa.

DESCRIPTION OF NEW SPECIES OF SOUTH AFRICAN EUMOLPIDÆ.

By E. Lefevre.

[Read April, 1889.]

Group. ODONTIONOPITES.

Gen. Odontionopa. Chevr.

O. discolor.—Oblonga, subparallela, modice convexa saturate cyanea vel cupreo-ænea, nitida, subtus pube albida brevissima obsolete vestita, labro, palpis, antennis pedibusque brunneo-rufis ; prothorace dense punctato ; elytris crebre et fortius punctatis, ad latera utrinque transversim substrigatis ; femoribus omnibus subtus paulo ante apicem dente minutissimo instructis.—Long. $5\frac{1}{2}$—$5\frac{3}{4}$ mill. ; Lat $2\frac{1}{2}$—3 mill.

Cape Town.

Group. PSEUDOCOLASPITES.

Gen. Pseudocolaspis. Lap.

P. hottentota.—Breviter oblonga, modice convexa, æneo-metallescens, obscure subviolaceo-cuprea, nitidula, undique pilis longis albidis adpressis sat dense vestita ; capite subremote punctato, epistomate subarcuatim emarginato, palpis, antennis tibiisque ferrugineis ; prothorace elytrisque confertim minute punctulatis, illo transverso, lateribus subrotundato ; scutello pentagono femoribus omnibus subtus edentatis.—Long. $6\frac{1}{2}$ mill. ; Lat. $3\frac{3}{4}$ mill.

Cape Town.

P. variegata.—Oblonga, convexa, æneo-metallescens, pilis squamiformibus (subtus albis, supra albidis et fuscis intermixtis) densissime obtecta ; capite punctulato, inter oculos substrigato, antennis nigris, articulis duobus primis ænescentibus ; prothorace elytrisque confertim minute punctulatis, humeris nitidis, illo subgloboso, antice subangustato ; scutello pentagono ; pedibus æneo-metallicis ; femoribus duobus anticis subtus dente acuto armatis.—Long. 5—6 mill ; Lat. $2\frac{1}{2}$—3 mill.

Cape Colony (Triangle, Worcester).

P. brachiata.—Suboblongo-ovata, modice convexa, æneo-cuprascens, pilis squamiformibus albis, subtus dense, superne parcius, obtecta ;

capite magno, elongato, minute punctulato, vertice convexo, epistomate fronte continuato, lateraliter utrinque linea elevata limitato, antice triangulariter exciso, antennis basi, tibiis tarsisque saturate ferrugineis ; prothorace ampliato, subgloboso, confertim punctulato, infra marginem anticam transversim evidenter impresso ; scutello pentagono ; elytris densissime fortius punctatis, superne depressiusculis, humeris prominentibus ; pedibus (proesertim duobus anticis) elongatis, femoribur fusiformibus, duobus anticis spina valida, quatuor posticis dente minuto, subtus medio instructis.—♂ Long. 4 mill. : Lat. $2\frac{2}{3}$ mill. ; ♀ Long. 5—7 mill. ; Lat. $2\frac{1}{2}$—$3\frac{1}{2}$ mill.

Cape Colony (Hex River).

P. GRACILIPES.—Breviter ovata, modice convexa, viridi-subcupreometallica, nitidula, pilis squamiformibus albidis undique parcissime vestita ; capite punctulato, epistomate fronte continuato, grosse fortius punctato, lateraliter linea elevata utrinque limitato, antice subarcuatim emarginato, antennis apice obscure cyaneo nigris ; prothorace rotundato, superne convexiusculo, crebre substrigatim punctato ; scutello pentagono ; elytris confertius punctatis ; pedibus gracilibus, femoribus fusiformibus, subtus muticis.—Long. $3\frac{1}{2}$—4 mill. ; Lat. $1\frac{1}{2}$—$1\frac{3}{4}$ mill.

Cape Colony (Worcester).

P. VIRIDANA.—Ovata, modice convexa, læte viridis, nitidula, pube alba adpressa undique parum dense obtecta ; capite sat crebre minuta punctulato, epistomate fronte continuato, lateraliter linea elevate utrinque limitato, antice subtriangulariter emarginato, antennir basi-metallico-œnis, apice nigricantibus ; prothorace subgloboso, confertim minute punctato, juxta marginem anticum obsolete transversim impresso ; scutello subpentagono ; elytris densissime punctatis, humeris modice prominentibus ; pedibus viridi-metallico-œneis, femoribus fusiformibus, subtus edentatis.—Long. 4 mill ; Lat. $2\frac{2}{3}$ mill.

Cape Colony (Worcester).

ECHTRUSIA.

(Nov. gen.)

Corpus late ovatum, convexum, pube subtili albicante parce vestitum. Caput magnum, exsertum, epistomate fronte continuato, antice triangulariter exciso, utrinque angulatim lobato, oculis parvis globosis, integris. Antennæ graciles, dimidio corpore vix longiores, articulis quinque ultimis incrassatis, moniliformibus. Prothorax transversus, conicus, ad latera utrinque deflexus ibique distincte marginatus. Scutellum triangulare, apice rotundatum. Elytra humeris deletis. Prosternum late quadratum, planum, Metosternum sicut et

mesosternum latissimum. Pedes robusti, breves, femoribus subclavatis, muticis, intermediis gracilioribus, tibiis rectis, apice abrupte dilatatis, unguiculis bifidis.

Owing to the curved triangular scutellum this genus must be placed near *Eurysthenes*. It is differentiated by the eyes which are smaller, the mesosternum is less broad, and the thighs are not toothed.

E. RHOMBOIDEA.—Late ovata, convexa, ænea, parum nitida, labro, antennisque obscure ferrugineis ; capite crebre substrigatim punctato, in media fronte sulco longitudinali obsolete instructo ; prothorace minute punctulato ; elytris subtilissime granosis, vix visibiliter minutissime punctulatis ; pedibus æneis, tibiis apice magis minusve obscure brunneis, tarsis viridi-æneis.—Long. 4 mill. ; Lat. $2\frac{1}{2}$ mill.

Cape Town.

Gen. PAUSIRIS. Chap.

P. STRIGICOLLIS.—Suboblongo-ovata, subtus æneo-nigra, pleuris pube sericea dense obtectis, supra ænea, nitidula, undique pilis albis suberectis parce vestita, antennis nigris, basi obscure ferrugineis ; capite punctulato ; prothorace juxta marginem anticum utrinque arcuatim evidenter impresso, crebre undique strigatim punctato, punctis oblongis ; elytris infra humeros obsolete transversim impressis, inordinatim punctatis, punctis intra impressionem basalem paulo majoribus ; pedibus æneis, femoribus muticis, tibiis apice rufescentibus, tarsis nigris.—Long. 3—$3\frac{1}{2}$ mill, ; Lat. $1\frac{1}{2}$—$1\frac{3}{4}$ mill.

Cape Colony (Constantia).

Gen. PALLENA. Chap.

P. CHAPUISI.—Late ovata, convexa, subcupreo-ænea, pube subtili albida parce vestita, elytris metallico-viridibus, subtilissime undique granosis ; antennis ferrugineis ; capite magno, depresso, dense minute punctulato, epistomate triangulariter exciso ; prothorace juxta marginem anticum late, sed obsolete, transversim impresso, minute substrigatim punctulato ; scutello pentagono, lævi ; pedibus robustis, femoribus medio ampliatis, muticis, tibiis arcuatis, apice summo abrupte dilatatis, tarsis latis, unguiculis bifidis.—Long. $3\frac{1}{2}$—4 mill. ; Lat. $2\frac{3}{4}$—3 mill.

Cape Town.

Gen. MACETES. Chap.

M. PERINGUEYI.—Suboblongo-ovata, modice convexa, subtus metallico-cuprea, fulgida, pube sericea subdense obtecta, supra viridi metallica, nitida ; capite alutaceo, minute punctato, spatiis subelevatis

cupreis hic illic instructo, epistomate arcuatim emarginato, labro cupreo, antennis ferrugineis, basi cupreo-reflexo-micantibus ; prothorace parum profunde subremote punctato, infra marginem anticum transversim impresso, margine antico ipso cupreo ; scutello pentagono, cupreo, medio minute punctulato ; elytris infra humeros transversim sat fortiter impressis, juxta suturam minute et subremote, ad latera autem (præsertim intra impressionem basalem) crebrius et fortius substrigatim punctatis, callo humerali prominente, sæpius cupreo ; pedibus metallico-cupreis, fulgidis, femoribus anticis et posticis subtus dente acuto armatis, tibiis apice ferrugineis, tarsis cyaneo-violaceis.—Long, $4\frac{3}{4}$—5 mill ; Lat. $2\frac{3}{4}$—3 mill.

Namaqualand Minor.

Gen. TRICHOSTOLA. Chap.

T. CAPENSIS.—Breviter ovata, pilis squamiformibus albis sat dense vestita, subtus nigra, capite prothoraceque aureo-cupreis, fulgidis, confertim punctatis, labro viridi-metallico, pedibus sicut et antennis basi lœte fulvis, harum articulis quinque ultimis nigris ; elytris lœte metallico-viridibus, crebre punctatis ad latera transversim subrugulosis. —Long. $2\frac{1}{2}$ mill. ; Lat. $1\frac{1}{3}$ mill.

Cape Colony.

Variat capite, prothorace elytrisque omnino obscure æneo-subcupreis, minus nitidis.

Group EUMOLPITES.

Gen. COLASPOSOMA. Cast.

C. PARVULUM.—Breviter ovatum, convexiusculum, viridi-metallicum, nitidum, magis minusve cupreo-aureo-micans, labro rufo, antennis fulvis, apice nigricantibus ; capite punctulato, spatiis lævibus hic illic instructo ; prothorace brevissimo, valde transverso, sat fortiter et subconfluenter punctato ; scutello lato, apice rotundato, lævi ; elytris infra humeros obsolete transversim impressis, punctatis, punctis ad latera (præsertim intra impressionem basalem) majoribus et substrigatis ; pedibus rufo-fulvis, genubus magis minusve viridi-metallicis.—Long 4 mill. ; Lat. $\frac{1}{2}$ mill.

Transvaal (Lydenburg).

Group TYPOPHORITES.

Gen. EURYDEMUS. Chap.

E. DEPRESSUS.—Oblongus, superne depressus, subtus brunneo, piceus, capite prothoraceque piceo-nigris, illo undique punctato-rugoso-hoc transverso, crebre leviter punctato, lateribus rotundato ibique

macula fulva notato ; labro, palpis antennisque fulvis ; elytris fulvis, infra humeros transversim impressis, substriato pnnctatis, punctis intra impressionem basalem majoribus, versus apicem autem evanescentibus, sutura, limbo laterali, humeris et in singulo maculis duabus latis irregulariter digestis, nigris ; pedibus fulvis, genubus nigro-infuscatis femoribus (præsertim anticis) ampliatis, singulo subtus ante apicem spina validissima armatis.—Long. 5 mill. ; Lat. 2½ mill.

Zambeze.

Gen. Syagrus. Chap.

S. rufo-brunneus.—Oblongo-elongatus, parallelus, rufo-brunneus, nitidus, antennis nigris, basi ferrugineis, capite punctulato, inter oculos linea impressa longitudinaliter instructo ; prothorace lævi, punctis nonnullis (oculo armato) vix perspicue notato ; scutello lævissimo ; elytris infra basin subtiliter transversim impressis, valde regulariter striato-punctatis ; pedibus concoloribus, femoribus apice, tibiisque magis minusve nigro-infuscatis, illis subtus versus apicem dente minute instructis.—Long. 7 mill. ; Lat. 3½ mill.

Zambeze.

S. rugiceps.—Oblongo-elongatus, parallelus, saturate piceo-niger, antennis rufo-brunneis ; capite creberrime undique confluenter rugoso-punctato ; prothorace dense grosseque subconfluenter punctato ; lcutello lævi ; elytris fortiter striato-punctatis, interstitiis elevatis, sævibus ; pedibus piceo-brunneis, tarsis dilutioribus.—Long. 6½ mill ; Lat. 3 mill.

Zambeze.

Allied to S. *puncticollis*, Lef. ; the head and prothorax are rugoso-punctate.

Group. CORYNODITES.

Gen. Corynodes.

C. insignis.—Oblongo-elongatis, convexus, subtus cupreo-violaceus, pupra metallico-viridis aurato-reflexo-micans, fulgidus, labro nigro, palpis nigro-œneis, antennis saturate cyaneis, articulis quinque ultimis valde ampliatis ; capite grosse subcrebre punctato, medio inter oculos foveolato ; prothorace subconico, confertim subrugose punctato (punctis minoribus et majoribus intermixtis) ; elytris undique minute inordinatim punctulatis ; pedibus cyaneo-violaceis, fulgidis, tarsis cœruleo-viridibus, unguiculis bifidis.—Long. 13 mill. ; Lat. 7 mill.

Zambeze, Northern Transvaal.

The structure of the head and the very fine punctuation of the elytra differentiates it from all the African species of the genus.

NOTES ON CYPHIA VOLUBILIS, WILLD.

BY

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[Read May 28th, 1890.]

When I was working out the *Campanulaceae* for Engler and Prantl's "Natürliche Pflanzenfamilien," (1) I was struck with the absence of any detailed information on the plants which form the sub-order of "*Cyphioideae.*" I was unable to find anything about them beyond their mere descriptions. As I had at that time only dried material at my disposal, I was not in a good position for extending our knowledge of these plants. This was the more to be regretted since they are generally considered to form a connecting link between the *Campanuloideae* on the one hand and the *Lobelioideae* on the other hand, because their flowers, being as a rule, zygomorphic, have the general appearance of those of the latter and have free anthers, which is the rule in the former. The following notes may therefore serve as the first step to fill up this gap in botanical literature.

My observations have mostly been made on specimens, which had been kept in spirit for a short time. I may mention that I have only observed the variety with sub-entire leaves and hairy anthers. (2)

The vegetative organs of the plants, which I examined, were very simple. The stem never branches in its lower portion. It rises from the ground not much thicker than ordinary twine. As soon as it reaches a support it begins to twist round it. On its lower portion it bears about half a dozen very tiny toothlike leaves, and above these about as many more foliage leaves. (Fig. i). It is terminated by a simple racemose inflorescence (without terminal flower like the racemose inflorescences of the Lobelioideæ), which is also twining. In rare cases one or two lateral inflorescences are formed just below the terminal inflorescence, which have the same simple structure as the latter. The taproot, which has about the same thickness as the stem, is at its lower extremity (usually 2—3″ below ground) thickened into a more or less globular tuber of $\frac{1}{2}$—$\frac{3}{4}$″ diameter. This tuber has, therefore, morphologically speaking the same value as the tubers known in other members of the *Campanulaceae.* (3) Both the tuber and the upper portion of the taproot bear a number of rootlets.

The anatomical structure of the stem is very much the same as in

(1). IV. Theil, 5. Abtheilung, pp. 40—70.

(2). Compare Harvey and Sonder, Flora Capensis iii, p. 604.

(3). It is a root and not a stem as in the potato.

the majority of the *Campanuloideae* and *Lobelioideae*. Medullary rays and hard bast are absent. The laticiferous tubes, which are articulated as in all *Campanulaceae*, accompany the soft bast usually in 3 or 4 groups. In many cases (though not in all) laticiferous tubes are also found in the centre of the pith. This will appear somewhat remarkable, however, among *Campanuloideae* there are also a number of species in which different specimens possess a somewhat different anatomical structure (1). It may be mentioned that the structure of the stem does not exhibit any peculiarity produced by its twining habit.

I found the main root always to be tetrarch. Its structure was quite normal. Secondary thickening does not take place. The tuber is composed almost entirely of parenchymatous tissue in which the vascular bundles pursue a rather irregular course. It is completely surrounded by a typical cork-layer composed of about 6—10 layers of cells. Separated from it by a few layers of parenchymatous cells there is a group of laticiferous tubes, which form a complete circle in transverse section. A small number of such tubes is irregularly distributed in the interior of the tuber. At the time when my investigations were carried out, *i.e.*, when the plant was in flower, the tubers contained a fair amount of Inuline as reserve material. Starch was absent. The discovery of Inuline in a member of the *Cyphioideae* is of some interest, as the same substance has been proved to occur in the *Campanuloideae*, *Lobelioideae*, *Goodeniacae* and *Candolleaceae*, besides the well-known occurrence of Inuline in *Compositae*.

The inflorescence is composed of about half a dozen flowers, which have a tendency of placing themselves in a straight line. The inflorescence thus becomes frequently unilateral and is more conspicuous than it would be if the flowers were turned in all directions. Each flower is preceded by two very minute bracteoles, which are always sterile as in the majority of *Lobelioideae*. The bracts of the flowers resemble the foliage leaves, but decrease in size from below upwards.

The flowers are two lipped, the upper lip being composed of three parts, the lower lip of two. In *Lobelioideae* (with the exception of the genus *Monopsis* and a few other cases, which I have pointed out in my paper quoted above) we find just the reverse (2). Here the lower lip is composed of three parts and the upper lip of two. The odd petal in the *Lobelioideae* is therefore anterior, whereas in *Cyphia volubilis* it is placed in a posterior position. In *Campanuloideae* (3)

(1). Natürliche Pflanzenfamilien iv., 5. p. 41.

(2). "Natürliche Pflanzenfamilien," iv., 5 p. 67, 69, 70.

(3). With very rare exceptions. Eichler ("Blütendiagramme i., p 294) mentions that in *Specularia* the parts of the flower are sometimes found in the same position as in *Cyphia volubilis*.

we find the parts of the flowers in the same position as in the *open* flowers of the *Lobelioideae.* I have underlined the word *open* because the flowers of *Lobelioideae* are always formed in the same position as in *Cyphia volubilis* (with posterior odd petal), but just before and during anthesis a twisting of the pedicel takes place, which reverses the position of the parts of the flowers. They are turned through an angle of 180° (as in many Orchids) (Figs. ii and iii). Baillon (1) has stated that resupination (as the process through which this reversal is effected is called) also takes place in the *Cyphioideae.* An examination of the specimens contained in the Oxford Herbarium, however, showed me that he was mistaken (2) and I am glad that the examination of fresh specimens of at least one species of *Cyphia* has confirmed my opinion that his statement was not correct, but of course, in order to upset it completely, a larger number of species would have to be observed in a living state. It is true that a slight displacement of the flowers usually takes place consequent upon the tendency of the inflorescence of becoming unilateral, but no such decided reversal as in most species of *Lobelioideae* takes place.

When a flower is about to open the anthers though not connected with one another are placed so close together as to form a tube the bottom of which is closed by the thickened upper portion of the style which is densely covered with hairs (Fig. iv and v). As soon as the flower opens the pollen is shed by the anthers, and deposited on the style. So far everything is the same as in the majority of the *Lobelioideae* and to a certain extent as in *Campanuloideae* (3). In *Lobelioideae* the style has, as a rule, not completed its growth by this time. (Fig. vi.—ix.). It goes on elongating, pushing the pollen gradually out of the tube formed by the anthers. Insects visiting the flowers come into contract with the pollen, which is prevented from falling by a number of hairs placed around the entrance of the tube (Fig. vi.). By and bye the style itself has reached sufficient length to protrude out of the tube. As soon as this stage is reached it developes its two stigmatic lobes (Figs. viii., ix.), which then and not till then are ready to receive pollen for the fertilisation of the flower. As will easily be seen, the flower was therefore at first in a male state (Fig. vi.) and passes into the female state after the stigmatic lobes are developed (Fig. viii). It is distinctly

(1). "Histoire des Plantes," viii. p. 337.

(2). "Natürliche Pflanzenfamilien," iv, 5, p. 61.

(3). I may here mention that in the South African species of Campanuloideae (belonging to the genera *Wahlenbergia* and *Lightfootia*), which I hitherto had an opportunity of observing, pollination is effected in exactly the same way as in the genus *Campanula.*

proterandrous and cross-fertilisation must therefore as a rule take place for the production of seeds.

In *Cyphia volubilis*, however, the style has reached its final length when the flower opens, and as no change is perceptible after the pollen has been deposited on the top of the style even if it is examined with a lens, I was for some time under the impression that we have here a very marked case of self-fertilisation, which was the more strange as all species of *Campanulaceae* which have hitherto been examined show very elaborate arrangements for cross-fertilisation, although self-fertilisation is in many cases not excluded. The microscopic examination of the style, however, revealed some arrangements, which to say the least must sometimes ensure cross-fertilisation and these arrangements are quite unique as far as my knowledge goes. Any longitudinal section through the upper portion of the style (Fig. x.) will show that it contains a cavity in its thickened part, and if such a section be made exactly in its median plane, it will reveal the existence of a narrow channel at its posterior portion (Fig. x *c*.), through which the cavity communicates with the open air. I will call this cavity the "stigmatic cavity."

I said before that the anthers are placed closely together, and the pollen is kept in the tube, which is formed by them. The slightest touch on the anthers or filaments will, however, open the tube. Insects visiting the flowers can therefore not fail to dust themselves with pollen if they touch these parts, and as the pollen is frequently entirely removed from the flowers, I do not think that we can imagine any other agency which can effect this. At a comparatively early stage there appear at the mouth of the stigmatic cavity drops of a slimy substance (Fig. v *e*), and the cavity itself is also filled with the same substance, which appears to be produced by the breaking down of the walls of the cells lining the cavity, and of the hairs placed round the entrance, in very much the same way as the slimy substances in many fruits are formed. However, the exact nature and the precise mode of the formation of this slime remain to be determined. In this slime we see in older flowers a number of pollen grains germinating (Fig. x), and the pollentubes pass from the cavity into the "conducting tissue" of the style. I have never seen a pollentube passing from the top of the style into it although I have diligently searched for such cases, and although it sometimes happens that a few pollengrains which have been left there, begin to push out their tubes. It will now be apparent why I have called the cavity "the stigmatic cavity." It acts like a stigma by receiving the pollen for fertilisation by giving it an opportunity of germinating and allowing the pollentubes to pass into the style. The question now arises what is the biological

meaning of this structure ? I believe that all these arrangements are there to ensure crossfertilisation. It will be seen from Fig. iv. and v., that the pollengrains deposited on the top of the style can hardly reach the entrance of the stigmatic cavity. There remains further the fact that the pollen is frequently removed, which can only be done by insects (although I must admit that with the exception of a little butterfly I have not seen any insect visiting the flowers), and insects, laden with pollen from other flowers, will probably leave some of it on the slime round the entrance of the stigmatic cavity. However, this has to be confirmed by actual observation before it can be accepted as representing the full truth ; besides as the male and female conditions of the flowers are not so sharply separated as in most *Lobelias*, it is quite possible that self-fertilisation may also sometimes be effected either with or without the aid of insects.

One curious fact remains to be mentioned. Pollengrains are not only found at the mouth of the " stigmatic cavity," but also inside it. I have found them there so frequently that it is almost impossible to imagine that they got there accidentally when my sections were prepared. I may suggest that the slime dries up a little occasionally, and that the pollengrains are thus drawn in by the slime reducing its volume. Fresh slime being formed other pollengrains are caught, and the same game may be repeated. To quote a somewhat analogous case I may mention that in many *Coniferae* the pollengrains are also caught by a drop of fluid at the mouth of the micropyle and drawn down on to the top of the nucellus when the fluid dries up.

The structure of the style besides giving a hint as to how pollination is effected in *Cyphia volubilis*, is also very interesting from another point of view. Harvey, in his " Genera of South African plants " (1), and Sonder in " Flora Capensis " (2), say that the " stigma " of *Cyphia* has an " obsolete ciliate indusium " and this character probably induced them to place the tribe of " *Cyphieae* " next to the " *Goodenovieæ* " their 4th tribe of *Campanulaceae*. The latter tribe is only represented in South Africa by a species of the genus *Scaevola*, a widely spread sea-shore plant. Most species of the " *Goodenovieæ* " are Australian. *Bentham* and *Hooker* separated the *Goodeniaceæ* from the *Campanulaceæ* as an order, following in this respect almost all previous botanical authors, who had had occasion to treat of them. Baillon (3) united them again without, however, recognizing that the " *Cyphieæ* " possessed any structure corresponding to the " indusium " of the " *Goodenieæ*." In his description of the style of *Cyphia* he simply says " stylo apice stigmatoso obliquo vel 2-lobo." Now as long as no plant was known among the

(1). 2nd ed. p. 215. (2). iii. p. 597. (3). " Histoire des plantes," viii p. 369.

Campanulaceæ (as defined by Bentham and Hooker), which possessed any structure corresponding undoubtedly to the "indusium" which forms such a marked character in *Goodeniaceæ*, I did not think it right to include the latter among *Campanulaceæ*. I was well aware that some writers (1) had maintained that certain *Lobelioideæ* possessed an "indusium." However, a minute investigation of a great many species of the latter convinced me that there was only an external resemblance between the tufts of hairs on the styles of many *Lobelioideæ* and the "indusium" of the *Goodeniaceæ* and consequently (although erroneously) I considered at the time the remarks of Harvey and Sonder as regards the "indusium" of the *Cyphioideae* to be also founded only upon vague analogies, and thought myself quite justified in keeping the *Goodeniaceae* as a separate order, especially as in taking this course I had the approval of Baron Ferdinand von Mueller, the greatest living authority on these plants. However, I have altered my opinion now. I shall show presently that *Cyphia volubilis* at all events (and probably also the other species of *Cyphia*) possesses a structure homologous with the "indusium" of *Goodeniaceae* and that, therefore, the latter have to be included among *Campanulaceae*. As an objection to the advisability of this step one might only bring forward the fact that the *Goodeniaceae* do not possess any laticiferous tubes. But this objection loses considerably in force when we consider that in *Compositae* also (an order very nearly allied to the *Campanulaceae*) there are many forms possessing laticiferous tubes, while others are entirely without them.

To make the foregoing remarks a little more intelligible I will refer briefly to the structure and development of the "indusium" in *Selliera radicans*, (a species of *Goodeniaceae* occurring in Australia, New Zealand and South America, which I was enabled to study in fresh specimens). The style having reached a certain stage in this species developes round the apex an oval protuberance (several cell-layers in thickness), which grows considerably until it forms a cup, which opens at the top by a narrow slit. A number of hairs are placed round the entrance of the cup. This cup is called the "indusium." Now if we imagine the entrance to it to be a roundish hole instead of a slit, and its position shifted to one side, we have very much the same what we find in *Cyphia volubilis*, the tissues surrounding the "stigmatic cavity" in the latter may therefore even from analogy be considered as corresponding to the tissues of the "indusium" in *Selliera* and other *Goodeniaceae*, and this view is considerably strengthened by the fact, which I was able to ascertain, that their

(1). F. i. Urban in "Jahrbuch des K. botan. Gartens zu Berlin," Vol. i, p. 260.

development proceeds on the same lines as in *Selliera*. Apart from the unimportant differences as regards position and shape of the entrance to the "indusium," we have to take also into account another difference, which I will briefly discuss.

In *Selliera* and probably in many other (if not in all) *Goodeniaceae* the pollen is deposited in the "indusium" after having been discharged by the anthers. But shortly afterwards two stigmatic lobes begin to be developed, pushing the pollen out of the cup, whence it is carried away by insects in very much the same way as in *Lobelia*. The stigma does not become receptive until it has grown through the entrance of the cup ; in fact, the latter has the same biological function as the tube formed by the anthers in *Lobelia*. Now in *Cyphia volubilis* no stigmatic lobes are developed, and it is the inside of the "indusium," which performs the function of a stigma. But even this difference can, I believe, not shake the conclusion that what I have now called the "indusium" in Cyphia volubilis is homologous to what we are accustomed to call the "indusium" in *Goodeniaceae*. But to satisfy even the most scrupulous morphologist one might perhaps say that the structure enclosing the "stigmatic cavity" is homologous with the combined stigma and indusium of *Goodeniaceae*.

It would be interesting to know for certain whether the other species of *Cyphia* also possess a similar "indusium," although one may conclude from Harvey and Sonder's description that this is the case, and if found in all of them this character might be used as a test whether the American genera *Nemacladus*, *Parishella* and *Cyphocarpus* are so nearly allied to *Cyphia*, as is frequently supposed, because the structure of the flower is somewhat similar in all of them. I have, however, already expressed my doubts whether these 4 genera really form a natural group(1).

Summary.

1. The anatomical structure of the stem of *Cyphia volubilis* is broadly speaking the same as in *Lobelioideae* and *Campanuloideae*. The tuber contains Inuline as reserve-material.

2. The flowers are not resupinated.

3. The style contains a cavity in its upper portion, which communicates laterally with the open air by a narrow channel. The tissues surrounding it are homologous with the combined stigma and "indusium" of *Goodeniaceae*.

4. It is advisable to include the *Goodeniaceae* among *Campanulaceae*.

(1). "Natürliche Pflanzenfamilien," iv., 5 p. 61.

5. Fertilisation is only effected through the open entrance of the "stigmatic cavity." Pollengrains are caught at the mouth of this entrance by a slimy substance formed by the cells lining the "stigmatic cavity," and by the hairs surrounding its mouth.

6. Cross-fertilisation probably often takes place through the agency of insects.

Description of Plate.

Fig. i.—*Cyphia volubilis*, Willd. Whole plant $\frac{1}{3}$ natural size, l = line separating root and stem, t = tuber.

Fig. ii.—Diagram of flower of *C. volubilis* and of *Lobelia coronopifolia*, L., before resupination has taken place in the latter a = axis ; b = bract ; α, β = prophylls ; s = sepal ; p = petal ; a = stamen ; o = ovary.

Fig. iii.—Diagram of flower of *Lobelia coronopifolia*, L., after resupination.

Fig. iv.—Upper portion of the stamens of *C. volubilis*, slightly magnified. They surround the style completely.

Fig. v.—Upper portion of the style of *C. volubilis*, slightly magnified, e = entrance to the stigmatic cavity closed up by a drop of a slimy substance.

Fig. vi.—Stamens of *Lobelia coronopifolia*, L., slightly magnified, from the flower in male condition. The growing style has pushed a number of pollengrains out of the tube formed by the anthers. They are collected at the top.

Fig. vii.—Style of the same flower.

Fig. viii.—Stamens of *L. coronopifolia*, L., slightly magnified, from a flower in female condition. The style has grown through the staminal tube and has unfolded its two stigmatic lobes.

Fig. ix.—Style of the same flower.

Fig. x.—Median section through the upper portion of the style of *Cyphia volubilis*, c = canal leading into the stigmatic cavity, which is filled with a slimy substance. A quantity of this substance is collected round the entrance. Four pollengrains (p). which have sent out their pollentubes are represented.

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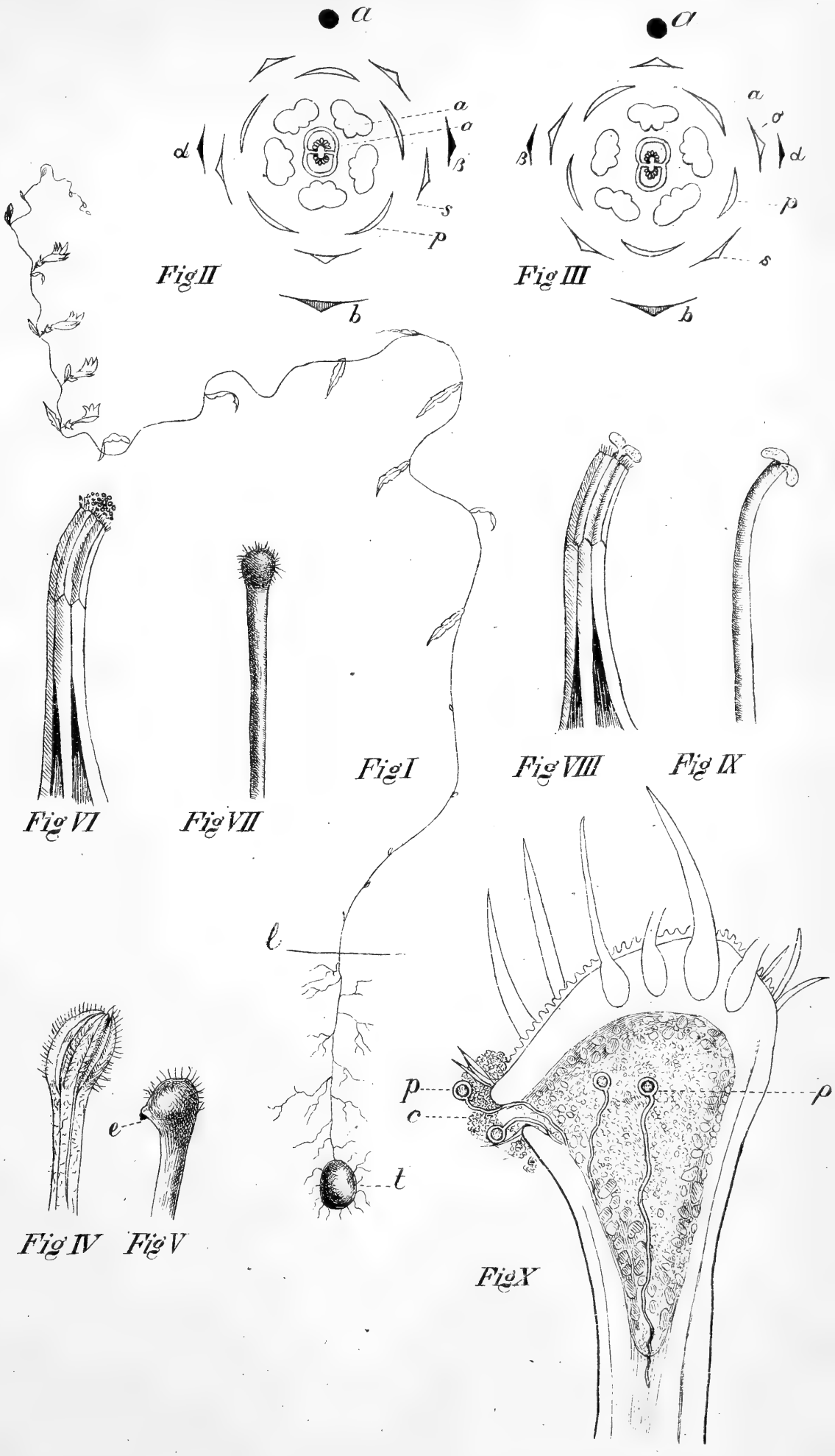

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THE TRANSACTIONS

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THE TRANSACTIONS

OF THE

South African Philosophical Society.

THIRD CONTRIBUTION TO THE SOUTH AFRICAN COLEOPTEROUS FAUNA.

By L. Péringuey, F.Z.S. F.E.S., London, France, &c.

[Read 1892, March 30.]

On Beetles collected in Tropical South-Western Africa by Mr. A. W. Eriksson.

While travelling in Northern Ovampoland, Mr. A. W. Eriksson has devoted a great part of his time to collecting birds and insects, and he has on two occasions presented part of his valuable entomological collections to the South African Museum, the Curator of which, Mr. R. Trimen, has lately made known the list of the butterflies: Proc. Zool. Soc. 1891, p. 59.

The Coleoptera collected by Mr. Eriksson are extremely interesting, inasmuch that they are all of a true South-African type, identical in most cases with those of the Zambeze-Mozambique fauna, but totally different, except in very few instances, from those of the pure Cape Colony fauna, and certainly greatly differentiated from that of Central Angola, as known by the descriptions of Von Harold and others.

The material at my disposal, although large, is not sufficiently complete to give a true idea of the coleopterous fauna of that part of the country, but, with the exception of very few Senegal and West African forms, it may be said to be the same, although varying slightly, as the one met with from the North of Quilimane to Mossamedes, and so far as we now know, I am satisfied that on the 16° of latitude, is the true limit of the South-African Coleopterous fauna.

The abundance of *Graphipterus* is a very noticeable feature of the Carabidæ, which coupled with that of *Polyhirma* and *Anthia*, imply a

partly open country, more or less grassy and occasionally barren, and as might be expected where the inhabitants are chiefly of pastoral habits, the coprophylous Lamellicornia are plentiful and much varied, the Cetonidæ again are but poorly represented, there being only two Ceratorrhynidæ.

Among the Tenebrionidæ, the absence of the long-legged *Adesmia* (sub. gen. *Onymachris*), is very noticeable, implying perhaps that the species included in this sub-genus are not met with far from the sand dunes extending along the sea shore. In the Meloidæ, the *Mylabris* are very numerous, and the Curculionidæ include no less than fourteen species of *Brachycerus*, as well as one species of *Hipporrhimus*, which genus had not been recorded as yet from so far North.

The Longicornia are not very numerous, but they include a representative of a genus, *Olenecamptus*, peculiar to Australia and India.

Cicindelidæ	number	5	species or varieties,	of	which	3	are new.
Carabidæ	„	73	„	„	„	31	„
Dytiscidæ	„	4	„	„	„	—	„
Hydrophilidæ	„	2	„	„	„	1	„
Paussidæ	„	2	„	„	„	—	„
Histeridæ	„	3	„	„	„	—	„
Silphidæ	„	1	„	„	„	—	„
Dermestidæ	„	1	„	„	„	—	„
Trogositidæ	„	1	„	„	„	—	„
Lamellicornia	„	90	„	„	„	22	„
Buprestidæ	„	26	„	„	„	5	„
Elateridæ	„	4	„	„	„	2	„
Malacodermidæ	„	8	„	„	„	1	„
Bostrychidæ	„	2	„	„	„	—	„
Tenebrionidæ	„	64	„	„	„	22	„
Cistelidæ	„	2	„	„	„	—	„
Lagriidæ	„	4	„	„	„	1	„
Meloidæ	„	25	„	„	„	5	„
Curculionidæ	„	52	„	„	„	13	„
Longicornia	„	26	„	„	„	5	„
Phytophaga	„	39	„	„	„	13	„
Erotylidæ	„	3	„	„	„	—	„
Coccinellidæ	„	5	„	„	„	—	„

Or a total of 442 species or varieties, of which 124 are now described for the first time.

Family : CICINDELIDÆ.

Gen. MANTICHORA. Fabric.

M. LIVINGSTONI, Casteln.

Recorded from Lake N'Gami by De Castelnau. This species is closely allied to *M. latipennis*, and differs from huge specimens of this species by the strong and continuous serration of the outer sides of the elytra of the ♂ ; the wing covers are also more elongated and less cordiform. It is difficult to decide from the description alone, although a very elaborate one, if the insect called *M. Livingstoni* by Von Harold (Coleopt. Hefte, XVI. 1879, p. 9), and coming from Angola, is identical with the true species ; it is, however, very probable, owing to the locality. Ovampoland (Omaromba).

The genus Mantichora will be found to consist of the following described species and varieties :

M. tuberculata.—De Geer.

=*maxillosa*, Fabr. Syst. El. 1, p. 167.
=*gigantea*, Thumb. Nov. Ins. Sp. 1, p. 25.
=*granulata*, Klug. Mon. p. 420.

Var. *tibialis*, Bohem. Ins. Caffr. 1, 1848. This variety differs only from the true *tuberculata* in the colouring of the legs which are reddish-brown. It is mostly met with in the Eastern Provinces of the Cape Colony.

Var. *Sicheli*, Thoms. Mong. p. 9, is generally smaller than *tuberculata* and with the discoidal part of the elytra more granulated. Common in Griqualand West, Cape Colony ; very local.

M. congoensis, Pering. Ann. and Mag. Nat. Hist. 1888, p. 219. Size of *tuberculata*, but differentiated by the great declivity of the postical part of the elytra. Congo ; exact locality unknown.

M. latipennis, Waterh. Ann. and Mag. Nat. Hist. 1837, p. 503, &c. The typical form is met with in the Orange Free State and Southern Transvaal, also in Northern Natal. Examples from the Limpopo and Zambeze are larger and the elytra more cordiform, approximating *M. mygaloides* of Thomson.

=*mygaloides*, Thoms. Mon. p. 8 ; Archiv. Entomol. p. 323.
=*Dregei*, Casteln. Rev. Zool. 1863, p. 69.

M. Livingstoni, Casteln. Rev. Zool. 1863, p. 71. N'Gami Ovampoland, Angola.

M. Ludovici, Casteln. Rev. Zool. 1863, p. 70. North of Great

Namaqualand, Damaraland. The elytra are nearly smooth and shining. Seems to be very local.

M. scabra, Klug, Mon. p. 420. Elytra convex and sloping abruptly posteriorly ; covered with fine granulations. Mozambique, neighbourhood of Delagoa Bay.

M. herculeana, Klug. Monog. p. 423. The largest of all the species of this genus, with elytra but slightly rugose, and shaped like those of *Livingstoni*. From Mozambique, and Lake Nyassa, occurring also in N'Gami land.

Gen. OPHRYODERA. Chaud.

O. RUFO-MARGINATA, Bohem. var. ERIKSSONI.

Long. 23, lat. 8mm.

Head and prothorax of *rufo-marginata* and with two longitudinal bands of dense white hairs ; elytra brassy with a broad sutural pale-yellow band uniting at the apex, a wide fascia ascending on each outer side to about the middle of the wing cover and terminating in a small diagonal ramus, a little below the shoulder a slanting ramus reaching about the third part of the length of the wing-cover but not connected with the sutural band ; underside and legs covered with dense white hairs ; the 5th, 6th and 7th articulations of the antennæ are much compressed and dilated.

This variety is intermediate between var. *Bradshawi*, Per. and var. *Oberthuri*, Pering. Ann. and Mag. Nat. Hist. 1888, p. 221.

3. O RUFO-MARGINATA, var. *Bradshawi*, Pering. Ann. and Mag. Nat. Hist. 1888, p. 220.

Recorded from Zambese River.

Gen. CICINDELA. Linn.

4. C. JUCUNDA. spec. nov.

Supra viridis, nitida, subtus cyanea lateribus dense albo-squamosis ; labro flavo, elytris opacis, crebre punctulatis, margine laterali flava, utrinque postice sinuata, lineis tribus (prima sub-humerali introrsum, secunda ad medium posita retrorsum ducta tertiaque brevi, apicali,) emittente.

Long. 10, lat. 4mm.

Metallic green, moderately shining, labrum and base of mandibles white ; prothorax narrow, slightly pilose ; elytra elongated, narrow, regularly punctured, outer margin with a white narrow band briefly

interrupted below the humeral angle ; a little below the shoulder is a narrow ramus directed towards the suture which it does not reach, at about the middle, a second ramus less arcuated and evidently intended, altho' disconnected, to form with a dot situated short of the apex another ramus directed backwards, also a small projecting dent at the rounding of the apical part.

Long. 10, lat. 4^{mm}.

Evidently allied to *C. pudibunda*, Boh.—a very erratic species—but narrower and differentiated by the position of the rami emitted from the margin : the sub-humeral one is nearer the base, more slender and nears the suture, the second one is directed backwards and the projecting dent at the rounding of the apex is sharper and longer, the marginal band is also much more narrow and interrupted below the humeral part.

Gen. MYRMECOPTERA. Germ.

5. M. ERIKSSONI. spec. nov.

Supra nigro-ænea, capite prothoraceque transverse plicatis, hoc angusto, elongato ; elytris elongatis, sub-ovalibus, late profundeque punctatis, apice mucronatis, singulo plaga triangulari discoidali vittaque marginali a medio apicem attingente albidis notato ; subtus nigro-cyanea, pedibus violaceis. Long. 14—15. Lat. 4^{mm}.

Shape, colouring and sculpturing of *D.* (*myrmecoptera*) *limbata*, *Saundersi Chd*, and *bi-lineata* Dohrn, but narrower than these three species ; the discoidal patch is situated in the centre of each elytron, elongated and bluntly triangular, and even sometimes faintly connected with the marginal band which begins only at the medium part of the elytra and is broad and well defined.

The two examples collected by Mr. Eriksson have no trace of any humeral or sub-humeral marginal band or dot, as in the species above mentioned.

Family : CARABIDÆ.

Gen. MELADROMA. Motsch.

6. M. LUGUBRIS. Schaum.

Recorded from Northern Natal, Orange Free State, Transvaal, Zambeze River.

Gen. TRIÆNOGENIUS. Chaud.

7. M. SCULPTURATUS. Gerst.
,, From Lake Jipe and Zambeze R.

Gen. CALLIDA. Dej.

8. C. CRIBRIPENNIS. Chaud.
,, Transvaal, Damara-land.

Gen. BRACHINUS. Weber.

9. B. NOBILIS. Dej.
Pheropsophus Alstoni, Pering. Trans. S. Afr. Phil. Soc. 1888, p. 72.
,, Nubia, Abyssinia, Dongola, Senegal, Cape Colony.

Gen. TETRAGONODERUS. Dejean.

10. T. DISPAR. spec. nov.

Elongatus, supra fusco-æneus, nitidus, subtus niger; prothorace brevi, elytris sub-quadratis, striatis, plaga elongata sub-humerali, diagonali medium disci attingente alteragne sinuata sub-postica in singulo ornatis, antennarum basi pedibusque rufescentibus.

Elongated, coppery, shining on the upper part, black underneath, with the first three articles of the antennæ, the palpi and the legs reddish; head and prothorax smooth, shining, the latter short, broad with the outer margins raised and two rigid setæ on each side; elytra a little broader than the prothorax at the base, slightly quadrate, plane, well striated, each with a diagonal pale-yellow patch placed on the 3rd, 4th, 5th, 6th intervals from the suture, acuminated apically with the point reaching the centre of the elytron and a little below it a semi-triangular slightly sinuated sub-apical patch reaching from the 3rd interval to the outer margin.

Allied to *T. 4-maculatus*. Gory.

Gen. SIAGONA. Latr.

13. S. SIMPLEX. spec. nov.

Nigra, nitida, fere glabra; antennis brunneo-pubescentibus; capite prothoraceque profunde punctulatis; elytris planis, punctis tenuibus

setiferis fere tri-seriatis, marginibus parce tomentosis ; subtus pedibusque nigris, tarsis atque palpis rufescentibus.

Long. 11. Lat. 4mm.

Head, antennæ and prothorax as in *S. caffra*, Boh. ; elytra smooth, each one with a few vague punctures each bearing a small seta, and more or less arranged in three longitudinal series, the lateral and posterior margins sub-setulose ; underside and legs black, tarsi rufous.

Evidently closely allied to *S. caffra*, but smaller, and differentiated by the setifer punctures and the setulose margins.

14. S. AUSTRALIS. spec. nov.

Rufo-castanea, pubescens ; capite lato, crebre punctato ; prothorace capite paululo latiore, utrinque profunde impresso, in medio tenuiter canaliculato ; elytris valde deplanatis, elongatis, crebre punctulatis longeque pubescentibus.

Long. 14. Lat. 5mm.

Very much like *S. Europæa*, Dej. and closely allied to *S. pubigera*, Chd. Rufo-castaneous, shining, with the apex of the mandibles and the head somewhat darker than the colour of the rest of the body ; antennæ pubescent, the first, second and third articulations with long, rigid bristles ; head closely punctured, prothorax pubescent, setulose laterally, very deeply impressed on each side of the median groove which is very narrow ; elytra with the shoulders not much rounded, elongated, nearly parallel, much depressed and covered with close punctures from each of which springs a little hair forming a dense pubescence, and also a few scattered rigid bristles ; underside of the head and prothorax punctured, abdomen shagreened and pubescent like the legs.

Gen. GRAPHIPTERUS. Latr.

15. G. GRANDIS. spec. nov.

Niger, ochraceo pubescens ; capite prothoraceque in medio vitta lata nigra, hoc deplanato, lato, lateribus in medio valde productis, albo-marginatis ; elytris sub-rotundatis, deplanatis, sutura lata, apice acuminata, nigra, vittis angustis tribus in singulo suturaque albidis, interstitiis dorsalibus secundo tertioque rufescentibus.

Long. 19. Lat. 10mm.

A very distinct species with a facies differing from all the other South-African species I know. Head moderately large, covered with

whitish hairs and with a triangular black band in the centre ; prothorax twice as broad as the head with the outer sides strongly ampliated in the middle, covered with an ochraceous tomentum and having a broad median black band and the outer margins whitish ; elytra nearly rounded, plane, three times the length of the prothorax and nearly twice as broad, with a very broad, black, sutural band acuminated towards the apex and three narrow whitish bands on each elytron ; the first two are connected at the apex with the outer margin which is broadly white, and the third one stops short of it ; the 2nd and 3rd interstice instead of being ochraceous like the first are dark brown.

Probably allied to *G. laticollis*, Harold, which I know from description only.

16. G. AMABILIS. Bohem.

Recorded from the Lake N'Gami, and between Zambeze and Limpopo Rivers. The examples from that last locality have a more golden-yellow pubescence than those from Ovampoland.

17. G. ANDERSONI. Chaud.

Recorded from Lake N'Gami.

18. G. ADAMANTINUS. Péring.

differs slightly from the type.

„ from Cape Colony (Kimberley) and Orange Free State (Parys).

19. G. ORNATUS. spec. nov.

Niger, pube flavescente vel cinnamonea supra vestitus ; prothoracis medio vitta nigra lateribusque albidis ; elytris elongatis, sub-parallelis, albo-marginatis, sutura nigra vittisque angustis duabus in singulo nigris albis.

Long. 10-11, Lat. 5-6^{mm}.

Upper side yellowish, pubescent, turning in some examples to a cinnamon hue ; both sides of the head pubescent ; prothorax briefly cordiform with a broad, black, median vitta, lateral sides white ; elytra elongated, very little ampliated in the middle, in fact almost sub-parallel, with a broad, sutural, blackish, brown band and two narrow whitish ones on each elytron, the first one edges the black sutural band, and the other is discoidal ; the outer margin is white, and broader than the dorsal vittae.

Allied to *G. suturiger*, Chaud, and shaped like it, but differs in

colouring ; the prothorax has a broad black median line wanting in *G.suturiger*, the white dorsal vitæ of the elytra are more defined, and the sutural band is not acuminated posteriorly. In some examples the cinnamon-coloured interval between the outer margin and the discoidal vitta is rufous black.

20. G. VICINUS. spec. nov.

G. vittigero certe affinis ; ab illo præcipue differt vittis dorsalibus elytrorum angustioribus vittaque discoidali breviore.

Long. 11, lat. 5mm.

Shape of preceding species but covered with a reddish-brown pubescence, the pre-sutural vitta on each elytron, as well as the discoidal one are very narrow, the latter does not reach the apex and is thus disconnected posteriorly from the margin.

I have only seen two examples of this species, and they may perhaps be only a variety of *G. vittiger*.

21. G. DECEPTOR. spec. nov.

G. vittigero affinis, ab illo differt vestitudine grisea, prothorace in medio haud vittato elytrisque vittis quatuor angustis albidis in singulo ornatis.

Long. 10, Lat. 5mm.

Shorter than the two preceding species but nearly coloured alike, *deceptor* is differentiated from *vittiger* by the colouring of the prothorax and of the elytra ; in the former there is no trace of a median black line and the discoidal part is rufous-brown, the sutural band of the elytra is not so broad and is slightly narrowed in the median part, the white lines are broader and four in number on each wing-cover : the one bordering on the suture is as broad as the discoidal one, the premarginal one narrower and the marginal as broad as the presutural ; in fact it may be said that the white pubescence has invaded the pale-cinnamoneous background to such an extent as to make it doubtful if the later is really the background. The shape of the elytra which are sub-quadrate will, however, help to differentiate this species from the preceeding one.

22. G. OVIPENNIS. spec. nov.

Ovatus, capite prothoraceque cinnamoneis, in medio nigro-vittatis,

hoc albo-marginato ; elytris griseo-pubescentibus sutura nigra ad apicem acuminata.

Long. 11-12, Lat. 5-5½mm.

Ovate, head and prothorax with a median band of rich-brown depressed hairs, disk of the latter almost rufous with the outer margins white ; elytra very ovate, covered with a short, thick, pale-yellow pubescence and having a broad sutural margin acuminated towards the apex and stopping a little short of it.

23. ? Var. PROPINQUUS.

Præcedenti certe simillimus, sed elytris vitta discoidali nonnunquam fere obsoleta, cinnamonea vel pallide-fulva saepeque postice interrupta, primo intuitu differt.

Same as type, elytra with a more or less distinct cinnamoneous discoidal band which is even reduced to a faint supra humeral dot, in which case the dot is generally rich cinnamon.

Allied to *G. Andersoni*, Chaud., which may prove to be only a smaller variety of *G. amabilis*, Boh., but more ovate and smaller than these two species. Had I not seen a very numerous series of examples, I would have been inclined to consider several grades of colouring as distinct ; the ovate facies, when compared to other species of that group, imparts to *G. ovipennis* an unlikeness with its congener ; in its nearest ally *G. Andersoni*, the sutural band and the discoidal cinnamon vitta on each elytra are very much broader and more strongly defined.

24. G. AGILIS. spec. nov.

Niger, ovatus, pube grisea vel cinnamonea tectus ; prothorace augusto, in medio nigro-vittato ; elytris elongato-ovatis, sutura, margine laterali, linea dorsali albis vittaque sub-lata, nigra, juxta suturam posita in singulo ornatis.

Long. 12-13, lat. 5-6mm.

Shaped like *G. ovipennis*, but the elytra are a little more elongated, narrowed at the base, covered with a yellowish or cinnamon pubescence ; prothorax very narrow, denuded in the centre, with the outer margin slightly whitish ; elytra with a broad sutural band, a narrow discoidal line and the suture whitish, and on each side of the broad sutural whitish band, a well-defined black vitta reaching from very near the base to the apex.

Hab. Damaraland.

Allied to *G. velox*. Péring.

25. G. SIMULATOR. spec. nov.

Niger, pube flavescente tectus; capite in medio vittato; prothorace brevi, cordiformi, in medio haud vittato, albo-marginato; elytris subquadratis, albo marginatis, vitta lata, nigra prope suturam posita, apicem attingente, postice haud acuminata vittisque discoidalibus duabus albis in singulo ornatis.

Long. 12. Lat. 5-5½mm.

Allied to *G. bi-vittis*, Chaud., but the elytra are more quadrate, and the pre-sutural black band on each elytron reaches from the base to the apical margin and is not acuminated posteriorly, the two white dorsal bands are much more defined, the one edging the black vitta is the largest of the two.

26. G. BILINEATUS. Boh.

Recorded from Damaraland, and the vicinity of Lake N'Gami.

27. G. AMICUS. spec. nov.

Niger, pube griseo-flavescente vestitus; prothorace brevi, lato, albido-marginato, in medio nigro-vittato; elytris brevibus, latis, subrectis, albo-marginatis, vittis duabus nigris duabusque albis alternantibus in singulo ornatis.

Long. 10. Lat. 5mm.

Allied to *G. bilineatus*. Bohem. The shape is the same, although smaller, but the markings of the elytra differ. Head and prothorax with a black central vitta, the latter is short and broad; elytra with a broad black band placed at a short distance from the suture, reaching from base to apex, and also a narrower discoidal one (which is often dark-brown instead of black); between the pre-sutural band and the discoidal one runs a white band as broad as the latter, which is also edged on the marginal side with a very fine white line; outer margins white.

I have seen an example where the large pre-sutural band is divided in two by a very fine white line, the same thing occurs occasionally in *G. bilineatus*.

28. G. LÆTUS. spec. nov.

Niger, capite prothoraceque in medio flavo-pubescentibus, hoc albido-marginato; elytris ob-ovatis, depressis, pube nigro-brunnea tectis,

albo-marginatis, sutura lineisque tribus angustis flavescentibus in singulo ornatis.

Long. 11, Lat. 5mm.

Shape of *G. canescens*, Chaud. ; prothorax and head thickly covered with a yellowish pubescence without any denuded median band, and with the outer margins of the prothorax whitish ; elytra ob-ovate, covered with a dark-brown pubescence, and having a narrow, sutural, flavescent band and three dorsal ones of the same colour on each elytra ; outer margins whitish.

29. G. VELUTINUS. Bohem.

Recorded from Lake N'Gami.

30. G. CORDIGER. Dej.

Damaraland. Also recorded from Cape Colony, Natal, Orange Free State, Transvaal.

Examples from the Northern part of the Transvaal, and from Damaraland, have the discoidal patch of the elytra more cordiform and narrower than those of the extreme South.

31. G. PUSILLUS. Chaud.

Recorded from Cape Colony.

32. G. LINEOLATUS. Bohem.

—*Piezia lineolata*. Bohem.

„ from the Northern Transvaal, and the Zambeze River. Examples from the last locality are more elongated than those from Ovampoland.

33. G. LUGENS, Chaud.

—*G. univittatus*. Péring.

„ from the Zambeze.

34. G. ERIKSSONI. spec. nov.

Pube nigra, depressa, supra vestitus ; capite utrinque, prothoracis lateribus medioque, elytris vittis dorsalibus angustis duabus ad apicem connexis margineque laterali in singulo, flavescentibus.

Long. 9, Lat. 5½mm.

Shape of *G. lugens*, Chaud. Black, covered with a short, depressed

pubescence on the upper part, smooth and shining on the underside, antennæ and legs black, the former thickened and compressed ; head moderately large, covered with yellowish-white hairs but denuded in the centre ; prothorax cordiform not much wider than the head, with the outer sides and the discoidal part covered with a dense yellow pubescence ; elytra elongated, sub-ovate, each with the outer margin and two narrow, yellow, pubescent bands reaching the apex.

Allied to *G. Salinæ*, Klug and *G. lugens*, Chaud, but very distinct.

Gen. PIEZIA. Brullé.

35. P. OVAMPOENSIS. spec. nov.

Nigra, sub-nitida, supra pubescens, capite prothoraceque utrinque albo-pubescente vittatis ; elytris rugulosis, punctato-striatis, vitta lata dorsali a basi fere medium attingente, puncto discoidali plagaque communi apicali albido-pubescentibus in singulo notatis.

Long. 21-23, Lat. 9$^{mm.}$

Shape of *P. angusticollis*, Bohem., but larger ; head and prothorax aciculated, with a band of white hairs on each side, continued on the elytra where it reaches the median part, and with a faint spot on the adjoining interstice, and also a semi-triangular white sutural patch at the apex.

The sculpturing and the inter-costal pubescence is very much like in *P. fazoclica*, Thoms, which it also greatly resembles.

Gen. POLYHIRMA. Chaud.

36. P. BI-LUNATA. Bohem.

Recorded from Damaraland only.

37. P. PERSPICILLARIS. Chaud. Rev. et Mag. de Zool. 1878, p. 63.

„ from Zambeze River and Zanzibar (Schimba), teste Chaud.

The examples collected by Mr. Eriksson do not agree altogether with Chaudoir's types and are an intermediate form between *bi-lunata* and *perspicillaris*.

38. P. GRACILIS. Dej.

„ from Orange Free State, Natal, Transvaal, Limpopo.

39. P. EDAX. spec. nov.

Nigra, sub-nitida, capite, prothoracis medio, scutello elytrorumque

basi pube albida vestitis ; prothorace angusto, oblongo-ovato, elytris elongatis, sub-ovatis, deplanatis, in singulo septem costatis, interstitiis latis, profunde sulcatis ; margine laterali bifariam sulcata setisque nonnullis erectis munita.

Long. 21-24, Lat. 7-8$^{mm.}$

Might be taken at first sight for *P. gracilis*, Dej., but is of a larger size and the elytra are much more depressed, nearly plane ; the seventh pre-marginal costa reaches much nearer the base, the outer margin has two distinct series of broad punctures, and the outer carina of the margin is set with a row of distant, erect, bristles.

40. P. FOVEATA. Perroud.

Recorded from the Orange Free State, Transvaal, Natal, Limpopo River.

41. P. DIVISA. Bohem.

„ from Zambeze River (Bradshaw).

42. P. OPULENTA. Boh.

„ from Damaraland only.

43. P. ALSTONI. spec. nov.

Nigro-brunnea, nitida, glabra, capite macula rufa inter oculos posita ; prothorace late cordiformi, medio sulcato ; elytris elongato-ovalibus, ad basin leviter angustatis, in medio nonnihil ampliatis, postice breviter acuminatis, deplanatis, late carinatis, interstitiis regulariter sulcatis.

Long. 23-24, Lat. 6-7$^{mm.}$

Facies unlike any other South African species of the genus *Polyhirma* but without any generic characteristic difference. Rufous black, hairless, except on the lateral margin of the elytra, the outer part of which has a few distinct rigid bristles ; head as in other species of the genus and with a distinct large reddish spot between the eyes ; prothorax broad and very cordiform ; elytra sub-parallel, slightly narrowed at the base, very little amplicated in the middle, little narrowed behind, not convex, and each with six carinæ, the first four from the suture rounded, the other two acute, intervals finely pitted at a regular and long distance, outer margin with a double row of foveæ.

I have much pleasure in calling this insect after G. Alston, Esq., to whom the South African Museum is greatly indebted for a valuable entomological collection made under great difficulties in British Bechuanaland, where this insect was first met with.

Gen. ANTHIA. Weber.

44. A. THORACICA. Fabric.

Recorded from all parts of South Africa, from Delagoa Bay to Damaraland. My examples from Delagoa Bay have the elytra more deeply striated.

45. A. LIMBIPENNIS. Chaud, var. *ovampoensis.*

The Ovampoland specimens of the species are generally larger than those from the Transvaal, and have on the outer part of the disk of the prothorax a few white decumbent hairs, more noticeable in the males, in which the postical lobes are also not sensibly produced posteriorly and are merely incised in the postical margin.

This variety is probably a form of transition between *limbipennis*, Chaud. and *calida*, Harold.

46. A. OMOPLATA. Lequien.

This species varies very much in the sculpturing of the elytra and in the size of the supra-humeral maculæ, and may be divided in varieties as follows :

Type form : *A. omaplata :* elytra deeply punctato-striated, supra-humeral patch broad, ovate, extending from the fourth to the seventh interval.

Long. 36-43, lat. 13-15$^{mm.}$

Recorded from Cape Colony, Orange Free State, Transvaal, Limpopo, Northern Ovampoland.

Var. ALGOENSIS : elytra deeply punctato-striated and supra-humeral patch as in *A. omoplata*, but the lateral white margin reaches from the apex to below the median part of elytra only.

Long. 40, lat. 13$^{mm.}$

„ from Delagoa Bay only.

47. Var. HERES : elytra less deeply punctato-striated, supra-humeral patch reduced to a mere dot, the dot sometimes bifid.

Long. 31-36, lat. 10-14$^{mm.}$

„ from Northern Ovampoland.

48. Var. INTEMPESTIVA : elytra hardly costate, the supra-humeral patch often reduced to a small elongated patch, but sometimes extending from the fifth to the seventh interval.

Long. 37-41, lat. 13-15$^{mm.}$

„ from Ovampoland, Damaraland, Upper Limpopo, British Bechuanaland.

49. Var. CUPIENS: elytra hardly costate, supra-humeral patch, elongated, broad, placed on the sixth interval and coalescing at the apex with the marginal outer band.

Long. 39-42, lat. 14-16mm.

Recorded from Ovampoland, also Upper Limpopo.

Var. VAGANS: elytra hardly costate, lateral white band reaching past the median part of the elytra as in *intempestiva*, but supra-humeral patch totally wanting.

Long. 37, lat. 13mm.

„ from Ovampoland.

51. Var. MELLYI: De Bréme: elytra slightly striated in the male, the striæ still finer in the female, supra-humeral patch large, ob-ovate, often tri-partite in the male, much larger in the female.

Long. 31-41, lat. 10-15mm.

The males from Ovampoland are considerably larger than those from the Cape Colony or the Transvaal.

„ from Ovampoland, Transvaal, Upper Limpopo, Orange Free State, Cape Colony (Kimberley).

Var. INCOLATA: elytra nearly smooth, very faintly striated, supra-humeral patch broad, ob-ovate, lateral white band totally wanting.

Long. 38, lat. 14mm.

„ from Delagoa Bay.

52. A. ŒMILIANA. Dohrn.

„ from Cape Colony (Northern Namaqualand minor), and British Bechuanaland, also Zambeze (teste Dohrn).

53. A. LIMBATA. Dej.

„ from Cape Colony, Orange Free State, Transvaal.

The examples from Ovampoland are slightly more deeply striated than those from the Transvaal, and have the elytra a little more parallel, thus approximating *A. æquilatera*. Klug.

Gen. PASSALIDIUS. Chaud.

54. P. ANDERSONI. Chaud.

„ from Ovampoland and Zambese River.

55. P. FORTIPES. Chaud.

Recorded from Damaraland, Namaqualand minor, Cape Colony (Kimberley).

Gen. SCARITES. Fabric.

56. S. MOLOSSUS ? Klug.

„ from Northern Transvaal.

Gen. CLIVINA. Latr.

57. C. GRANDIS, Dej.

„ from Damaraland, Natal, Transvaal, Cape Colony.

Gen. TEFFLUS. Latr.

58. T. MEGERLEI. Fabric.

A very large example which I cannot differentiate from *E. Delegorguei*. This last species is not even for me a variety of *Megerlei*, but quite identical.

„ from Tongaland and Delagoa Bay.

ZELOTICUS. gen. nov.

Allied to *Chlœnius*. Head narrow, sub-declivous, and narrowed behind the eyes, third articulation of maxillary and labial palpi very short and strongly securiform ; antennæ sub-pubescent with the median articulations compressed ; prothorax very long, slightly ampliated in the middle and not much broader than the head ; elytra elongato-ovate, sub-convex, front tarsi spongy with the three basal articulations extremely dilated in the male.

The characteristic difference between *Zeloticus* and *Chlœnius* is found in the extreme securiform shape of the third articulation of the palpi and its shortness ; the general facies is also different ; the head is much more elongated, the prothorax narrower, longer and less ampliated than in the group *Vertagus*, and the colouring of the elytra is also very different from that of any *Chlœnius*.

59. Z. TRISTIS.

Niger, sub-nitidus, capite prothoraceque glabris, hoc capite paulo longiore, angusto, in medio breviter ampliato, longitudinaliter canaliculato, posticeque utrinque longe sulcato ; elytris elongatis, sub-ovatis,

postice angustatis, sub-convexis, breviter pubescentibus, profunde striatis, interstitiis punctatis, vitta angusta supra marginali a basi medium attingente plagaque parva apicali triangula albidis in singulo ornatis; subtus pedibusque nigris.

Long. 16, lat. 6mm.

Black with the head and prothorax shining and hairless, the former long, faintly and irregularly punctured, the latter a little longer than the head, narrow, with the median outersides slightly ampliated, deeply and broadly punctured, with a narrow longitudinal groove in the centre and two deep, long impressions on either side posteriorly; elytra a little broader than the prothorax at the base, narrowed apically, somewhat convex, covered with a short black tomentum, deeply striated with the striæ forming strong punctate costæ; on each elytron a whitish band on the seventh interval from the suture running from the base to the centre and a sub-triangular patch of the same colonr placed between the fourth and seventh interval at the supra-apical declivity; underside and legs black. A very close examination shows a faint elongated whitish dot placed on the fifth interval at about the middle of the disk of each elytron.

Gen. Chlœnius. Bonelli.

60. C. Dohrni. Bertol.

Recorded from Mozambique and Bagamoyo.

61. C. Erikssoni. spec. nov.

Niger, supra nitidus vix pubescens, subtus æneo-micans; capite profunde punctato; prothorace lato, rugoso-punctato, in medio leviter canaliculato, postice utrinque profunde impresso, marginibus lateralibus recurvis; elytris elongatis, prothorace basi vix latioribus, punctato-rugosis, alte costatis, nigris, maculis duabus angustis supra costas 4-6, ad tertiam partem locatis in singulo ornatis, margine laterali vage ænea.

Long. 17, lat. 7mm.

Allied to *C. insignis.* Chaud. the prothorax is of the same shape although the lateral sides are slightly more curved, the elytra are much less pubescent and the postical spots instead of forming one broad plaga as in *insignis*, extending on each side from the third to the seventh costa, are disconnected and consist of a very short line placed on the third costa and of another twice as long as the first on the sixth, neither of which invades the interstices.

62. C. OVAMPO. spec. nov.

Viridi æneus, antennarum articulo primo secundoque, palpis atque pedibus flavis; prothorace transverso, lato; elytris breviter pubescentibus, striatis, interstitiis crebre punctatis, macula postica sinuata inter strias 3—8 locata albido-flava in singulo ornatis.

Long. 14, lat. 15mm.

Shape and marking of *C. perspicillaris*, *Erichs*; head and prothorax brassy-green, shining like the prothorax, this one nearly as broad as long, faintly grooved longitudinally in the centre and with a moderately deep sulcus on either side posteriorly; elytra elongated, nearly straight, rounded postically, little convex, pubescent, striated, with the intervals shagreened and having each a sinuated yellow patch at about the third part of the elytra and extending from the third to the eighth interval; this patch is almost square from the third to the sixth interval and narrowed on the seventh and eighth, and reaches there a little nearer to the apex.

63. C. EGREGIUS. spec. nov.

Œneo-cæruleus, postice sub-violaceus, sub-nitidus, supra breviter pubescens; palpis, antennarum basi pedibusque rufis; prothorace breviter transverso, lateraliter anguste rufo-marginato; elytris elongatis, sub-rectis, modice convexis, anguste striatis, plaga posticali flavo-rufa, transversa, lata utrinque marginem fere attingente, ornatis.

Long. 11, lat. 4mm.

Metallic-blue turning to violet-blue on the apical part of the elytra, briefly tomentose; the palpi, the three first articulations of the antennæ and the legs red; prothorax as broad as long, short, deeply punctured, slightly grooved in the centre and with a lateral depression on each side behind, lateral margins raised and reddish; elytra decidedly, though moderately convex, broader at the base than the prothorax, finely striated with the intervals broad and closely punctured, and with a broad, yellowish red, very little sinuated, transverse band extending almost from outer margin to outer margin, and placed above the apical part; underside metallic greenish-blue.

Approximates *C.* (*Vertagus*) *Bohemani*, but very distinct.

64. C. DUSSAULTI. Duf.

Recorded from Upper Limpopo.

65. C. SIGNATUS. Bohem.

C. apiatus. Klug.

" from Mozambique.

66. C. VELUTINUS. Bonelli.

I have compared this species with de Chaudoir's types and cannot distinguish it from the variety *auricollis*, Géné or *senegalensis Dej.* I have also recorded *C.* (*Epomis*) *capensis*, from Lake N'Gami.

Recorded from Damaraland.

67. C. MORIO. Bohem.

From Lake N'Gami, teste Boheman.

68. C. FULVICOLLIS. Chaud.

„ from Delagoa Bay, teste Chaud.

69. C. FRATERNUS, spec. nov.

Sub-opacus, capite viridi, labro, antennarum basi, palpis, pedibus prothoraceque rufis, hoc in medio vittis angustis duabus interruptis nigris; elytris æneo-nigris, pubescentibus, anguste striatis, interstitiis latis, margine, plaga parva discoidali in singulo alteraque communi postica, flavo-testaceis; abdomine nigro.

Long. 9, lat. $4\frac{1}{2}$mm.

Closely allied to *C. vitticollis.* Bohem., from which it may be said to differ only in having on the elytra two discoidal patches which are totally wanting in *vitticollis.*

Head green, shining, with the labrum, the palpi, the first three articulations of the antennæ and the legs reddish; the prothorax is as broad as long, pale-red, with on each side of the disc a longitudinal line interrupted so as to form four small patches; elytra almost plane, slightly pubescent, finely striated with the intervals broad and closely punctured, the outer margin from the base to two-thirds of the elytra is yellowish-red, there is a supra-apical, sutural, triangular patch and from the fourth to sixth interval a nearly quadrate patch of the same colour, placed a little above the median part of each elytron.

Gen. OODES. Bonelli.

70. O. CONSPICUUS. spec. nov.

Niger, nitidus, capite levi, in medio canaliculato, utrinque fovea parva impresso; prothorace lato antice angustiore, postice sub-dilatato, supra sub-deplanato, levi, carina angusta longitudinali in medio posticeque utrinque foveato; elytris antice prothoracis basi vix latioribus, post medium leviter ampliatis, sub-convexis, punctato-striatis interstitiis latis, levibus punctisque duobus in interstitio tertio impressis.

Long. 15, lat. 8mm.

Black, shining, head smooth with two small round depressions between the eyes, palpi rufous; prothorax with the anterior angles sloping, much increased posteriorly, very little sinuated basally, moderately convex, smooth with a very narrow median longitudinal groove and a small rounded moderately deep impression on each side above the scutellary region; elytra contiguous at the base with that of the prothorax, gradually ampliated from above the middle part, rounded behind, moderately convex, finely striated with the striæ punctured and the interstices broad and smooth, but with two distinct punctures on the second interstice from the suture; the first one is about the middle, the second almost at the apex of the postical declivity; underside and tarsi reddish black.

The number of punctures on the second interstice varies. In one example I find three on the left elytron with two only on the right; in another example these punctures are almost evanescent.

Recorded from Barberton (Transvaal).

Gen. HYPOLITHUS. Dej.

71. H. SAPONARIUS. Oliv.

„ from Senegal.

72. H. CAFFER. Bohem.

„ from Transvaal, Delagoa Bay, Natal.

73. H. ORNATUS. spec. nov.

Nigro-æneus, nitidus, glaber, palpis, antennis prothoracis marginibus pedibusque rufis; elytris striatis, interstitiis planis, macula communi triangula rufa prope apicem suturae posita ornatis.

Long. 12, lat. $4\frac{1}{2}$ mm.

Palpi antennæ and legs reddish; greenish-black above, dark testaceous underneath; head and prothorax shining, the latter parallel, finely aciculated behind, transverse and with the outer margins reddish; elytra smooth, shining, striated with the intervals plane and with a triangular postical reddish patch at the sutural apex.

Gen. HARPALUS. Latr.

74. H. EPHIPPIUM. Boh.

„ from Lake N'Gami.

Gen. PLATYMETOPUS. Dej.

75. P. FIGURATUS. Bohem.

Recorded from Delagoa Bay, Transvaal, Natal.

Gen. ACUPALPUS. Latr.

76. A. TESSELLATUS. spec. nov.

Oblongo-ovatus, fusco-testaceus, elytris tenuiter striatis, fascia diagonali ab humero ducta, in medio elytrorum angustata, nonnunquam ramulun emittente posticeque valde dilatata flava in singulo ornatis.

Long. 5, lat. 3mm.

Head reddish-brown, nearly smooth, prothorax transverse, deeply punctured transversely at the base and apex, discoidal part rufous; elytra oblongo-ovate, convex, striated with the intervals rounded and very vaguely punctured; each elytron with a diagonal broad yellowish band beginning at the shoulder and a sinuated patch at the apex connected with the humeral band by one or sometimes two narrow straight irregular lines forming with the back ground a tesselated colouring.

77. A. ELEGANTULUS. spec. nov.

Oblongo-ovatus, fuscus, elytris tenuiter striatis, basi vittaque dorsali longitudinali apicem haud attingente pallide flavis.

Long. 4, lat. 2mm.

Oblongo-ovate, infuscated, head nearly smooth; prothorax strongly punctured on the apical and basal margins, reddish on the disc, elytra finely striated, smooth, dark-brown, with a broad basal band extending from shoulder to shoulder and produced on each elytron in a broad vitta slightly diagonal, tapering posteriorly and uniting above the apex with that of the other elytron, thus leaving an elongated quadrate black patch on the disc; suture slightly reddish; legs palpi and base of antennæ pale-yellow.

Gen. RHATHYMUS. Dej.

78. R. MELANARIUS. Klug.

„ from Mozambique.

Family : DYTISCIDÆ.

Gen. HYDATICUS. Leach.

79. H. LEANDER. Rossi.

Recorded from Cape Colony, Natal, Transvaal.

Gen. CYBISTER. Eschsc.

80. C. TRI-PUNCTATUS. Oliv.

„ from all parts of South Africa.

81. C. BI-NOTATUS. Klug.

„ from Lake Nyassa (teste Sharp).

82. C. DYTISCOIDES. Sharp.

„ from Madagascar (teste Sharp).

Family HYDROPHILIDÆ.

Gen. HYDROPHILUS. Geof.

83. H. MUNDUS. Bohem.

„ from the Transvaal, and the Zambeze River.

Gen. SPERCHEUS. Kuggelm.

84. S. AUSTRALIS.

Pallido-flavus, sub-nitidus, capite, plaga dorsali in prothorace liturisque nonnulis sub-evanescentibus, in elytris, nigris, his concinne punctato-striatis, interstitiis leviter rotundatis.

Long. $4\frac{1}{2}$, lat. 2^{mm}.

Pale-yellow, convex, hairless, head black, with a median discoidal patch of the same hue on the prothorax ; elytra very convex, striated, the striæ deeply and closely punctured with the intervals smooth, slightly and equally rounded, and with a few elongated, evanescent, longitudinal, brownish-black patches.

Family PAUSSIDÆ.

Gen. ORTHOPTERUS. Westw.

85. O. SMITHI.

Recorded from Damaraland, also from Transvaal (Rustenburg, Leydenburg), and Zambeze Riv.

Gen. PENTAPLATARTHRUS. Westw.

86. P. NATALENSIS. Westw.

„ from Cape Colony, Transvaal, Natal.

I have seen an example from ? Baguamoyo (in Mons. Réné Oberthur's collection) much larger than the S. Afric. species; the true *P. paussoides W.* seems to be restricted to the immediate neighbourhood of Cape Town.

Family HISTERIDÆ.

Gen. HISTER. Linn.

87. H. NIGRITA. Erichs.

„ from Cape Colony, Natal, Transvaal, Zambeze.

88. H. VIDUUS. Fahr.

„ from Natal and Transvaal.

Gen. SAPRINUS. Erichs.

89. S. ELEGANS. Payk.

„ from all parts of South Africa.

Family SILPHIDÆ.

Gen. SILPHA. Linn.

90. S. MICANS. Fab.

„ from all parts of South Africa.

Family DERMESTIDÆ.

Gen. DERMESTES. Linn.

91. D. VULPINUS. Fabric.

„ from all parts of South Africa.

Family TROGOSITIDÆ.

Gen. MELAMBIA, Erichs.

92. M. GIGAS. Fabric.

M. maura. Pascoe.

I cannot separate *M. maura*, Pascoe from Senegal examples of *M. gigas*.

„ from Natal, Transvaal, Zambeze.

Family LAMELLICORNIA.

COPRINI.

Gen. PACHYLOMERA. Kirby.

93. P. FEMORALIS. Kirby.

„ from the Zambeze River, Transvaal, Delagoa Bay.

Gen. SCARABAEUS. Linn.

94. S. AERATUS. Gerst.

„ from Mombassa, East Africa.

95. S. PLAUSIBILIS. spec. nov.

Convexus, niger, capite rugoso-punctato, clypeo sex-dentato, nitido, ante oculos transverse sub-carinato; prothorace nitido, granulato, medio disci punctulato lineaque longitudinali levi, marginibus lateralibus crenulatis longeque villosis; elytris opacis, late striatis, interstitiis parce sub-punctulatis, callo humerali suturaque nitidis, pedibus nigro pilosis, tibiis anticis quadri-dentatis; subtus nitidus.

Long. 27-30, lat. 17-19^{mm}.

Convex, black, with head and prothorax shining; elytra opaque with a supra humeral protuberance and the suture shining. Head deeply and closely punctured, clypeus with six strong, acute spines and a transverse, little defined, smooth, raised line in front of the eyes; prothorax very convex, granulated on the sides of the disk and punctured in the centre with a smooth longitudinal line, the outer lateral margins crenated and with a long black villosity; elytra convex, broadly striated with the intervals moderately convex and vaguely punctured; underside black, shining; tibæ with long blackish hairs, the fore-ones strongly quadri-dentate externally.

Facies of *S. Bonelli*, but distinct.

96. S. LUCIDULUS. Boh.

Recorded from Lake N'Gami.

97. S. INTRICATUS. Fabric.

„ from all parts of South Africa.

Gen. GYMNOPLEURUS. Illig.

98. G. WAHLBERGI. Fahr.

„ from Natal, Transvaal.

99. G. CUPREUS. Fahr.

„ from Limpopo, Transvaal, Natal.

100. G. SMARAGDINUS. Fahr.

„ from Limpopo, Transvaal, Natal.

The green colour turns to red in many of the examples from Ovampoland.

Gen. COPTORRHINA. Hope.

101. C. KLUGI. Hope.

„ from Natal, Transvaal, Limpopo.

Gen. HELIOCOPRIS. Hope.

102. H. FAUNUS. Boh.

„ from Damaraland.

103. H. HAMADRYAS. Fabr.

„ from Cape Colony, Natal, Transvaal, Limpopo, Zambeze River.

104. H. GIGAS. Linn.

Isidis. Latr.

„ from the Zambeze, Limpopo, Transvaal.

105. H. PIRMAL. Fabr.

„ from the Zambeze, Limpopo, Mozambique, Cape Colony (Kimberley).

Gen. CATHARSIUS. Hope.

106. C. INSIGNIS. spec. nov.

Convexus, nigro-piceus, nitidus, capite parteque antica prothoracis transverse aciculatis, subtus dense fulvo-pilosis.

Mas. capite cornu elongato, compresso porrectoque armato; prothorace antice truncato, carina media elevata, in medio leviter emarginata, lateraliter utrinque dentata atque spina longa, compressa, retrorsum ducta, instruto.

Femina: capite prope medium carina edentata armato prothoraceque leviter transverse carinato.

Long. 34—39. Lat. 20—22^{mm}.

Allied to *C. platycerus*, Klug which it much resembles. The head of the male is provided with a long, nearly upright horn much longer than in *C. platycerus*; the median transverse ridge of the prothorax is not so declivous in front, the upper margin is more sinuated, incised in the centre, and the lateral angle forms a sharp conical protuberance prolonged in a long, sharp, flattened tooth directed backwards and overlapping the humeral angle of the elytra; the striation, convexity and texture of the elytra is the same as in *platycerus*; the underside is fulvo-villose, and the first and second articulations of the intermediate and posterior tarsi very broad and dilated.

The female differs from the male in the total absence of cephalic horn, which is replaced by a very little raised, transverse ridge; the ridge on the prothorax is hardly defined and faintly sinuated.

107. C. MELANCHOLICUS. Bohem.

Recorded from Damaraland.

Gen. COPRIS. Geoffr.

108. C. ORION. Klug.

„ from Natal, Transvaal, Limpopo, Zambeze.

109. C. LATIFRONS. Harold.

Cape Colony, Natal, Transvaal, Zambeze.

110. C. CEPHALOTES. spec. nov.

Niger, sub-nitidus; capite lato, elypeo in medio exciso acuteque bi-dentato, fronte cornu brevi acuto armata; prothorace sub-granulato,

brevi, convexissimo, antice abrupte truncato, in medio profunde impresso; elytris convexis, obsolete coriaceis angusteque striatis :

Long. 12-13, lat. 8-9mm.

Black, moderately shining, very convex, head granulose, very broad, with the margins of the clypeus reflexed, indented in the centre with the two augles raised and a conical very short horn between the eyes ; prothorax very convex, shagreened, abruptly truncated in the anterior part which has a broad central depression culminating in the centre of the disk where it forms two obsolete protuberances ; elytra as broad as the prothorax at the base and more convex, vaguely shagreened with narrow shining striæ ; anterior tibiæ tri-dentate ; underside black with a short rufous villosity ; club of antennæ reddish-brown.

Female, like the male, but with a rudimentary cephalic horn and without any impression on the anterior part of the prothorax.

Owing to its convexity the facies of this species is not unlike that of *Macroderes Greeni*.

Gen. ONITIS. Fabr.

111. O. CASTELNAUI. Harold.

Recorded from Limpopo, Zambeze and Damaraland.

112. O. VICINUS. Lansberge.

„ from Transvaal.

113. O. FODIENS. Bohem.

„ from Transvaal, Delagoa Bay, Limpopo River.

114. O. FULGIDUS. Klug.

„ from the Zambeze River.

Gen. ONTHOPHAGUS. Latr.

115. O. FURCIFER. Bohem.

„ from Zambeze River.

116. O. BI-CALLOSUS. Klug.

„ from Mozambique, Zambeze, Limpopo River.

117. O. SAPPHYRINUS. Fahr.

„ from Zambeze, Limpopo, Upper Transvaal.

118. O. VANELLUS. Lansberge.

Recorded from Northern Transvaal.

119. O. DREGEI. Harold.

„ from Northern Transvaal.

120. O. GAZELLA. Fabric.

„ from all parts of South Africa.

121. O. HAROLDI. Péring.

Probably a variety of *O. corniculatus*. Reich.

„ from Transvaal.

122. O. SUSPECTUS. spec. nov.

Supra virescens, subtus æneus, flavescente-pilosus, antennis palpisque flavis ; clypeo rotundato, crebre punctato, antice late emarginato, in medio incisurae dente distincto, sub-porrecto munito ; prothorace creberrime punctato, convexo, in medio impresso ; elytris convexis, striatis, interstitiis elevatis, vage punctatis.

Long. 11-12, lat. 6-6½mm.

Closely allied to *O. aciculatus*, Fahr., this species differs from it in the shape of the clypeus which is strongly emarginated in the centre and provided with a sub-erect, short, sharp, tooth, whereas in *aciculatus* the clypeus is rounded in front ; the shape of the prothorax is also different, having a moderately deep impression forming two smooth faint protuberances in the anterior part, and the intervals between the striæ of the elytra are much more narrow and more raised, and also faintly punctured.

123. O. COSTIPENNIS. Fahr.

„ from Delagoa Bay, Transvaal and Bechuanaland.

124. O. AMABILIS. spec. nov.

Ovatus, supra leviter convexus, breviter pubescens ; capite prothoraceque viridi-æneis ; elytris flavis, sutura fasciaque diagonali, communi, nigris.

Mas.: capite cornu porrecto gracili armato : femina : capite carina transversali.

Long. 6-6½, lat. 3-4mm.

Clypeus rounded with margins slightly raised, head with the usual semi-circular margin, on the vertex an erect slender long horn in the

male, and a transverse highly-raised ridge in the female; antennæ yellow; prothorax moderately convex, depressed posteriorly, slightly deflexed in front and with two apical tubercles, hairy, deeply punctured, brassy-green like the head; elytra depressed, narrowed behind, finely striated, each interval with two rows of fine punctures, pale-yellow with the suture black, and a broad semi-circular black band beginning at the shoulder and uniting with the suture a little above the apex; pygidium and pectus covered with dense, long silky hairs.

125. O. BOVINUS. spec. nov.

Niger, sub-metallescens, nitidus; clypeo lateribus reflexis, in medio valde exciso angulisque acute dentatis, a capite carina brevi integra disjuncto, capite carina frontali mediana bi-cornuta; prothorace antice retuso, carina transversa elevata utrinque profunde impressa munito; elytris ovatis, auguste striatis, interstitiis vage punctulato-hirtis.

Long. 6-8, lat. 4-5$^{mm.}$

Black, with a metallic coppery tinge on the head and prothorax; margins of the prothorax reflexed, strongly indented in the centre with the angles very sharp, separated from the head by a raised line, head with a median carina produced on the vertex in two sharp, well-defined horns: prothorax closely and regularly punctured, truncated anteriorly, and having an elevated ridge overhanging the base and very strongly impressed on both sides; elytra ovate, convex, finely striated with the intervals broad and vaguely punctured, the punctures briefly setigerous; antennæ and palpi reddish.

The ridge of the prothorax is shaped like that of *O. columella*.

126. O. VENUSTULUS. Erichs.

Recorded from Cape Colony, Natal, Transvaal.

127. O. PUSILLUS. Fahr.

„ from Natal, Transvaal.

128. O. EXIGUUS.

Rotundatus, nitidus, breviter pilosus; capite prothoraceque æneis illo bi-cornuto; elytris rufo flavis, sutura maculisque tribus nigris in singulo notatis.

Long. 4, lat. $2\frac{1}{4}^{mm}$.

Clypeus deeply emarginated at the apex with the angles diverging, vertex of the head with two short erect acute horns having each a small inner tooth at the base; prothorax finely punctured, convex

dehiscent apically, with a small fovea on each side, coppery, shining and pilose like the head and clypeus ; elytra slightly convex, deeply punctato-striate, hardly pubescent, yellowish-red, shining, with the suture infuscated and three black patches on each elytron ; the first one at the base, the second one a little below the median part, both beginning at the third stria and uniting with the suture, while the third one, placed at about the middle of the disk begins at the fourth stria and reaches the outer margin ; underside and legs black, shining, antennæ rufescent.

The shape of the cephalic horn is that of *O. venustulus*, Erichs, but *exiguus* is much more convex and differently mar ed.

Gen. APHODIUS. Illiger.

129. A. ? AMABILIS Bohem.

Recorded from all pars of South Africa.

Gen. ORPHNUS. McLeay

130. O. MELEAGRIS. Westw.

The size is smaller and the prothoracic cavity not so deep as in the Senegal examples, but it cannot be differentiated.

Gen. HYBOSORUS. McLeay.

131. H. ILLIGERI. Reich.

„ from all parts of South Africa.

132. H. RUFICORNIS. Bohem.

„ from Transvaal, Limpopo, Zambeze.

133. H. INCULTUS. spec. nov.

Smaller than *H. ruficornis*. Boh. but differentiated from it by the sculpture of the elytra which are very vaguely punctato-striate. Black, moderately shining, underside, palpi and clava of antennae yellowish-red ; elytra convex, faintly striated, with the interstices irregularly and not deeply punctured.

Long. 9, lat. 5-5½mm

Gen. BOLBOCERAS. Kirby.

134. B. CAFFER. Boh.

„ from Natal, Transvaal.

Gen. TROX. Fabric.

135. T. RADULA. Erichs.

I have not recorded that species, which is doudtless the *T. squalidus.* Olivier, from any other part of South Africa than the Vaal River.

136. T. TUBEROSUS. Klug.

Recorded from Zambeze Riv.

137. T. FOVEOLATUS. Bohem.

„ from Lake N'Gami and Damaraland.

138. T. VARICOSUS. Erichs.

„ from Angola, *teste* Harold.

139. T. LURIDUS. Fabric.

I have carefully examined Von Harold's types in Mons. R. Oberthur's collection, and am unable to find any difference between *luridus*, *caffer*, Har. and *sulcatus.* Thunb.

„ from all parts of South Africa.

MELOLONTHINI.

Gen. TROCHALUS. Casteln.

140. T. BADIUS. Bohem.

„ from the vicinity of Lake N'Gami.

141. T. BOHEMANI. Gerst.

„ from Northern Transvaal.

142. T. SPLENDIDULUS. Fahr.

„ from Natal.

143. T. FULGIDUS. Fahr.

„ from Natal (D'Urban), Transvaal.

144. T. MODESTUS. spec. nov.

Ovatus convexus rufo testaceus, sub-nitidus, glaber, elytris sub-striatis, punctulatis.

Long. 6, lat. 4.^{mm}

Reddish, shining but not iridescent. Facies of *T. splendidulus.* Fahr, but not so convex ; clypeus very strongly reflexed apically and

laterally and with a distinct longitudinal ridge, separated from the head by a raised line ; prothorax short and moderately convex, closely but not deeply punctured ; elytra convex, faintly striated and covered with punctures ; underside pale-red, smooth, irregularly punctured.

145. T. MOERENS. spec. nov.

Breviter ovatus, convexissimus, nigro-micans, glaber, antennis flavis ; capite prothoraceque crebre punctulatis ; elytris striatis, interstitiis fere levibus.

Long. 7—8, lat. 5—6^{mm}.

Black, iridescent, very convex ; clypeus narrowed with the apical and lateral margins reflexed, a semi-circular ridge separating it from the vertex, and with a small raised line reaching from the apex to the vertex ; prothorax short, very convex and finely and closely punctured like the head and clypeus ; elytra very convex, almost gibbose, narrowly striated, with the interstices very finely punctured, the punctures smaller than those of the head and prothorax ; underside reddish-black, smooth, finely punctured.

Resembles much *T. obtusus*, Fahr. in colouring, but it is much more convex, the striæ are not so deep, and the punctures are fainter

Recorded from the Zambeze River.

146. T. PLAGIGER. spec. nov.

Ovatus, convexus, æneo-niger, glaber, elytris flavis, basi, sutura, lateribus plagaque dorsali rotundata in singulo nigris.

Long. 6—7, lat. 4—4$\frac{1}{2}$^{mm}.

Ovate, convex, head and prothorax coppery-black, shining, closely and regularly punctured; scutellum black ; elytra striated with the intervals broad and closely punctured, yellowish, with the basal, outer and apical margins and the suture black, and a round discoidal patch of the same colour on each elytron ; legs reddish black, antennæ and palpi yellow.

A very distinct species.

147. T. RUFOVITTATUS. spec. nov.

Sub-ovalis, parum convexus, niger, metallico-micans ; elytris striatis, interstitiis grosse punctatis, vitta longitudinali lata, flavo-rufa a basi ad apicem ducta in singulo ornatis.

Long. 4—5, lat. 3$\frac{1}{2}$—4^{mm}.

Sub-ovate, little convex ; black with a metallic iridescence ; head and prothorax closely and regularly punctured: elytra striated with the intervals broad and coarsely punctured, and having on each elytron a broad yellowish-red band reaching from the humeral part to a little short of the apex ; palpi and tarsi yellowish.

The width of this yellowish-red patch varies much, but does not invade the whole of the disk of the elytra.

148. T. MOESTUS. spec. nov.

Sub-ovatus, modice convexus, æneo-fuscus, micans, elytris profunde striatis, interstitiis punctatis.

Long. 7, lat. 5mm.

Shape of *T. obtusus* Fahr., head and prothorax closely punctured, clypeus tri-dentate, palpi and antennæ testaceous ; elytra elongato-ovate, little convex, iridescent, very distinctly striated with the intervals roughly and deeply punctured.

149. T. PLAGIATUS. spec. nov.

Sub-ovatus, parum convexus, capite prothoraceque æneis, micantibus ; elytris metallico-rufescentibus, anguste punctato-striatis, sutura, marginibus plagaque discoidali sub-evanescente in singulo fuscis ; clava antennarum nigra.

Long. 6-6½, lat. 4-4½mm.

Sub-ovate, little convex, head and prothorax coppery-black, iridescent, clypeus tri-dentate, palpi yellowish, club of antennæ black, elytra striated narrowly, (striæ evidently punctured,) red with a metallic tinge and with the suture the lateral margins and a sub-discoidal patch on each elytron brownish, black ; underside metallic-red.

150. ? Var. VAGANS.

Differs from *plagiatus* only in the colouring, which is metallic-red with the exception of the head and scutellum which remain coppery-black.

Gen. SERICA. McLeay.

151. S. CARNEOLA. spec. nov.

Rufo carneola, micans, elongata, parum convexa ; clypeo tenuiter

marginato; elytris elongatis, distincte punctato-striatis, interstitiis punctulatis; antennarum clava quadri-articulata.

Long. 9-9½, lat. 4-4½mm.

Totally of a reddish, fleshy colour with a metallic iridescence; clypeus a little narrowed in front with the margins slightly raised, head rugose with a slightly raised line between the eyes, club of the antennæ quadri-articulated, with the flabellum as long as the head; prothorax convex, short, punctulated; elytra elongated, convex, conspicuously punctato-striated, with the intervals punctulated.

152. S. DECEPTOR. spec. nov.

Of a reddish fleshy colour very much like that of the preceding species, but less iridescent and also much smaller; the clava of the antennæ with three articulations only.

Long. 6-7, lat. 4mm.

153. S. OBESA. spec. nov.

Rufo-testacea, crassa, modice metallico-micans; clypeo sub-recurvo, capite profunde punctato; prothorace brevi, convexo, punctulato; elytris convexis, elongatis, distincte sed haud profunde striatis, interstitiis vage punctulatis; pygidio in medio nigro.

Long. 10, lat. 6mm.

Reddish-testaceous, moderately metallic-iridescent; clypeus with the margins slightly raised and a little infuscated, roughly punctured like the head; prothorax convex, short, punctulated; elytra very convex and elongated, moderately shining, not deeply striated with the intervals roughly but not deeply punctured; pygidium black in the middle.

154. S. LUCIDULA. spec. nov.

Oblonga, rufo-testacea, sub-opalina, elytris vage nigro-tessellatis, striatis, interstitiis pilis brevissimis adspersis.

Long. 7, lat. 4mm.

Facies of *Pleophylla fasciatipennis* Clypeus emarginate apically, with the margins reflexed; antennæ pale-yellow; head and prothorax finely punctured, darker in colour in the disk; scutellum triangular, very long and acute; elytra oblong, moderately convex, striated, with faint traces of tesselated black spots, sub-opaline and with very minute, distant, irregularly scattered whitish hairs; underside rufous, slightly pilose.

Gen. TRIODONTA. Muls.

155. T. MODESTA. spec. nov.

Elongata, rufo-testacea, griseo pubescens; clypeo antice sinuato, marginibus reflexis; prothorace brevi, punctulato; elytris elongatis, prothorace convexioribus, striatis, interstitiis punctulatis.

Long. 8, lat. 5^{mm}.

Elongated, testaceous red, covered with a short, close, greyish pubescence; clypeus sinuated in the middle with the margins reflexed, closely punctured; antennæ yellowish; prothorax short, convex, punctulated; elytra elongated, very convex, nearly three times as long as the prothorax, striated, with the intervals closely punctured; pygidium very pubescent: legs and underside punctulated, slightly pubescent, reddish-brown with a metallic tinge.

156. T. SERICANS. Fahr.

Recorded from Cape Colony.

157. T. TENELLA. Fahr.

„ from Natal, Cape Colony.

Gen. ABLABERA. Erichs.

158. A. VARIABILIS. Fahr.

„ from Limpopo River (teste Bohem.)

Gen. SCHIZONYCHA. Blanch.

159. S. VALIDA. Bohem.

„ from Northern Transvaal.

160. S. RUFINA. Bohem.

„ from Northern Transvaal.

161. ? S. OBLONGA. Bohem.

„ from Transvaal (Rustenburg).

162. S. TUMIDA. Casteln.

„ from all parts of South Africa.

163. S. CARBONARIA. Bohem.

„ from Transvaal, Natal, Cape Colony.

164. S. CURTULA. spec. nov.

Ovata, convexa, rufo-ferruginea, nitida, antennis palpisque flavis ; capite prothoraceque rugoso-punctatis, clypeo reflexo a capite linea angusta haud profunda disjuncto ; elytris prothorace parum latioribus, profunde crebreque punctatis, subtus pygidioque glabris, crebre punctatis.

Long. 9-10, lat. 5-6^{mm}.

Ovate, convex, ferrugineous-red, shining, with the palpi and antennæ yellowish ; head darker in colour, closely punctured with the margins of the clypeus slightly raised and separated from the head by a narrow shallow groove ; prothorax convex, closely punctured and slightly sinuated behind ; elytra little broader than the prothorax at the base, a little ampliated in the middle, convex, twice and a half as long as the prothorax and very deeply and regularly punctured ; underside hairless and closely punctured like the pygidium ; anterior tibiæ tri-dentate.

The shape of the head which has a transverse groove instead of a ridge as in other *Schizonycha* may necessitate the creation of a new genus for this species, but all the other generic characters are those of *Schizonycha*.

RUTELINI.

Gen. ANOMALA. Sam.

165. A. PALLIDA. Fabric.

Recorded from Natal, Transvaal, Delagoa, Zambeze and Limpopo Rivers.

166. A. IMMATURA. Bohem.

„ from Lake N'Gami (teste Boheman.)

167. A. RESPLENDENS. Fahr.

„ from Natal.

GEN. ADORETUS. CASTELN.

168. A. MACULATUS. Fahr.

„ from Natal, Transvaal.

169. A. NIGRICEPS. Fahr.

I cannot separate two examples from Ovampoland from this species, although they are a little more pallid and lack the infuscated patch on the head.

Recorded from Transvaal, Natal.

DYNASTINI.

Gen. ORYCTES. Illig.

170. O. BOAS. Fabric.

„ from all parts of South Africa.

CETONINI.

Gen. CERATORRHINA. Westw.

171. C. (DICRANORRHINA) DERBYANA. var. *Layardi.*

This variety differs from the type-form in the disposition of the white bands of the elytra which reach from the shoulder to the apex, curve round the apical margin and reascend to the supra-humeral base.

Long. 23-52, lat. 18-24^{mm}.

This variety seems to be constant and is apparently replaced in the Eastern-side by the var. *Oberthuri.* It seems to reach the Zambeze falls, from which place I have received a very small example.

172. C. (CHEIROLASIA) BURKEI. Westw.

„ from Zambeze, Transvaal (Rustenburg).

Gen. HETERORRHINA. Westw.

173. H. (GENYODONTA) QUADRICORNIS. Jans.

„ from the Zambeze (Victoria falls).

174. H. (PLAESIORRHINA) TRIVITTATA. Sch.

Black variety.

„ from the Zambeze River and Transvaal (Rustenburg).

Gen. Hæmatonotus. Kraatz.

175. H. Fritschii. Kraatz.

Recorded from Transvaal (Rustenburg).

Gen. Anoplochilus. McLeay.

176. A. odiosus. Gory & Perch.

„ from Cape Colony, Orange Free State, Transvaal, Zambeze River.

Gen. Oxythyrea. Muls.

177. O. hœmorrhoidalis. Fab.

„ from all parts of South Africa.

Gen. Diplognatha. Gory-Perch.

178. D. gagates. Fabr.

„ from all parts of South Africa.

Gen. Cetonia. Fabr.

179. C. impressa. Goldf.

„ from all parts of South Africa.

180. C. cincta. De Geer.

„ from all parts of South Africa.

181. C. picturata. Bohem.

Seems to be restricted to Ovampoland.

Gen. Genuchus. Kirby.

182. G. nigriclavus. Westw.

One example from Ovampoland, differing slightly from Boheman's description. The antennæ are somewhat rufescent, and the dorsal white macula is duplicated on each elytron.

Gen. Cœnochilus, Schaum.

183. C. leoninus. spec. nov.

Elongatus, niger, sub-nitidus, capite, prothorace, elytris subtusque

longe pallido-pilosis; elytris modice convexis, rugoso-punctatis, in singulo leviter bi-costatis bi-striatisque prope suturam; tibiis anticis extus haud dentatis.

Long. 8, lat. $3\frac{1}{2}$mm.

Facies of *C. setosus.* Burm. which it much resembles, but covered with silky-pale, long hairs longer on the clypeus, head and prothorax; elytra rugose, absolutely bi-costate on each side and with a double parallel stria on each side of the suture, pygidium, pectus and abdomen very pilose; club of antennæ rufescent; fore tibiæ without any external teeth.

Family BUPRESTIDÆ.

Gen. STERNOCERA. Esch.

184. S. ORISSA. Buq.

Recorded from all parts of South Africa.

185. S. ORISSA. var. *modesta.*

Facies of *orissa* but with the prothorax and elytra of a darker metallic hue, the prothorax lacks altogether the yellowish or white pubescent patches, the basal median patches at the base of the elytra are wanting, although the impressions are still visible, and the lateral median maculæ are very faint, the postical lateral band is the same as in *orissa*, but narrower and apt to disappear almost altogether. This variety of which I have seen several very fresh examples unites *S. orissa* with *S. monacha* and *luctifera.*

186. S. WAHLBERGI. Bohem.

„ from Lake N'Gami, Damaraland.

187. S. LUCTIFERA. Klug.

var. *funebris.* Bohem.

„ from Damaraland.

Gen. JULODIS. Esch.

188. T. VITIPENNIS. Boh.

„ from all parts of South Africa.

Gen. STERASPIS. Solier.

189. S. BREVICORNIS. Klug.

Recorded from the Zambeze falls.

190. S. AMBIGUA. Fahr.

„ from Damaraland.

Gen. CHRYSOCHROA. Solier.

191. C. PETELI. Gory.

„ from Damaraland, the Zambeze and Northern Transvaal.

Gen. PSILOPTERA.

192. P. AMAUROTICA. Klug.

„ from Zambeze River.

193. P. OPHTHALMICA. Klug.

„ from Zambeze.

194. P. HILARIS. spec. nov.

Oblonga, modice convexa, postice aculeata, aenea, capite, prothoraceque opalino-aurato squamosis; prothorace profunde punctato, in medio anguste carinato plagisque duabus rotundatis, nitidis utrinque notato; elytris elongatis, sub-costatis, costis punctis auratis regulariter seriatis, marginibus albidis.

Long. 22-28, lat. 9-13mm.

Oblong, little convex, much attenuated behind; of a bronze colour, with the head, prothorax and underside covered with opaline scales with a golden tinge; prothorax with a fine smooth shining raised line in the centre and two rounded smooth patches on each side, completely disconnected with one another; elytra finely striated, with the striæ and the interstices regularly punctured, the punctures golden; the four last segments of the abdomen each with a small denuded round spot, outer margins white. Allied to *P. amaurotica*, the tessellation of the elytra being almost the same, and to *P. ophthalmica*, owing to the smooth prothoracic patches which are identical.

195. P. PLAGICOLLIS. Boh.

„ from Bechuanaland.

196. P. SUB-LEVICOLLIS. Boh.

Recorded from Damaraland.

Gen. ACMŒODERA. Esch.

197. A. VIRIDIÆNEA. de Geer.

„ from Zambeze, Transvaal, Natal, Cape Colony.

198. A. AUREO-LIMBATA. Bohem.

„ from Bechuanaland.

199. A. GAMENSIS. Harold.

„ from Zambeze and Limpopo Rivers and also Northern Transvaal (Rustenburg).

200. A. PUELLA ?. Bohem.

„ from Transvaal.

201. A. ALBO-VILLOSA. Fahr.

„ from Limpopo Riv. teste Bohem.

202. A. WAHLBERGI. Fahr.

„ from the Zambeze, Limpopo and Northern Transvaal (Rustenburg).

202. (bis) A. GRATA. Fahr.

„ from Transvaal, Zambeze River.

203. A. SUAVEOLA. spec. nov.

Nigra, tenuiter pubescens, capite prothoraceque punctatis; elytris elongatis, punctato-striatis, interstitiis elevatis, supra modice convexis, postice acuminatis serrulatisque, ad basim purpureo-fulgidis vittisque tribus albis in singulo notatis.

Long. 7, lat. 2^{mm}.

Black, covered with a greyish pubescence; head and prothorax closely punctured, the latter with the outer sides rounded, convex on the disk and with a supra-scutellary transverse narrow impression; elytra elongated, moderately convex, accuminated towards the apex, striated, with the striæ moderately punctured and the interestices raised, black with a shining, fiery-purple triangular median basal patch and with three white bands on each elytron: the first one borders on

the triangular basal patch, the second is obliquely placed at about the middle, and the third, a transverse one, is above the apex.

Resembles much *A. pectoralis. Oliv* ; the white bands are also similar in shape, but not in position ; the colouring of the basal part of the elytra is quite different, and it lacks the abdominal red patch so noticeable in *pectoralis.*

204. A. FALLAX. spec. nov.

Oblonga, convexa, nigra, sub-nitida, parce pubescens ; capite prothoraceque profunde punctatis, hoc lateraliter flavo marginato, brevi, rotundato, in medio obsolete impresso ; elytris crebre punctato-striatis sub-cylindricis, postice acuminatis, singulo maculis flavidis novem ornato.

Long. 8, lat. 6^{mm}.

Black, covered with a very short, greyish pubescence ; prothorax rounded, convex, hardly impressed in the middle, closely punctured like the head, attenuated posteriorly and slightly serrated at the apex, closely punctato-striated, and having on each side nine, more or less rounded, yellowish patches : the first two are on the shoulder and near the scutellum, the second two (which sometimes coalesce) in a line below the first two, the other four are sloping and the last one is close to the apex.

Shape, size and colouring of *A. 10-guttata.* Thunb, but more convex and with the spots arranged in a different manner.

Captured in Damaraland.

Gen. BELIONOTA. Esch.

205. B. SPHENOPTEROIDES. spec. nov.

Supra obscure aenea, glabra ; prothorace brevi, parum convexo, ad basin valde sinuato, crebre punctulato lateribusque haud sulcatis ; elytris, sub-depressis, postice acuminatis, a medio valde serratis, quadri-costatis, costis sub-lævibus, interstitiis reticulato-punctatis ; subtus æneo-micans lateribus leviter pubescentibus, segmentis abdominis extus acute spinosis.

Long. 18, lat. 6^{mm}.

Obscure bronze on the upper part, and hairless ; head with a transverse raised smooth line and a semi-circular one between the eyes ; prothorax little convex, strongly sinuated behind, covered with fine, deep punctures, with no perceptible median line and without any

lateral depression ; elytra very little broader at the base than the prothorax and with the shoulders sloping but little, elongated, little convex, attenuated from the middle, with the margins strongly serrated from that part ; each wing-cover has four smooth, raised lines, the sutural and marginal one only coalescing near the apex, with the intervals reticulated and punctured, and with a faint trace of another rugose line in the second and third interval ; underside very shining with the lateral sides slightly pubescent, outer sides of abdomen very acute, the last one tri-spinose.

A little more convex than the species of this genus, and without the characteristic lateral depressions on the prothorax.

Gen. SPHENOPTERA. Sol.

206. S. TRISPINOSA. Klug.

Recorded from the Zambeze River and Northern Transvaal.

Gen. DISCODERES. Chevr.

207. D. EXASPERATUS. Swartz.

„ from all parts of South Africa.

Gen. AGRILUS. Steph.

208. A. FERRUGINEO GUTTATUS. Herbst.

„ from all parts of South Africa.

209. A. ELONGATULUS. Cast & Gory.

Captured in Damaraland.

„ from Cape Colony and Natal.

Family : ELATERIDÆ.

Gen. LACON. Cast.

210. L. SENILIS. spec. nov.

Elongatus, squamis nigris albido variegatis dense vestitus ; capite utrinque crista ante-oculari munito ; prothorace transverso, angulis posticis productis ; elytris elongatis, prothorace duplo longioribus,

sub-convexis, postice acuminato-rotundatis ; subtus crebre punctulatus, squamosus ; palpis, antennis pedibusque rufescentibus.

Long. 8, lat. 3mm.

Black, densely covered with black, scale-like hairs variegated with white ; head with a forward projection shaped like two crests above the eyes ; prothorax a little longer than broad, convex in the centre, with the postical angles much pronounced ; elytra elongated, convex, twice as long as the prothorax, rounded behind, acuminated at the apex, and slightly costate with the costae hidden by the scales; underside punctulated and scaly ; palpi, antennæ and legs rufescent.

Gen. TETRALOBUS. Serv.

211. T. ALBICANS. Cand.

? an. T. Flabellicornis. Linn.

Recorded from Natal, Transvaal, Damaraland.

212. T. RONUNDIFRONS. Guér.

„ from Natal, Transvaal, Zambeze, Limpopo and Damaraland.

Gen. PANTOLAMPRUS. Candeze.

213. P. OVAMPO. spec. nov.

Piceus, leviter pilosus ; capite prothoraceque concinne profundeque punctatis, hoc elongato, sub-convexo, angulis posticis valde conicis ; elytris elongatis, modice convexis, postice angustatis, pilis brevissimis griseis adspersis, regulariter punctato striatis, interstitiis haud elevatis, levibus ; subtus punctulatus, sub-pilosus ; antennis pedibusque nigro-rufescentibus.

Long. 13, lat. 4mm.

Pitch-black, very shining ; head and prothorax slightly pilose, very closely, deeply and regularly punctured, the latter moderately convex with the postical angles very acute ; elytra elongated, moderately convex, narrowed apically, covered with very short greyish hairs and with regular series of deep round punctures ; underside punctulated and covered with short hairs ; antennæ and legs blackish-rufescent.

Family : **MALACODERMIDÆ.**

LYCINI.

Gen. Lycus. Fabric.

214. L. trabeatus. Guér.

Recorded from the Zambeze River and Zululand.

215. L. cuspidatus. Klug.

„ from Cape Colony (East London), Natal, Zululand.

Gen. Luciola. Casteln.

216. L. tetrasticta. Fairm.

„ from Transvaal (Leydenburg).

MELYRINI.

Gen. Hapalochrus. Erichs.

217. H. sumptuosus. Bohem.

„ from Transvaal (Rustenburg).

The examples from Ovampoland are a little smaller than the Transvaal ones, and the green patches on the elytra coalesce often along the suture.

218. H. opulentus. spec. nov.

Oblongo-quadratus, viridis, griseo-pubescens parceque villosus, ore antennarum basi, pedibus abdomineque flavo-testaceis.

Mas : *antennis serratis, tibiis anticis fere simplicibus, mediis vald dilatatis.*

Long. 8-9, lat. $3\frac{1}{2}$mm.

Oblong, sub-quadrate, covered with a greyish pubescence and dotted with long, scattered black hairs, metallic-green on the head, prothorax and elytra, with the mouth, the four basal articulations of the antennæ the legs and abdomen brick-red, the last-named part with the apical segment green and two median spots of the same colour on each segment.

The male differs from the female in having the antennæ more serrated ; the fore tibæ are slightly enlarged at the apex, with the second tarsal articulation diform, and the apical part of the median tibæ extremely inflated.

Gen. MELYRIS. Fabric.

219. M. RUFIVENTRIS. Bohem.

Recorded from the Zambeze River.

Family : BOSTRYCHIDÆ.

Gen. SINOXYLON, Duftsch.

220. S. SENEGALENSE. Karsh.

„ from Damaraland, Transvaal, Natal, Cape Colony.

221. S. ADUSTUM. Fahr.

Probably *S. rufobasale*, Fairm. Ann. S. Ent. France, 1888, p. 179.

„ from Zululand, Transvaal.

Family : TENEBRIONIDÆ.

Gen. ZOPHOSIS. Latr.

222. Z. RUGATIPENNIS. spec. nov.

Ovata, nigra, sub-nitida; capite prothoraceque confertim punctulatis; elytris convexis, a medio postice deplanatis, scrobiculato rugosis, utrinque tri-costatis; epipleuris latis, rugosis.

Long. 11, lat. 8mm.

Size, shape and sculpturing of *Z. orbicularis* Deyr, but much more scrobiculated.

Black, moderately shining; head and prothorax closely but finely punctured; elytra ovate, convex, with the postical sutural part depressed, strongly scrobiculated and with three raised, slightly sinuated lines on each side; epipleuræ broad and very rugose, claws and spurs of tibiae red.

„ from Walfish Bay, ? Ovampoland.

223. Z. DORSATA. spec. nov.

Elongata, nigra, sub-opaca, capite prothoraceque punctulatis; elytris ovalibus, granulosis, singulo vage bi-lineato propreque suturam alte carinato.

Long. 12-15, lat. 7-9mm.

Elongated, black, little shining ; head and prothorax closely punctured ; elytra very long and ovate, convex, closely covered with short granules more acute behind, and with the back-ground finely shagreened ; each elytron has two dorsal very faint raised lines, and a very acute and much raised line close to the suture which is also slightly raised ; epipleuræ broad and granulose.

A very distinct species.

Recorded from Walfish Bay (Damaraland), ? Ovampoland.*

224. Z. ROTUNDATA. Deyr.

„ from Damaraland.

225. Z. BOEI. Sol.

„ from Northern Cape Colony, Transvaal.

226. Z. ELONGATA. Deyr.

„ from Damaraland.

227. Z. HYPOCRITA. spec. nov.

Nigra, sub-nitida, capite prothoraceque aciculatis ; elytris ovalibus, sub-convexis, postice acuminatis, sub-rugosis, in singulo tri-costulatis ; epipleuris vage granosis.

Long. 7-8, lat. 4-5^{mm}.

Black, moderately shining ; head and prothorax aciculated ; elytra ovate, moderately convex, acuminated behind, rugose in the anterior part, granulose past the middle and with three moderately raised lines slightly undulating towards the apex on each elytron ; epipleuræ slightly granulose, legs dark-red.

The general facies is not unlike that of *Onychosis gracilipes. Deyr.*, but it is more convex. It forms evidently a link between this genus and *Zophosis.*

228. Z. NANA. spec. nov.

Elongata, sub-nitida, supra crebre punctulata ; elytris haud costatis, lateribus epipleurisque longitudinaliter plicatulis ; subtus pedibusque sub-rufescentibus.

Long. 3, lat. 1$\frac{1}{2}$^{mm}.

Elongated, black, moderately shining ; head and prothorax closely

* These two species were not collected by Mr. Eriksson.

punctured ; elytra elongated, nearly parallel, dehiscent behind, closely punctured in the anterior part and rugose from past the middle, with the outer margin and also the epipleuræ plicated longitudinally ; underside and legs reddish, spurs of tibiae yellowish.

Gen. CALOSIS. Deyr.

229. C. AMABILIS. Deyr.

Recorded from the shores of Walfish Bay and some 100 miles inland.

Gen. ADESMIA. Fish.

230. A. (MACROPODA), LURIDA. Haag.

„ from the Zambeze.

231. A. (MACROPODA) RETICULARIS. Gemm.

„ from Zambeze, Limpopo River.

232. A. (MACROPODA) INŒQUALIS. Fahr.

„ from Damaraland, Bechuanaland.

Gen. STENOCARA. Sol.

233. S. SERICEICEPS. Péring.

Captured in Damaraland.

234. S. VITTATA. Haag-Rut.

„ from Northern Cape Colony ; Great Namaqualand.

Captured in Damaraland.

235. S. DISTINCTA. Péring.

„ from between Zambeze and Limpopo River, also from Northern Transvaal.

236. S. ALBO-VILLOSA. spec. nov.

Ovalis, nigra, sub-nitida, capite, prothoracis lateribus margine elytrorum parteque postica sericeo-pubescentibus ; prothorace levi, lateribus haud ampliatis ; elytris ovatis, seriebus tribus tuberculorum in singulo instructis, interstitiis haud tuberculosis.

Long. 8-9, lat. 5-6^{mm}.

Ovate, black, moderately shining ; head densely covered with a

silky-white pubescence ; prothorax short, broader than long, convex, with the outer sides rounded and not ampliated, very faintly punctured and with the outer margins covered with a white pubescence ; elytra, ovate, sub-gibbose, owing to the very pronounced postical declivity, with the suture raised and two dorsal and a marginal series of very acute disconnected tubercles on each elytron, the intervals smooth ; the marginal interval is clothed from base to apex with a thick silky-white pubescence which covers also the dorsal posterior part from the apex to the top of the declivity ; the epipleuræ are also covered with a white tomentum, and the legs are very long and slender.

Shape of *S. eburnea*, Pasc. and *S. globulum*, Haag. and approximates still more *S. velox*, Péring. ; the elytra of the female are however, much more declivous, and the silky vestiture will easily lead to the identification of this species.

Gen. HYPEROPS. Eschsch.

237. H. PLICICOLLIS. spec. nov.

Niger, sub-nitidus, pedibus palpisque sub-rufescentibus ; capite prothoraceque confertim plicatulis, hoc transverso, postice attenuato atque utrinque angulato ; elytris elongatis, crebre punctulatis.

Long. 7-8, lat. 3-3½mm.

Black, moderately shining ; with the legs and palpi somewhat reddish ; head closely plicated longitudinally with the exception of the extreme basal part which is punctured ; prothorax nearly as broad as long, with the apical angles rounded and the posterior ones acute, slightly narrowed at the base, somewhat convex and closely plicated longitudinally ; elytra a little broader at the base than that of the prothorax, and with the humeral angles very acute, elongated, little convex and covered with close punctures very briefly setulose and without any trace of striation ; underside closely punctured.

Size of *H. tagenioides*, Esch., but with prothorax and elytra broader ; the former is plicated instead of being punctulated and the sculpturing of the elytra is very different ; the supra-orbital ridge is dented in the centre.

Gen. HIMATISMUS. Erichs.

238. H. VARIEGATUS. Fabr.

Recorded from all parts of South Africa.

239. H. MANDIBULARIS. Erichs.

Recorded from Zambeze, Walfish Bay, Damaraland.

Gen. EURYCHORA. Thunb.

240. E. CILIATA. Fabric.

„ from Cape Colony, Natal, Orange Free State, Lower Transvaal.

Gen. PERISTEPTUS. Haag-Rut.

241. P. LÆVIGATUS. Gerst.

„ from the Zambeze River.

Gen. POGONOBASIS. Sol.

242. P. HIRSUTA. spec. nov.

Nigra, rugosula, prothorace elytrisque pilis erectis longis vestitis; elytris ovatis, modice convexis, sutura elevata.

Long. 9, lat. 4^{mm}.

Black, rugose, head with a median ridge reaching from the apex to the centre; prothorax with the sides much reflexed, crenated at the tips and covered with long, bristly hairs; elytra ovate, moderately convex, longer than broad and dehiscent posteriorly, rugose, densely covered with long, greyish-black bristles, suture raised; epipleuræ deeply punctured; underside sub-pubescent.

A little more ovate in shape than *Peristeptus lævigatus*, Gerst. and with the elytra a little more declivous posteriorly.

Gen. GEOPHANUS. Haag.

243. G. CONFUSUS. Fahr.

„ from Cape Colony, Orange Free State, Transvaal.

Gen. AMIANTUS. Fahr.

244. A. GIBBOSUS. Fahr.

„ from Natal, Transvaal.

Gen. DICHTRETHUS. Haag-Rut.

245. D. ANGUSTIPENNIS. spec. nov.

Rufo-niger, sub-nitidus; capite prothoraceque profunde punctatis, hoc angusto, convexo, parte postica disci elevata; elytris punctatis, punctis brevissime setigeris, costis quatuor obsoletis in singulo flexuosis, dorso sub-deplanato margineque laterali acuta.

Long. 19, lat. $9\frac{1}{2}$mm.

Reddish-black, moderately shining, with the head and prothorax covered with narrow, confluent foveæ, the latter convex with the postical half part of the disk much compressed and raised; elytra sub-parallel and declivous behind, nearly plane on the back with a very acute, much-raised lateral margin stopping short of the apex, finely punctured with the punctures briefly squamoso-pilose, and four sinuated, nearly obsolete, ridges beginning at a short distance from the suture; legs briefly villose.

Male with a velvety oblong patch on the second basal segment of the abdomen.

Gen. PSAMMODES. Kirby.

246. P. PIERRETI. Amyot.

Recorded from the Zambeze and Limpopo Rivers.

247. P. SCABRICOLLIS. Gerst.

„ from Northern Transvaal, Delagoa Bay, Damaraland.

248. P. PACHYSOMA. spec. nov.

Niger, aterrimus, glaber; capite postice plicatulo; prothorace transverso, convexo, medio brevissime, lateraliter latius punctato; elytris ovalibus, in medio prothorace dimidio latioribus, convexissimis apiceque rotundatis, levigatis.

Long. 36-40, lat. 20-24mm.

Mas.: abdominis segmentis basalibus tribus late sericeo-plagosis.

Black, very shining and hairless; anterior part of the head above the epistome deeply punctured, upper part finely plicated longitudinally; prothorax one half broader than long, very convex, with the outer margins acute and slightly crenated in the anterior part, very faintly punctulated in the disk, the punctures deeper on the outer sides; elytra twice as broad in the middle of the disk as the pro-

thorax, ovate, very convex, attenuated and rounded behind ; smooth and without any trace of striæ ; legs strongly punctured.

Male, : the three basal segments of the abdomen with a median villose rufous spot.

Allied to *P. tumidus*, Haag. shape of *P. scabricollis*, Gerst., but much larger and much more convex ; the sculpturing of the prothorax is also quite different.

249. P. SCROBICOLLIS. Haag-Rut.

Recorded from the Transvaal and Limpopo River.

250. P. ERRANS. spec. nov.

Oblongus, niger, sub-nitidus; prothorace in medio leviter punctulato lateribusque rugosis ; elytris elongatis, oblongis, haud costatis sed postice vage longitudinaliter sinuatis ; pedibus anticis glabris, reliquiis apice flavo pubescentibus posticorumque articulo basali valde compresso, dilatato.

Long. 29-47, lat. 14-23^{mm}.

Black, moderately shining, head finely punctured ; prothorax one half broader than long, and a little ampliated near the apex, punctulated in the centre and almost scrobiculated on the sides ; elytra elongated, broader than the prothorax at the base, oblong, convex, with the outer margin very raised, smooth, except at the apex of the declivity which has a very short yellowish pubescence, and also with minute, very briefly setigerous distant punctures ; posterior part with very faint sinuated lines ; underside finely punctured ; legs rugose, the apex of the intermediate and posterior tibæ covered with a yellowish-brown tomentum, tarsi of the two hind pairs compressed, the basal articulation of the postical tarsus very much dilated.

Allied to *P. molossus*, Haag., which I take to be synonymous with *Phanerotoma gravida*, Westw., and with the hind tarsi-compressed and dilated in the same manner ; the prothorax is not so deeply scrobiculated, and the elytra have not the broad raised lines conspicuous in *P. gravida*.

251. P. GRANULICOLLIS. Haag.

„ from Damaraland.

GEN. TRACHYNOTUS, Latr.

252. T. ÆNEUS. Sol.

Found throughout South Africa.

253. T. CINCTUS. Haag.

Upper Damaraland.
Recorded from Damaraland only.

254. T. DISTINCTUS. spec. nov.

Elongatus, niger, pilis squamiformibus sparsis tectus; prothorace utrinque albo-vittato, lateribus in medio acutis; elytris angustis, in medio ampliatis posticeque valde acuminatis, supra modice convexis, sub-scabrosis, margine costaque dorsali apiciem haud attingente in singulo elevatis; subtus pedibusque dense albido-pilosis.

Long. 14-15, lat. 5-5½mm.

Black, covered on the upper part with a few scattered scale-like whitish hairs, denser on the head and on the prothorax where they form on each side a distinct white band; prothorax moderately convex with the median part of the outer sides very acute; elytra not broader at the base than that of the prothorax, gradually increased towards the middle, aculeated posteriorly, moderately convex and each elytron with an outer, slightly serrated, raised margin, and a dorsal ridge placed nearer to the margin than to the suture and reaching only the apex of the posterior declivity; underside and legs densely covered with white hairs.

Allied to *T. cinctus*, Haag., but differentiated by the disposition of the dorsal costa which in *cinctus* reaches the apex and occupies also the median part of the elytron; the present species is also more convex and more declivous behind.

255. T. SERICEUS. Péring., Trans. S.A. Phil. Soc. 1888. p. 124.

„ from Damaraland only.

256. T. FUNESTUS ?. Fahr.

„ from Damaraland, Northern Transvaal and Zambeze.

257. T. SILPHOIDES. Fahr.

„ from Northern Natal, Orange Free State and Transvaal.

Gen. EPAIROPS. Fahr.

258. E. FRAGILIS. Fahr.

„ from Transvaal.

259. E. LEVIGATA. spec. nov.

Oblonga, nigra, squamoso-grisea pilisque brevibus ochraceis tecta; prothorace sub-plano, lateribus anticis dilatatis; elytris oblongis, sutura costaque dorsali ante apicem flexa elevatis.

Long. 10-11, lat. 4-5^{mm}.

Oblong, black, covered with greyish white scales, whiter on the outer margin of the prothorax, and with very short ochraceous hairs; head punctulated, slightly excavated above the epistome, with the pedunculated eyes moderately raised; prothorax transverse, moderately convex, with the anterior angles much dilated, and a little narrowed behind; elytra oblong, sub-convex, broader than the prothorax, with a raised suture and an acute dorsal ridge on each elytron reaching from the base to the apex of the declivity, where it diverts slightly inward without reaching the apex.

The facies is almost that of a small *Trachynotus*. It differs much from *E. fragilis* in having the head less deeply excavated in front, the pedunculated eyes are not so much raised, and there is a total absence of fascicles of hairs on prothorax and elytra.

Recorded from Damaraland.

260. E. VARIEGATA. spec. nov.

Oblonga, nigra, squamis albidis pilisque brevissimis fusco-ochraceis variegatis dense tecta; elytris oblongis, carina dorsali acuta apicem haud attingente in singulo instructis.

Long. 11, lat. 5^{mm}.

Shape of the preceding species, but with a different vesture. Head deeply excavated above the epistome, and setulose; prothorax moderately convex with the outer angles angulated, covered with white scales and having two discoidal brownish longitudinal patches; elytra oblong, moderately convex, broader than the prothorax, each with a dorsal carina stopping at the apex of the posterior declivity, white, tesselated with very short brown hairs forming a distinct median macula close to the suture; underside and legs squamose, white.

Gen. SEPIDIUM. Fabric.

261. S. OVAMPOENSE. spec. nov.

Nigrum, brunneo-tomentosum; prothoracis lateribus acute dentatis,

processu apicali tri-dentato ; elytris tuberculis setigeris triplici serie in singulo instructis.

Long. 14, lat. 7mm.

Black, covered with a brown tomentum ; prothorax with the lateral sides produced in the middle in a rounded projecting tooth, disc with two longitudinal bristly ridges each culminating into a tri-crested process at the apex, the crests sloping towards the head ; elytra broader than the prothorax, a little ampliated in the middle, acuminated behind, convex above and declivous postically, each one with three rows of setigerous tubercles, the first row from the suture less conspicuous than the other two, and the postical ones of the second row not much developed.

More robust than *S. senegalense.* Klug., or *S. brevicaudatum.* Fairm., this species will be easily distinguished through the prothoracic processus which is not as much raised as the dorsal ridges.

Gen. Usagaria. Ancey.

262. U. australis. spec. nov.

Nigra, nitida, longe rufo-pilosa ; capite crebre punctato, prothorace scrobiculato, elytris, parallelis, late profundeque striato-punctatis.

Long. 9-10, lat. 3-4mm.

Black, shining with the three apical articulations of the antennæ and palpi reddish ; head, prothorax and elytra covered with long, erect, reddish hairs ; head rugose ; prothorax broader than long, with the sides rounded, deeply scrobiculated ; elytra parallel, convex, rounded posteriorly, and not broader than the prothorax, striated, with the striæ filled with deep broad punctures ; underside closely punctured, legs black, pilose.

More parallel than *U, major*, Fairm., much more densely pilose and with the striation different.

Recorded from Bechuanaland.

Gen. Selinus. Muls. & Rey.

263. S. planus. Fabr.

„ from Guinea, Sierra Leone.

Gen. TRIGONOPUS. Muls. & Rey.

264. T. LATICOLLIS. spec. nov.

Oblongus, niger, nitidus; prothorace scrobiculato, lato, convexo, lateribus rotundatis; elytris prothoracis basi haud latioribus, fere rectis, punctato-striatis; pedibus anticis intermediisque tri-dentatis.

Long. 9-13, lat. 4-6½mm.

Oblong, black, shining, with the palpi and the two last articulations of the antennæ reddish; head and prothorax finely scrobiculated, the latter broad, very convex and with a faint median impression in the anterior part; elytra straight, rounded posteriorly, not so broad as the prothorax, moderately convex, punctato-striated with the intervals rounded; anterior tibiæ slightly falcate inwardly and tri-dentate outwardly, as are also the intermediate ones, the basal tooth being the broadest of the three; the hind tibiæ have only one broad tooth.

Gen. GONOPUS. Latr.

265. G. AGRESTIS. Fahr.

Recorded from Lake N'Gami and Zambeze River.

266. G. COSTATUS. Fahr.

„ from Damaraland.

267. G. SULCATUS. Solier.

„ from all parts of South Africa.

Gen. ANOMALIPUS. Guer.

268. A. LEMUR. Fahr.

„ from Transvaal, and between the Zambeze and Limpopo Rivers.

269. A. ELEPHAS. Fahr.

„ from Lake N'Gami and between the Zambeze and Limpopo Rivers.

Gen. TOXICUM. Latr.

270. T. TAURUS. Fabr.

„ from Cape Colony, Natal. Transvaal, Guinea and Senegal.

Gen. SOLENOMERUS. Fahr.

271. S. LONGIPES. Fahr.

Recorded from Transvaal and Limpopo River.

272. S. VELOX. spec. nov.

Oblongo-ovatus, niger, squamositate grisea vestitus; capite prothoraceque punctulatis, hoc antice leviter angustato, in medio haud dilatato, marginibus lateralibus acutis reflexisque; elytris ovatis, apice acuminatis, convexis, tuberculis parvis quadruplici serie in singulo instructis, interstitiisque tuberculis nonnullis majoribus.

Long. 7, lat. 3mm.

Black, covered with greyish, scale-like, very short hairs; head and prothorax finely punctured, the latter a little attenuated in front, not ampliated in the middle, moderately convex and with an acute, raised, lateral margin; elytra ovate and strongly acuminated behind, convex, each with four series of small distant tubercles and with some larger ones interspersed in the intervals, suture raised and subtuberculated; legs very long, setulose and pubescent inwardly.

Gen. EMYON. Gerst.

273. E. TRISTIS. Fahr.

„ from Bechuanaland.

274. E. SCABROSUS. spec. nov.

Sub-ovatus, convexus, rufo-castaneus, sub-opacus; capite prothoraceque confertim scrobiculatis; elytris acute crenulato-costatis, interstitiis carinatis.

Long. 4, lat. 2mm.

Reddish brown, moderately shining; head and prothorax closely and densely scrobiculated, the latter convex, a little narrowed in front, with the outer margins serrated, elytra one third broader than the prothorax, convex, ampliated in the middle, rounded and somewhat declivous behind, costate, with the costæ narrow and strongly and closely serrated, each interval with a raised, slightly serrated line.

Shape of *E. tristis.* Fahr. but much smaller and with a different sculpturing.

Gen. HOPLONYX. Thoms.

275. H. AFER. Fahr.

Recorded from Northern Transvaal.

276. H. INGRATUS. spec. nov.

Oblongus, niger, sub-nitidus, capitis vertice lato, rugoso, prothorace angusto, sub-convexo, marginato, in medio vage quadri-impresso, obsolete punctulato; elytris elongatis, postice acuminatis, ad basim leviter gibbosis, supra modice convexis, anguste striato-punctatis; femoribus anticis subtus valde dentatis; tarsis antennis palpisque nigro-rufescentibus.

Long. 13, lat. 6mm.

Oblong, black, moderately shining with the tarsi, the palpi and the antennæ reddish-black; head punctured, ante-ocular ridges well developed, space between the eyes, broad with a faint median impression; prothorax narrow, but broader than long, attenuated in front, marginated all round, moderately convex, nearly smooth and with four faint discoidal impressions; elytra broader than the prothorax and slightly gibbose near the base, from there moderately convex, parallel, moderately aculeated behind, and having narrow lines of deep punctures with the intervals smooth and hardly convex; anterior legs with the apex of the femora armed with an acute tooth.

277. H. CLYPEATUS. Fahr.

„ from the Zambeze (Victoria Falls.)

Gen. EUPEZUS. Blanch.

278. E. NATALENSIS. Lacord.

„ from Natal, Transvaal, Zambeze (Falls), Delagoa.

Gen. AMARYGMUS. Dalm.

279. A. NATALENSIS. spec. nov.

Globoso-ovatus, aeneus, nitidus, tarsis pedibusque rufescentibus; capite punctulato-rugoso; oculis haud approximatis; prothorace brevi, lato, antice attenuato, distincte marginato, punctulato; elytris sub-globosis, postice modice declivis acuminatisque, anguste sed profunde punctulato-striatis; femoribus subtus profunde canaliculatis.

Long. 7-9, lat. 5-6mm.

Globose, ovate, coppery, shining, with the antennæ, palpi, tarsi and

legs reddish ; head slightly rugose owing to the irregular closely-set but not deep punctures, eyes widely apart on the vertex ; prothorax short, broad, much attenuated anteriorly and distinctly marginated, closely punctulated ; elytra sub-globose but gradually declivous and acuminated behind, smooth, narrowly striated with the striæ very closely punctured ; underside punctured, femora grooved underneath.

Might be identical with *A. subhemisphœricus* Boh.—the description of which I have not been able to peruse.

Recorded from Natal, Transvaal and Delagoa Bay.

Gen. STRONGYLIUM. Kirby.

280. S.? BOHEMANI. Maklin.

Not previously recorded.

281. S. PURPUREIPENNE. Makl.

„ from Zambeze Falls and Limpopo.

282. S. CYANEUM. spec. nov.

Elongatum, sub-cylindricum, nigro-cyaneum, antennis palpis pedibusque refescentibus ; elytris convexis, profunde punctato-striatis.

Long. 15-17, lat. $5\frac{1}{2}$-7^{mm}.

Coppery, blackish, sub-metallic blue, with the antennæ, the palpi and legs reddish ; prothorax sub-globose, convex, marginated ; elytra elongated, almost parallel, moderately convex and very deeply punctato-striated.

Gen. PRAOGENA. Cast.

283. P. SPLENDENS. Makl.

„ from Natal, Transvaal, Zambeze.

284. P. FESTIVA. Gerst.

„ from Northern Transvaal, Zambeze.

285. P. TRISTIS. spec. nov.

Nigra, nitida, glabra ; prothorace transverso, supra modice convexo, punctulato ; elytris profunde punctato-striatis.

Long. 16, lat. 7^{mm}.

Black, very shining, with almost no metallic hue ; head and pro-

thorax closely punctured, the latter short, transverse, moderately convex, elytra elongated, convex, slightly ampliated past the middle, striated, with the striæ deeply punctured, and the intervals narrow and smooth ; legs and underside black, shining.

Family : CISTELIDÆ.

Gen. OTHELECTA. Pasc.

286. O. TORRIDA. Pascoe.

Recorded from Walfish Bay.

Gen. ECTENOSTOMA. Fahr.

287. E. NIGRIVENTRIS. Fahr.

„ from Natal, Transvaal and Zambeze.

Family : LAGRIIDÆ.

Gen. LAGRIA. Fabric.

288. L. CORRUGATA. spec. nov.

Oblonga, aeneo-virescens, capite prothorace subtusque sparse rufo-pilosis ; elytris sub-deplanatis corrugatis, glabris, nitidis, antennis nigris.

Long. 12-13, lat. $5\frac{1}{2}$-6^{mm}.

Oblong, brassy-green, darker on the head and prothorax ; antennæ with the four basal articulations reddish, the other black ; head and prothorax deeply punctured, the latter nearly rounded but not much convex, fringed with short yellowish hairs ; elytra twice as broad as the prothorax at the base, increased from past the middle, rounded behind, sub-depressed on the disk, coarsely shagreened, hairless and shining ; underside and legs slightly pubescent.

Shape of *L. amœna.* Fahr, larger, more depressed and lacking the fulvo-villose cavity of the disk in the prothorax.

„ from the Zambeze.

289. L. AMŒNA. Fahr.

The examples from Ovampoland have the elytra dark-coppery hue, instead of testaceous as in the types.

Recorded from Natal, Orange Free State, Transvaal and Zambeze.

290. L. PROPINQUA. Fahr.

„ from Northern Transvaal and Zambeze.

291. L. FUSCIPENNIS. Fahr.

„ from Transvaal and Natal.

Family : MELOIDÆ.

Gen. MELOË. Linn.

292. **M.** MERIDIANUS. spec. nov.

Cyaneo-purpurascens ; capite profunde punctato ; prothorace subquadrato, scrobiculato, in medio late canaliculato ; elytris costis subelevatis undulatisque ; abdomine pedibusque cyaneis.

Long. 25, lat. 7^{mm}.

Head deeply punctured with a distinct longitudinal depression on the vertex ; antennæ dark blue, prothorax sub-quadrate, coarsely punctured with the punctures almost foveate, deeply grooved in the middle of the disk, the walls of the groove slightly raised and deflexed ; elytra three times as long as the prothorax, covered with irregular, sinuose, raised lines ; abdomen and legs dark-blue.

Head and prothorax shaped as in *M. angulicollis*, Leach, its nearest ally ; the sinuated lines of the elytra approximate those of *M. caffer*. Péring., but are not so much raised ; this species is very distinct from the three known South-African Meloë.

Gen. HORIA. Fabric.

293. H. HOTTENTOTA. Péring.

„ from Cape Colony, Natal, Walfish Bay.

Generally found under the bark of dead trees ; is evidently a parasite of *Xylocopa* bees ; the female has been met with in the galleries of *Xylocopa inconstans*. Sm.

Gen. MYLABRIS. Fabric.

294. M. PLAGIATA Pall.

Recorded from all parts of South Africa.

295. M. TRICOLOR. Gerst

„ from Natal, Transvaal, Zambeze, Delagoa Bay.

296. M. ALTERNA. Cast.

„ from Natal.

297. M. SCALARIS. Mars.

„ from N'Gami land.

298. M. LIQUIDA. Erichs.

„ from Angola.

299. M. PALLIATA. Mars.

„ from Caffraria (teste Marseul.)

300. M. HOLOSERICEA. Klug.

„ from Transvaal, Limpopo and Zambeze Rivers.

301. M. HILARIS. spec. nov.

Oblonga, nigra, villositate flavescente vestita ; antennis pedibusque nigris ; elytris vitta suturali lata, fasciis duabus transversis sinuatis vittaque marginali ab humero ad fasciam posticam ducta flavis in singulo ornatis.

Long. 12-13, lat. 4-4½mm.

Black, covered with a pale flavescent silky villosity ; antennæ and legs black ; head and prothorax densely villose ; elytra elongated, shagreened, each one with a broad elongated patch running alongside the suture to nearly the median part, and two transverse, much sinuated bands reaching from the suture to the outer margin where they are connected with a moderately broad marginal band reaching from the second transverse fascia to the shoulder ; the second transverse fascia is placed far above the apex ; underside very villose.

Closely allied to *M. holosericea*, Klug, but less villose on the elytra, the yellow bands of which are arranged in the same manner, but the transverse ones are more sinuated and the marginal band does not run round the apex of the suture as in *M. holosericea*, but stops at the second ante-apical transverse band.

302. M. (Ceroctis) blanda. spec. nov.

Oblonga, nigra, flavo-pilosa ; antennis nigris, capite prothoraceque dense griseo-flavescente pilosis ; elytris coriaceis, nigris, plaga elongata prope scutellum posita fasciisque tribus transversis rufis, prima humero linea marginali connexa, in singulo ornatis.

Long. 10, lat. 3mm.

Oblong, black, covered with a short, decumbent, slightly flavescent hairs ; antennæ black ; head and prothorax covered with long flavescent silky hairs ; elytra elongated, slightly ampliated behind, shagreened, black with an elongated patch, round the scutellum two transverse moderately broad bands the first of which is connected with the shoulder by a narrow marginal band, and an arcuated apical patch of a red colour nearly turning to vermillion ; underside and legs black, pubescent.

303. M. (Ceroctis) aliena. spec. nov.

Oblonga, nigra, capite prothoraceque flavo-sericeis, antennis nigris ; elytris coriaceis breviter nigro-pubescentibus, maculis dorsalibus quatuor sinuatis, vitta marginali ab humero medium attingente maculaque parva flavis in singulo notatis.

Long. 10, lat. 4mm.

Oblong, black, with the head and prothorax covered with dense, short, silky, yellowish decumbent hairs ; antennæ totally black ; elytra shagreened, covered with a short blackish pubescence, and having on each one four sinuated dorsal patches nearer to the suture than to the outer margin, on which is a narrow band extending from the shoulder to about the middle, and a small patch below it ; the first dorsal patch is at the base, the second one a little before the middle, the third one a little past the middle, and the fourth, a round one, a little above the apex.

Examples will doubtless be found in which the dorsal patches are connected with the marginal band and spot.

The colouring and disposition of the yellow patches resemble somewhat those of *M.* (*Coryna*) *posthuma*, there is however only one sub-apical spot.

304. M. (Ceroctis) exclamationis. Mars.

Recorded from Cape Colony (Northern parts), Orange Free-State Transvaal.

305. M. (Coryna) apicipustulata. Mars.

Var. posthuma. Mars.

Recorded from N'Gami land only.

306. M. (Actenodia) jucunda. Erichs.

„ from Angola (teste Marseul).

307. M. (Actenodia) chrysomelina. Mars.

„ from Angola, Benguela, (teste Marseul).

Gen. Eletica. Lacord.

308. E. posticalis. Péring.

„ from Transvaal, Limpopo and Zambeze.

309. E. cardinalis. Péring.

„ from Limpopo and Zambeze River.

Gen. Cantharis. Linn.

310. C. (Lytta) granulipennis. Fahr.

„ from Zambeze and N'Gami.

311. C. (Lytta) pectoralis. Gerst.

„ from Transvaal, Limpopo, Delagoa.

312. C. (Lytta) fuvicollis. Fahr.

„ from Natal, Transvaal.

313. C. (Lytta) notaticollis. Péring.

„ from Cape Colony (Kimberley), Transvaal.

314. C. (Lytta) optata. spec. nov.

Elongata, prothorace rufo; elytris flavis, albido-pubescentibus, maculis uigris tribus in singulo notatis; capite, antennis, pedibus subtusque nigris.

Long. 13, lat. 3mm.

Elongated; head, antennæ and palpi black, the former punctulated; prothorax very narrowed anteriorly, shining, punctulated and with a small median impression; elytra twice as long as the prothorax and four times as long, parallel, rounded behind, rugulose, pubescent,

yellow, and each with three black patches ; the basal one rounding the shoulder and descending a little along the suture, the second one at about the median part of the disc, and the third one at the apex ; underside and legs black, pubescent.

315. C. (LYTTA) VELATA. Gerst.

Recorded from Natal and Transvaal.

316. L. ALBOLINEATA. Péring.

„ from Zambeze, Upper Transvaal.

Family : CURCULIONIDÆ.

Gen. BLOSYRUS. Schonh.

317. B. CARINATUS. Boh.

„ from Natal, Transvaal, Zambeze, Delagoa Bay.

Gen. STROPHOSOMUS. Sch.

318. S. SPARSUS. Fahr.

„ from Natal.

Gen. PODIONOPS. Schonh.

319. P. WAHLBERGI. Fahr.

Not previously recorded.

Gen. PIAZOMIAS. Schonh.

320. P. VIRIDANUS. Fahr.

„ from the Transvaal.

321. P. LIMBATELLUS. spec. nov.

Niger, dense griseo-squamosus, prothorace elytrisque argenteo-limbatis ; elytris punctato-striatis.

Long. 6, lat. 2^{mm}.

Black, densely covered with greyish-white scales ; antennæ and legs slightly rufescent ; rostrum and head grooved in the centre ; prothorax cylindrical, faintly rugose, scaly, with two discoidal bands

less squamose than the background, and with a lateral one of dense white silvery scales; elytra not broader than the prothorax at the base, elongated, slightly ampliated past the middle, acuminated behind, very convex, narrowly striated with the striæ finely punctured, densely squamose, and with a broad lateral margin of dense silvery scales.

322. P. SUMPTUOSUS. spec. nov.

Elongatus, niger, supra squamis viridis subtus argenteis dense tectus, antennis clava excepta rufis; prothorace fere cylindrico; elytris post medium ampliatis, postice acuminatis apiceque leviter divaricatis, tenuiter striato-punctatis; femoribus valde incrassatis, tibiis intus subcrenulatis setulosisque.

Long. 8-9, lat. 3-3½mm.

Black, densely covered with green scales, antennæ reddish except the club which is black; head and prothorax punctulated, the latter nearly cylindrical with a narrow longitudinal groove in the centre; elytra not broader than the prothorax at the base, elongated, ampliated past the middle, acuminated behind with both sides of the apical suture slightly diverging, narrowly striato-punctate; anterior femora much thickened, tibiæ serrated and setulose inwardly.

I have received several examples of that species almost entirely without green scales.

Gen. TANYMECUS. Sch.

323. T.? MAKKALIENSIS. Fahr.

Recorded from Northern Transvaal.

Gen. CIMBUS. Schonh.

324. C. BARBICAUDA. Lacord.

„ from Svakop River (Damaraland.)

325. C. OVAMPOENSIS. spec. nov.

Niger, pilis brevibus squamisque opalinis sat dense vestitus; prothorace transverse plicatulo; elytris, elongatis, apice pilosis; subtus vitta lata aureo-micante utrinque ornato.

Long. 18-22, lat. 6-7mm.

Black, moderately covered with very short whitish decumbent hairs nd opaline scales. Rostrum short, distinctly grooved, with longish

hairs at the apex ; prothorax cylindrical, slightly attenuated in front, transversely plicated, and covered with white hairs ; scutellum very squamose ; elytra broader than the base of the prothorax, slightly attenuated and rounded behind, convex with the humeral angles tuberculated, squamose, with the scales somewhat denser on the anterior part of the outer margin and with the apex thickly villose ; underside with a broad golden opaline with golden reflexions band on each side ; legs very pilose.

Shape and size of *C. barbicauda*, from which it differs merely in the arrangement and colouring of the scales.

Gen. POLYCLEIS. Schonh.

326. P. VESTITUS. Fahr.

Recorded from Transvaal and Zambeze River.

Gen. HYPOMECES. Schonh.

327. H. MODESTUS. Péring.

Dereodes Schonherri. Faust. Ent. Nachrith, 1885.

„ from Transvaal, Zambeze and Limpopo River.

Gen. SIDERODACTYLUS. Schonh.

328. S. ELEGANS. spec. nov.

Niger, opalino-squamosus, lateribus prothoracis elytrorumque dense sulphureo-squamosis ; elytris elongatis, convexis, striato-punctatis.

Long. 9-10, lat. 3-3½mm.

Black, covered with opaline scales ; head and prothorax punctured ; elytra elongated, convex, striato-punctated with the sides of the prothorax covered with sulphur yellow, dense scales forming also a very broad band on each side of the elytra somewhat above the outer margin ; legs and underside covered with pinkish opaline scales ; anterior tibiæ strongly serrated.

329. S. EGREGIUS.

S. simplicipes. Péring.

„ from the Transvaal.

I propose to change the name of *simplicipes* to *egregius* ; the types from which I described the species being females, the femoral tooth was absent, whereas it is strongly developed in the male. Specimens from Ovampoland are very pubescent.

330. S. HUMERALIS. Péring.

I should have added to the orginal description that the outer sides of the prothorax and of the elytra have a conspicuous white band.

Recorded from Damaraland only.

331. S. OPALINUS. spec. nov.

Niger, squamis opalinis dense tectus; prothorace antice angustato lateribus haud rotundatis posticeque acute dentatis; elytris elongatis striato-punctatis, humeris in dentem parvum productis.

Long. 9, lat. $3\frac{1}{2}$mm.

Shape and size of *S. humeralis*, black and totally covered with opaline scales and thus distinguished from the former; the prothorax is also more elongated, narrowed in front, but not behind, with the postical angles a little more acute; elytra elongated, a little ampliated past the middle, narrowed behind, very convex and narrowly striated with the striæ punctured.

PHÆNODERUS. Gen. nov. near Siderodactylus.

Head and antennæ of *Siderodactylus*; prothorax trapeziform with the outer posterior angles acute and very strongly developed in a conical tubercle in the male; elytra strangulated at the base and narrower than the base of the prothorax, dilated a little past the middle, very convex and acuminated behind; anterior tibiæ strongly serrated in both sexes, male with a strong tooth at the apex of the anterior femora.

Judging from the description only, and also from Lacordaire's remarks, Gener. d. Coleopt. Vol. 6. p. 103, the *Siderodactylus denticollis*, Thoms., will have to be included in this genus.

332. P. DISTINCTUS. spec. nov.

Mas. Niger, squamis sparsis aurantiaco-opalinis tectus; capite prothoraceque granuloso punctatis, hoc transverso, elevato, angulis posticis dilatatis, sub-fasciculatis acuteque dentatis; elytris antice augustatis, post medium sub-dilatatis, convexis, striato-punctatis, squamis aurantiacis lateraliter balteatis.

Femina a mare differt prothorace sub-rotundato femoribusque anticis haud dentatis.

Long. 11-$12\frac{1}{2}$, lat. 3-$3\frac{1}{2}$mm.

Black, sparsely covered with golden, opaline scales, denser on the outer sides of the elytra where they form a lateral band; head faintly

plicated with a median groove ; prothorax much raised above the elytra, depressed, and with the outer sides produced in an acute tooth surrounded by a few short bristles (the angle less acute in the female), punctulated and slightly grooved in the centre ; elytra narrower at the base than the prothorax, elongated, much inflated past the middle, convex, rounded behind and distinctly striated ; underside and legs very scaly.

Gen. STIGMATOTRACHELUS. Schonh.

333. S. PLACIDUS. spec. nov.

Elongato-ovatus, niger, squamis albidis variegatus ; rostro quinque-carinato, capite in medio profunde canaliculato ; prothorace sub-cylindrico ; elytris ovatis, postice valde compressis, foveolato-seriatis.

Long. 11-12, lat. 4-4½ mm.

Elongate-ovate, black besprinkled with small whitish, opaline scales, denser underneath and on the legs ; rostrum with five raised lines, separated from the head by a deep transverse impression ; head with a median longitudinal groove ; prothorax nearly as broad as long, sub-cylindrical, very closely punctured ; elytra ovate, very acutely compressed behind, perpendicularly declivous at the apex, and covered with regular series of deep foveæ ; tibiæ slightly pilose.

Gen. ELLIMENISTES. Schonh.

334. E. OSTENTATUS. spec. nov.

Niger, dense griseo-squamosus, elytris macula supra-humerali fasciisque angustis duabus brunneis in singulo notatis ; rostro capiteque in medio profunde canaliculatis, oculis sub-cristatis ; prothorace angusto, medio lateribusque longitudinaliter canaliculatis ; elytris basi truncatis, ovatis, humeris dentatis, valde convexis, posticeque acuminatis, costatis, interstitiis bifarian punctatis ; tibiis posticis intus crenatis.

Black, densely covered with greyish scaly tomentum, with a brownish spot on each side of the base and two transverse ill-defined narrow streaks on the elytra, the first one at about the middle, the second one near the top of the postical declivity ; antennæ with the scapus thick ; head and rostrum with a very deep median longitudinal

groove, eyes sub-cristate ; prothorax with the sides almost parallel and with three longitudinal impressions, one in the centre, the others on each side of the disk, with the two intervals raised and somewhat tuberculated in the middle ; elytra ovate, twice as broad as the prothorax, truncated at the base, with a conspicuous tooth at the humeral angles, very convex, dehiscent behind and acuminated at the apex, costate, the intervals with a double series of deep punctures ; posterior tibiæ serrated inwardly.

Although differing in general facies from the other South-African *Ellimenistes*, I cannot find any character necessitating the creation of a new genus for the present species.

Gen. Episus. Schonh.

335. E. cyathiformis. Gyllh.

Var. paucidentatus. Auriv.

Recorded from Damaraland.

336. E. Fahrei. Auriv.

„ from Damaraland.

337. E. brevicollis. Jekel.

Var. nigrovittatus. Auriv.

„ from Damaraland.

Gen. Microcerus. Schonh.

338. M. retusus. Fahr.

„ from nearly all parts of South Africa.

339. M. costalis. Auriv.

Var. Fahrei. Jek.

„ from Transvaal, Damaraland.

340. M. latipennis. Fahr.

„ from Natal, Transvaal, Zambezé, Limpopo, Zanzibar (mainland) and Delagoa Bay.

Gen. Brachycerus. Oliv.

341. B. apterus. Linn.

„ from all parts of South Africa.

342. B. INCOMMODUS. spec. nov.

Ovatus, niger, prothorace, elytris in dorso, subtusque dense ochraceo-squamosis; capite profunde impresso, prothorace utrinque spinoso, rugis duabus dorsalibus carinulam includentibus in medio; elytris ovatis, convexis, rugose punctatis, postice lateraliterque acute granosis.

Long. 16-19, lat. 11-12^{mm}.

Ovate, black, with the sides of the prothorax, the dorsal part of the elytra, the pectus, the sides of the abdominal segments and a ring round the tibiæ covered with ochraceous scales; rostrum long, excavated at the base and on the head, with the outer sides raised; prothorax with the sides produced in an acute spine, rugose, slightly tuberculated laterally and with a median very deep impression disconnected in the middle, the anterior part much raised and orbicular, the posterior one nearly straight, in the centre of the excavation a short raised line; elytra ovate, sometimes a little elongated, irregularly foveated, acutely granulose behind; on the dorsal part are faint traces of a double series of small granules hidden however by the scales which are denser there than on the outer sides of the disk.

Shape and size of *B. Westermani*, Fahr. and *B. intermedius*, Péring., but the prothorax and elytra are differently sculptured.

343. B. TURSIO. Pascoe.

Recorded from nowhere else but Damaraland.

344. B. SQUAMOSUS. Péring.

„ from Damaraland.

345. B. PHLYCTŒNOIDES. Pascoe.

Differs from. *B. granifer*. Fahr. only in having the granules of the elytra somewhat larger.

„ from Hereroland (Damaraland). Coll. Dohrn.—and Guinea. teste Pascoe.

346. B. NATALENSIS. Fahr.

„ from the Transvaal and Zambeze.

347. B. ADUSTUS. spec. nov.

Oblongo-ovatus, niger, sub-squamosus; rostro elongato, crasso, a capite profunde disjuncto, oculis sub-depressis palpebris elevatis; prothorace tuberculato lateribus acute spinosis, medio fovea profunda carinulam includente impresso; elytris elongatis, crebre granulosis,

tuberculis deplanatis duplici serie in singulo instructis plagisque ochraceo-squamosis seriatis notatis; pedibus rugosis, tibiis acute spinosis.

Long. 24-25, lat. 12-13mm.

Rostrum elongated and triangular, broad, plane, deeply excised from the head; eyes elongated, flat with a strongly developed ridge above; prothorax moderately covered with light-brown scales, and with the sides armed with a long conical spine, covered with sharp tubercles, and having in the middle a wide groove (the walls of which are much raised anteriorly), disconnected in the centre and hardly reaching the base; this groove contains a fine median ridge; elytra elongated, moderately convex, retuse posteriorly, densely granulose with the suture sub-tuberculated, and two series of flat, rounded tubercles on each elytron; they are moderately covered with scales forming regular longitudinal series of ochraceous patches—eight on each side from the suture to the epipleura,—those situated between the larger series of tubercles are very conspicuous and larger than the others; pectus and lateral sides of abdominal segments ochraceo-squamose; legs very rugose, bristly; tibiæ covered with short spines more developed in the hind ones, where some of these are longer than the others and very conspicuous.

Allied to, if not a variety of *B. rudis*, Gylh. and also to *B. rubiginosus*. Gylh.; differs however in general facies and marking.

Recorded from Namaqualand and Lake N'Gami.

348. B. CONGESTUS. Gerst.

„ from Zambeze River and Transvaal.

349. B. VIDUATUS. spec. nov.

Oblongo-ovatus, niger, prothorace pedibusque rufo-squamosis, femoribus albo annulatis; rostro elongato, sub-plano, postice utrinque strangulato atque a capite profunde disjuncto; prothorace fovea profunda antice impresso, verrucis setigeris tecto lateribusque acute spinosis; elytris ob-ovatis, verrucis confertim obsitis et tuberculis sub-validis duplici serie in singulo instructis.

Long. 18, lat. 10mm.

Oblongo, ovate, black with ochraceous scales on the prothorax; legs squamose with a whitish ring at the apex of the femora, also a few patches on each side of the pectus and abdominal segments

Rostrum deeply impressed laterally near the base, separated from the head by a deep groove ; prothorax round, with the outer sides produced in a sharp spine, convex, covered with setigerous granules very closely set, and with a deep anterior fovea hardly reaching the centre of the disk ; elytra oblongo ovate, convex, declivous behind, covered with closely set, raised, setigerous warts, and having on each side two rows of larger tubercles.

Closely allied to *B. annulatus.* Gerst., but differentiated by the sculpturing of the elytra, the warts being much more raised and closely set, the discoidal tubercles are also less conspicuous.

350. B. INTERSTITIALIS. Fahr.

Recorded from Upper Namaqualand.

351. B. WAHLBERGI. Fahr.

The granules on the elytra of the example captured by Mr. Eriksson are somewhat larger than in the types.

„ from Damarland, Northern Transvaal.

352. B. MONACHUS. Fahr.

„ from Bechuanaland, Transvaal.

353. B. CLITELLATUS. Fahr.

„ from Natal (Maritzburg).

354. B. ROTUNDATUS. Péring.

A very small ? male.

„ from Damaraland and Cape Colony (Carnarvon).

Gen. THEATES. Fahr.

355. T. LUDIFICATOR. Auriv.

„ from N'Gami (teste Auriv.)

One of the examples is twice as large as the type.

Gen. HOPLITOTRACHELUS. Schonh.

356. H. SPINIFER. Lacord.

„ from Natal, Transvaal, Limpopo, Bechuanaland and ? Zambeze River.

Gen. SYNTHOCUS. Sch.

357. S. NIGROPICTUS. Pasc.

Recorded from Damaraland.

Gen. SPARTECERUS. Sch.

358. S. QUADRATUS. Gerst.

„ from Zambeze River.

Gen. HIPPORRHINUS. Schonh.

359. H. OVAMPOENSIS. spec. nov.

Oblongus, niger, rostro supra convexo, a capite impressione arcuata disjuncto; prothorace tuberculato, lateribus spinosis, medio breviter carinato; elytris in singulo trifariam tuberculatis.

Long. 20, lat. 9mm.

Black, very little squamose; rostrum long, convex on the upper part, rugose, with a triangular raised line at the base, and separated from the head by a semi-circular impression; head punctured; prothorax with the sides produced in an obtuse tooth, closely covered with round warts and having an elongated, moderately acute tubercle in the centre, but no groove; elytra broader than the prothorax, convex, declivous behind and ending in two divaricating, acute tubercles, each one with three rows of moderately sharp, closely set tubercles, more acute behind; the intervals are also tuberculated, the tubercles of the intervals between the suture and the first dorsal series are also developed at the apex into a regular row; legs annulated with brown.

Allied to *H. Wahlbergi.* Bohem. by the shape of the prothorax which is not, however, grooved in the middle; the sculpturing of the elytra approximates it to *H. sulcirostris.* Fahr.

Gen. CLEONUS. Schonh.

360. C. (BOTHYNODERES) DISSIMILIS. spec. nov.

Long. 13-14, lat. 5-7mm.

Oblongo-ovatus, cinereo vel fusco-tomentosus; rostro bi-sulcato; prothoracis disco nigro; elytris post medium ampliatis, convexis, profunde striato-punctatis, interstitiis alternis elevatis, plagis duabus transversis nigro-fuscis punctoque albido in singulo ornatis.

Oblong, black, covered with a greyish-white, or sometimes a fuscous tomentum; rostrum with two lateral grooves, head with a small median impression; prothorax attenuated in front, very little convex above, and with a broad triangular brownish-black patch extending from the apex to the base; elytra elongated, ampliated past the middle, attenuated and rounded behind, very convex, deeply striato-punctuated, with the 2nd, 4th and 6th interval much raised, the fourth one with a distinct disconnected tubercle near the apex, each with a small triangular blackish-brown patch in the disk a little before the middle, and a broader one; (more distinct and arcuated,) past the middle; this second fascia has also a white tomentose spot on the edge.

361. C. ERRANS. Fahr.

Recorded from Caffraria (teste Fahreus.)

362. C. ANGULICOLLIS. Fahr.
„ from Transvaal.

Gen. LIXUS.

363. L. HOERENS. Bohem.
„ from Natal and Transvaal.

Gen. RHYNCHITES. Herbst.

364. R. EXARATUS. Bohem.
„ from Natal.

Gen. ALCIDES. Schonh.

365. A. INTERRUPTUS. Bohem.
„ from Natal and Transvaal.

366. A. HŒMOPTERUS. Bohem.
„ from Cape Colony, Natal, Transvaal.

367. A. EXILIS. Bohem.
„ from Transvaal, Zambeze, Natal.

Gen. OCLADIUS. Schonh.

368. O. VARIABILIS. Fahr.
„ Orange Free State, Transvaal, Bechuanaland.

Family : LONGICORNIA.

PRIONINI.

Gen. TITHOES. Thoms.

369. T. MACULATUS. Fabric.

„ from Natal, Transvaal, Zambeze, Mombassa.

Gen. MACROTOMA. Serv.

370. M. CŒLASPIS. White.

Recorded from Natal, Free State, Transvaal, Delagoa Bay, Zambeze, Limpopo, Bechuanaland.

I cannot distinguish this species from Senegal and West Coast specimens of *M. palmata*, Fabric.

Gen. COLPODERUS. Serv.

371. C. FORCIPATUS. Harold.

„ from Angola (teste Harold.)

CERAMBYCINI.

Gen. ZAMIUM. Pascoe.

372. Z. RUSTICUM. spec. nov.

Long. 19, lat. 7mm.

Oblongum, fusco-ferrugineum griseo-pubescens; antennis pilis longis adspersis; prothorace rotundato, supra valde deplanato, callis elongatis tribus, sub-nitidis in disco; elytris profunde punctatis.

Oblong, fusco-ferrugineous, covered with a dense, moderately long greyish pubescence; antennæ very pilose; head and prothorax very rugose, the latter round, much depressed with two elongated slightly raised shining tubercles on the disk and a shorter one in the centre; elytra plane, nearly parallel, deeply and closely punctured, densely covered with hairs and having, each, two raised, not very conspicuous lines.

Gen. XYSTROCERA. Serv.

373. X. LAETA. spec. nov.

Supra viridi-aenea, prothorace macula mediana fulva, subtus, antennis pedibusque rufis; elytrorum sutura tenuiter rufescens.

Long. 25, lat. $5\frac{1}{2}$mm.

Metallic green above, shining ; antennæ, legs and underside red. Head deeply grooved on the vertex, antennæ rugose, densely pilose underneath ; prothorax short, rounded, faintly punctured, with two deep impressions on each side of the anterior part of the disk, and with a reddish median macula ; scutellum rufous ; elytra moderately convex, finely and closely shagreened and with the suture reddish ; underside red with the basal part of the abdominal segments dark green.

Allied to *X. Buqueti*. Thoms.

Gen. HYPATIUM. Thoms.

374. H. FRIEESI. Fahr.

Recorded from Northern Transvaal.

Gen. PHYLLOCNEMA. Thoms.

375. P. SPECIOSA. spec. nov.

Elongata, nigro-violacea, capite, antennis, prothorace, pedibus basi apiceque obscure rufis ; prothoracis lateribus spinosis ; elytris coriaceis in singulo bi costatis.

Long. 30, lat. 8^{mm}.

Elongated, violaceous metallic black with the head, antennæ, prothorax, apex and base of femora and tibiæ dark metallic red, head and prothorax very rugose, deeply pitted, the latter with the outer sides produced into a conspicuous tooth, and with the apical angle acute, little convex on the back with two faint impressions on the disk ; scutellum chalybeate ; elytra elongated, shagreened, each with two conpicuous raised lines ; underside briefly silky ; posterior tibiæ foliated on the outer side.

An intermediate form between *P. latipes* and *P. Guienzii*, and approximating in size to the former ; the shape of the prothorax is however nearer to that of *P. Guienzii*, but not tuberculated on the disc ; the foliation of the hind tibiæ is identical.

Gen. CLOSTEROMERUS. Thoms.

376. C. AMABILIS. spec. nov.

Elongatus, cæruleo-viridis, antennarum articulis 6 *ultimis nigris ; femoribus quatuor anticis rufis.*

Elongated, blueish metallic green, very shining ; head and prothorax punctulated, the latter rounded, nearly as broad as long, convex, deeply impressed round the base ; antennæ with the last six articulations black, flattened and dilated ; elytra shagreened with one distinct median raised line on each, and of a deeper blue from past the middle ; legs and tarsi deep blue with the exception of the four anterior femora which are of a vivid red, except at the base ; underside emerald green and very shining.

Answers to the description of *C.* (*Helymoeus*) *rufipes*. Fahr., but is more robust ; the apical articulations of the antennæ are more closely set than in *C. rufipes*, the shape and colouring of the prothorax also differ.

Gen. CLYTANTHUS. Thoms.

377. C. DETERRENS. Pascoe.

Recorded from the Zambeze River.

Gen. AMPHIDESMUS. Serv.

378. P. ANALIS. Westw.

„ from Cape Colony, Natal, Transvaal, Limpopo.

LAMIINI.

Gen. PHANTASIS. Thoms.

379. P. GIGANTEA. Guér.

„ from Zambeze River.

380. P. CARINATA. Fahr.

„ from Damaraland, Bechuanaland, Zambeze, Northern Transvaal.

Gen. HERPETOPHYGAS. Fahr.

381. H. FASCIATUS. Fahr.

„ from Northern Transvaal and Delagoa Bay.

The Ovampoland example has the white fasciæ of the elytra as well as the dark background lighter than examples from Transvaal (Rustenburg) and closely resembles specimens from Delagoa Bay.

Gen. IDACTUS. Pasc.

382. I. TRIDENS. Pascoe.

Recorded from Transvaal, Delagoa Bay and Damaraland.

Gen. ZOGRAPHUS. Casteln.

383. Z. PLICATICOLLIS. Thoms.

„ from the Orange Free State and Transvaal.

Gen. CEROPLESIS. Serv.

384. C. FERRUGATOR. Fabric.

„ from Cape Colony, Orange Free State, Transvaal, Delagoa Bay, Zambeze, and Damaraland.

Gen. PYCNOPSIS. Thoms.

385. P. OBSOLETA. Fahr.

„ from Damaraland.

Gen. CERATITES. Serv.

386. C. JASPIDEUS. Serv.

„ from ? Northern Transvaal, and Damaraland.

Gen. COCHLIOPSELAPHUS. Lacord.

387. C. CATHERINÆ. White.

„ from Northern Transvaal, and Damaraland.

Gen. CHREOSTES. Pasc.

388. C. CINERASCENS. spec. nov.

Oblonga, nigra, cinereo-tomentosa, prothoracis lateribus acute spinosis, dorso tuberculis elevatis 8 *obsito; elytris elongatis, in basi rugoso punctatis, fascia diagonali sinuata dilutiore post medium posita in singulo ornatis.*

Long. 30, lat. 12^{mm}.

Covered with a greyish-white tomentum; prothorax with the sides acutely spinose and with eight tubereles on the disk; two on each

side, the apical one the smallest of the two, three in the anterior median part of the disk, and an elongated grooved one in the posterior part; elytra elongated, convex, not broader at the apex than at the base, broadly and deeply pitted in the anterior part, with a raised line which disappears before reaching the middle and covered with a whitish-grey tomentum, and having a broad, sinuated, diagonal band of a deeper grey placed a little past the middle; there is also a very faint trace of another sinuated diagonal band edging the basal punctures.

Very closely allied to *C. obesa.* Westw., from which it differs in colouring only.

389. C. EPHIPPIATUS. Pasc.

The tomentum of the Ovampoland examples is much more greyish than in the Natal specimens, and the dorsal marking of the elytra is almost whitish.

Recorded from Natal, Transvaal.

Gen. OLENECAMPTUS. Chevr.

390. O. BILOBUS. Fabr.

One example captured in Damaraland. There can be no doubt of the *bona fides* of the habitat. This singular species might have been introduced in that part of the country from Australia or India?

Gen. CROSSOTUS. Serv.

391. C. PLUMICORNIS. Serv.

„ from Transvaal and Natal.

Gen. TETRADIA. Thoms.

392. T. FASCIATOCOLLIS. Thoms.

„ from Cape Colony (Kimberley), Transvaal and Damaraland.

Gen. HECYRIDA. Thoms.

393. H. TERREA. Bertol.

„ from all parts of South Africa.

Gen. VOLUMNIA. Thoms.

394. V. WESTERMANNI. Thoms.

„ from Natal, Transvaal, Zambeze.

Family : **PHYTOPHAGA.**

Sub-family : CRIOCERINÆ.

Gen. SAGRA. Fabr.

395. S. BICOLOR. Lacord.

Recorded from Natal and Transvaal.

Gen. LEMA. Fabr.

396. L. PULCHELLA. spec. nov.

Oblongo-parallela, œnea, nitida, capite macula rufa ; prothorace angulis anticis sub-conicis, disco profunde bi-foveato ; elytris striato-punctatis.

Long. 5, lat. 2^{mm}.

Brassy, shining, antennæ black ; head punctured, very deeply grooved on the vertex and with a conspicuous red triangular patch ; prothorax strongly constricted behind and with the anterior outer angles produced in a short sub-conical tubercle, disk raised, convex and with two deep foveæ ; elytra oblong, moderately convex, with the humeral angles collose ; they are covered with series of punctures, the interstices of which are hardly raised. Underside and legs brassy black.

An example identical with this species, but evidently immature, is totally rufous with the exception of the elytra which are brassy like the type.

Closely allied to *L. chalcoptera* and *L. viridiaenea*, Lac.

397. L. GRANDIS. Lac.

„ from D'Urban, Natal.

Gen. CRIOCERIS. Geofr.

398. C. LITIGIOSA. spec. nov.

Oblonga, parallela, pallido-fulva ; capite antice, antennis, articulo primo excepto, pedibus subtusque nigris ; elytris profunde-punctatis, interstitiis sub-levibus.

Long. 10, lat. 4^{mm}.

Of a pallid fulvous colour with the anterior part of the head, the antennæ, with the exception of the first articulation, the under part

and legs black; head with two elongated frontal tubercles, prothorax smooth, constricted laterally, deeply impressed transversely above the base; elytra elongated, parallel, with deep series of punctures, the intervals of which are slightly raised and nearly smooth; underside slightly punctured, tibiæ pubescent.

Sub-family: MEGALOPODINÆ.

Gen. SIGRISMA. Fairm.

399. S. TUBERIFRONS. Fairm.

Recorded from Orange Free State, Transvaal and ? Limpopo River.

Gen. PŒCILOMORPHA. Hope.

400. P. BI-NOTATA. spec. nov.

Rufo-fulva, nitida, sub-hirta; antennis articulo primo excepto, tibiis pedibusque nigris; elytris profunde punctatis, piceis, macula flava prope apicem posita in singulo ornatis.

Long. 9, lat. 4^{mm}.

Shining red, slightly covered with brownish hairs; head impressed on the vertex, slightly punctured, palpi red, antennæ black with the first articulation reddish, prothorax short, convex, transversely impressed in front and behind, shining, covered with thinly scattered brownish hairs, and very slightly punctured; elytra broader than the prothorax at the base, nearly linear, rounded posteriorly and moderately convex with the shoulders somewhat raised; they are deeply and almost regularly punctured, black, shining, slightly tomentose, and have two conspicuous nearly smooth yellow patches disconnected with either suture or margin, and situated a little above the apex; abdomen and femora red, tibiæ and tarsi black, hind femora strongly clavate.

A very distinct species.

Sub-family: CLYTRINÆ.

Gen. CLYTRA. Laich.

401. C. BI-LIGATA. Lac.

„ from Natal, Transvaal, Zambeze River.

Gen. DIAPROMORPHA. Lacord.

402. D. TRI-FASCIATA. Oliv.

Recorded from Natal, Transvaal. Zambeze, Mozambique.

403. D. DORSATA. Lacord.

„ from Natal, Zululand.

Gen. MELITONOMA. Lacord.

404. M.? LITIGIOSA.

Not previously recorded. The Ovampo examples vary sensibly.

405. M. DECORATA. spec. nov.

Nigra, oblongo-cylindrica ; prothorace elytrisque olivaceis, illo maculis tribus, his plagis sex nigris in singulo notatis.

Long. $4\frac{1}{2}$, lat. $2\frac{1}{2}$mm.

Black, slightly silky except on the prothorax and elytra which are smooth ; head with a deep median impression ; prothorax convex, broader than long, olivaceous, nnd with two broad lateral black patches (which in some examples may be divided in four) and a supra scutellary spot ; scutellum black ; elytra elongated, a little attenuated behind, olivaceous, and each with six distinct black patches ; a supra humeral one, two in the middle, two past the middle, and an apical one.

Gen. GYNANDROPHTHALMA. Lacord.

406. G.? VENTRALIS. Lac.

„ from Natal and Transvaal.

Gen. DACHRYS. Lac.

407. D. CAPENSIS. Lac.

„ from Natal.

Sub-family : CRYPTOCEPHALINÆ.

Gen. CRYPTOCEPHALUS. Geof.

408. C. EMPHRACTUS. spec. nov.

Flavus, capite plaga verticali, antennarum articulis sex ultimis,

maculis sex in prothorace elytrisque macula supra humerali atque fasciis duabus transversis sinuatis in singulo nigris ; pectore lateraliter nigro-plagiato.

Long. 8, lat. 5mm.

Pale yellow, smooth, shining ; head slightly impressed in the centre and with a vertical black patch ; antennæ with the five first articulations yellow, the remainder black ; prothorax very convex, smooth, yellow, with a transverse anterior row of four black round spots and with two more behind, one on each side of the scutellum ; scutellum black ; elytra yellow, shining, seriato-punctated, each with a supra humeral black patch, another in the middle, reaching from the first series of punctures to the sixth, and another and broader one above the apex and extending from near the suture to the outer margin, but not reaching either ; both these bands seem to consist of two large coalesced spots ; underside yellow, pectus with a triangular black patch on each side.

409. C. STRENUUS. spec. nov.

Flavus, capitis plaga verticali triangula, antennarum articulis sex ultimis, prothoracis margine fasciisque duabus, scutello, elytrorum maculis tribus in singulo, sutura in medio subtusque nigris.

Long. 6, lat. 4mm.

Yellow, smoeth, shining ; head with a black triangular vertical patch ; antennæ yellow with the last six articulations black ; prothorax short, convex, smooth, narrowly marginated with black, and with a dorsal transverse black band and a basal one uniting on each side above the outer margin ; elytra seriato-punctated with a supra humeral elongated patch, another diagonal one starting from about the anterior third part of the elytra and uniting with the suture, and a supra marginal one past the middle ; the suture from where it unites with the discoidal patch, up to the postical one is black and dilated at the apex ; underside black, legs and tarsi yellow.

Sub-family : EUMOLPIDÆ.

Gen. PSEUDOCOLASPIS. Casteln.

410. P. AUREOVILLOSA. Mars.

Recorded from Natal, Transvaal, Limpopo and Zambeze.

411. P. HUMERALIS. Schauf.

from Natal and Zambeze River.

Gen. EURYOPE. Dalm.

412. E. TERMINALIS. Baly.

from Cape Colony (Diamond Fields) Natal, Transvaal and Delagoa Bay.

413. E. NOTABILIS. spec. nov.

Oblonga, valde convexa, supra pallido subtus rufo-fulva, antennis, fronte maculis binis, prothorace maculis sex, elytris plagis quatuor in singulo, pedibus pectorisque lateribus nigris.

Long. 11, lat. 6^{mm}.

Oblong, very convex, pale fulvous on the upper part, reddish underneath ; head very broad, depressed, with two round spots in the centre ; prothorax nearly twice as broad as long, with the anterior angles very acute, produced outwardly, and marked with six black spots, three on each side ; scutellum black ; elytra elongated, convex, with the shoulders moderately produced, faintly impressed transversely in the anterior part, a little above the middle, and each elytron with four black patches ; the first on the shoulder, the second in line with the first at an equal distance from the scutellum and the shoulder, the third, a very elongated one, in the centre at an equal distance from the suture and the outer margin, and the fourth below it, but nearer to the outer magin than to the suture ; antennæ, legs and sides of pectus black.

Allied to *E. terminalis*, Bal., but larger and differently marked ; the transverse supra-median impression on the elytra, so conspicuous in *terminalis* is hardly discernible in the present species.

Gen. SYAGRUS. Chapuy.

414. S. RUGICEPS. Lefév. Trans. S. Afric. Philos. Society, Vol. VI., 1890., p 43.

Recorded from Natal and Zambeze.

415. S. RUFO-BRUNNEUS. Lefév. loc. cit. p. 43.

„ from the Limpopo and Zambeze.

Gen. EURYDEMUS. Chap.

416. E. MACULOSUS. Har.

Recorded from the Zambeze River.

Gen. CORYNODES. Hope.

417. C. INSIGNIS. Lefév. loc. cit. p. 43.

„ from Northern Transvaal and Zambeze.

Sub-family : CHRYSOMELIDÆ.

Gen. CHRYSOMELA. Linn.

418. C. CORRUGATA. spec. nov.

Breviter ovata, fusco œnea, sub-nitida; prothorace in medio punctulato lateraliterque foveato; elytris profunde punctatis, lateribus anticis corrugatis; pedibus nigro-œneis, nitidis.

Long. 9, lat. 6^{mm}.

Briefly ovate, coppery-fuscous, moderately shining; head rugose, prothorax with the lateral angles nearly straight, deeply punctured in the centre of the disk, with the outer sides deeply pitted, and the interstices corrugated; elytra convex, a little elongated, deeply and irregularly punctured in the dorsal part, with the outer sides from the base to the middle almost foveated and the interstals between the foveae sinuated and raised; legs coppery black and shining.

Sub-family : HALTICINÆ.

Gen. CLADOCERA. Hope.

419. C. SPECTABILIS. spec. nov.

Oblonga, convexa, flava, capite maculis tribus, prothorace maculis quinque scutelloque nigris; elytris convexis concinne punctulatis, vittis duabus, latis, nigris post medium cohaerentibus punctoque apicali nigris in singulo ornatis.

Long. 10, lat. 6^{mm}.

Oblong, convex, pale yellow; antennæ serrated, black, with the exception of the first three articulations; head punctulated with a triangular central patch and two lateral ones at the apex; prothorax

convex, punctulated, with three round spots disposed in a triangular shape in the centre of the disk, and a large black patch on each side ; scutellum black ; elytra convex, three times as long as the prothorax, covered with very closely set punctures and having, each, two broad black bands, one supra marginal, the other pre-sutural, uniting below the middle and forming a broad dorsal patch reaching short of the apex where is also a rounded black spot ; outer sides of the pectus, tarsi and legs with the exception of the base of the femora black, pubescent.

Closely allied to *C. vittatipennis*. Baly.

420. C. SIMPLEX. spec. nov.

Oblonga, convexa, flava, capite maculis tribus nigris ; prothorace convexo, 5 nigro maculato ; scutello nigro, elytris punctulatis, convexis, marginis limbo externo maculaque humerali nigris ; pectoris lateribus, pedibus tarsisque nigris, femoribus late flavo-annulatis.

Long. 11, lat. 7^{mm}.

Oblong, convex, pale-yellow ; antennæ very little serrated, black, with the exception of the three first basal articulations which are pale-yellow but spotted with black ; head punctulated with a triangular black frontal patch, and one on each side of the vertex ; prothorax convex, punctulated, with three black round spots disposed in a triangle in the centre of the disk, and a round patch on each side near the base ; scutellum black ; elytra moderately elongated, very convex, closely but faintly punctured and with a small elongated black patch on the humeral part, the outer margin edged with a narrow black line broadening a little at the apex, sides of the pectus, coxæ, base and apex of the femora, tibiæ and tarsi black.

Although coloured somewhat like *C. pectinicornis*. Oliv., the facies of the present species is more that of *C. femoralis*. Gerst., and the antennæ are hardly serrated, thus distinguishing it at once from varieties of *C. pectinicornis*.

C. PECTINICORNIS. Oliv. ? var. dispar.

Like the type, but the elytra, instead of having one black patch on each side, have a supra humeral one as in *C. simplex*, one below the scutellum, near the suture, and another one past the middle and near the outer margin ; this last patch is occasionally absent.

This variety comes from the Zambeze River and ? Delagoa Bay.

Gen. HALTICA. Geof.

421. H. INDIGACEA. Illig.

Recorded from all parts of South Africa.

Sub-family : GALERUCINÆ.

Gen. DIACANTHA. Chevr.

422. D. CONIFERA. Fairm.

In some examples (females) the apical black patch has overrun the whole of the elytra.

Not recorded previously from South Africa.

423. D. LUGUBRIS. spec. nov.

Rufo nitida, antennis infuscatis, elytris punctulatis, humeris haud elevatis, nigris, fascia humerali arcuata rufa in singulo notatis, pedibus pectoreque nigris.

Long. 7-8, lat. 3mm.

Red, shining ; head with a deep median impression and a longitudinal groove on the vertex ; antennæ slightly pubescent, infuscated with the exception of the first three articulations which are red ; prothorax smooth, very shining ; transversely impressed above the base ; scutellum black ; elytra elongated, without any basal projection, closely punctulated, black with an arcuated red patch on each side, beginning at the shoulder and directed towards the suture which it does not reach ; this patch, which is also discernible under the shoulder, does not quite reach the middle of the elytron ; pectus and legs black, the latter slightly pubescent.

It is probable that all the examples captured by Mr. Eriksson are females.

424. D. OPULENTA. spec. nov.

Nitida, capite, prothorace, antennarum basi, scutello abdomineque rufis ; elytris violaceo-purpuratis, pectore pedibusque nigris.

Long. 9, lat. 4mm.

Shining, head red with a very strong transverse impression in the frontal part, and a longitudinal one on the vertex ; antennæ slightly pubescent, black with the three basal articulations red, prothorax red, obsoletely punctulated, moderately convex, with a well-defined

transverse impression above the base ; scutellum red ; elytra elongated, closely punctured, of a violaceous purple, very shining ; pectus and legs black, abdomen red.

I have seen two examples only of this handsome species, which I take to be females.

Gen. GALERUCELLA. Crotch.

425. G. GRISEO-SERICANS. Thoms.

Recorded from Natal and Cape Colony.

Gen. APOPHYLIA. Chevr.

426. A. TRICOLOR. Fabric.

„ from Cape Colony.

Sub-family : CASSIDINÆ.

Gen. LACCOPTERA. Bohem.

427. L. CORRUGATA. Sahlb.

„ from Natal, Transvaal, and Zambeze River.

428. ? CANCELLATA. Bohem.

„ from the Zambeze River.

Gen. ASPIDOMORPHA. Hope.

429. A. TECTA. Boh.

„ from Natal, Transvaal and Cape Colony.

430. A. ILLOTA. Boh.

„ from Cape Colony, Natal, Transvaal and Delagoa Bay.

431. A. TIGRINA. Oliv.

„ from all parts of South Africa.

432. A. PUNCTATA. Fabr.

Recorded from Natal and Transvaal.

Gen. CASSIDA. Linn

433. C. AREATA. Klug.

„ from Natal and Transvaal.

Family : EROTYLIDÆ.

Gen. MEGALODACNE. Crotch.

434. M. GRANDIS. Fab.

„ from Natal, Transvaal, Zambeze River, Mozambique.

Gen. EPISCAPHA. Lacord.

435. E. SCENICA. Gerst.

„ from Mombassa (teste Gerst.)

Gen. AULACOCHILUS. Lacord.

436. A. CAPENSIS. Lac.

„ from Cape Colony and Natal.

Family : COCCINELLIDÆ.

Gen. CHILOMENES. Chevr.

437. C. LUNATA.

„ from all parts of South Africa.

Gen. EXOCHOMUS. Redt.

438. E. VERSUTUS. Muls.

„ from Cape Colony and Natal.

Gen. ALESIA. Muls.

439. A. AURORA. Gerst.

Differs slightly from the type.

Not previously recorded.

Gen. ORTALIA. Muls.

440. O. GUILLEBAUI. Muls.

Recorded from Natal, and Transvaal (Lydenburg.)

Gen. EPILACHNA. Chevr.

441. E. DREGEI. Muls.

„ from Delagoa Bay, and Transvaal (Lydenburg.)

INDEX OF NEW SPECIES AND VARIETIES.

FOURTH CONTRIBUTION TO THE SOUTH AFRICAN COLEOPTEROUS FAUNA.

By L. Péringuey, F.Z.S., F.E.S., London, France, &c.

[Read 1892, March 30.]

Description of New Coleoptera in the South African Museum.

Family : CICINDELIDÆ.

Tribe : CICINDELIDÆ.

Gen. Myrmecoptera. Germ.

M. limpopoiana.

Nigro-œnea, supra sub-opaca, prothorace cylindrico, plicatulo; elytris elongatis, post medium (fem.) ampliatis, postice acuminatis apiceque breviter spinosis, a basi ante medium sub-scrobiculatis, deinde granulatis, costa sub-elevata medium disci attingente in singulo maculaque elongata apicali, alba utrinque notatis.

Long. 21, lat. $6\frac{1}{2}$-7^{mm}.

Black with a brassy tinge, moderately shining on the upper part, steel-blue, very shining underneath ; head strigose, labrum quite black or black in the centre and broadly edged with yellow in the female ; prothorax plicated obliquely, long, cylindrical ; elytra ampliated past the middle, acuminated behind with the suture ending in two very short spines, deeply foveated from the base to about the middle, with the postical part closely shagreened, each one with a moderately raised line, parallel to the suture and reaching the middle, and also an inconspicuous, short, narrow white patch near the apex.

Mashuanaland (Fort Tuli).

A very distinct species ; its nearest ally is *M. Bertolonii.*

M. Junodi.

Nigro-œnea, supra nitida, subtus violacea, prothorace elongato, cylindrico, plicatulo ; elytris elongatis, apice longe spinosis, a basi ultra medium scrobiculatis, deinde crebre lateque punctatis.

Long. 18-20, lat. 4-5^{mm}.

Metallic blue black, shining on the upper part ; labrum yellow with

a black, basal patch in the male, that of the female black with the outer sides narrowly edged with white ; head strigose, prothorax very long, slender, cylindrical, finely plicated obliquely ; elytra scrobiculated from the base to about past the middle and closely but broadly punctured from there till the apex, and having a row of deeper fovea with a golden tinge reaching from the base to about the middle, the apical part of the suture produced in two very long, sharp spines in both sexes, but those of the male are the longest ; no white patch on the margin or disk ; underside steel-blue, very shining.

Captured at Rikatla, twenty miles from Lourenzo-Marquez, Delagoa Bay, by the Rev. H. Junod, after whom I propose to name this pretty species, very different from any other South Africa *Myrmecoptera* known to me.

Family : CARABIIDÆ.

Tribe : LEBIIDÆ. Lacord.

Gen. LEBIA. Latr.

L. MASHUANA.

Rufo-testacea, elytris nigris, alte costatis, plaga supra humerali, elongata a basi fere ad medium extensa, supra costis 4-7 posita, vitta suturali angusta margineque laterali flavis.

Long. 9, lat. $3\frac{1}{2}$mm.

Rufo-testaceous on the upper part, moderately shining, apex of mandibles palpi and tarsi black, antennæ also black, pubescent, with three basal joints reddish ; head strigose ; prothorax nearly as broad as long, truncated in front and behind with the anterior angles slightly rounded and the posterior acute, grooved in the centre with the disk a little raised and the outer side flattened ; elytra elongated, parallel from the base to two-thirds of the length and from there slightly ampliated, strongly costate, a little convex, black, moderately shining and having on each side an elongated, nearly quadrate yellow patch, extending over the 4th, 5th, 6th and 7th costæ from the base, a little above the shoulder and reaching almost the median part ; this patch does not however invade the basal part of the fourth costa, the outer margin is edged with yellowish-red and alongside the suture runs, on each side, a very fine line of the same colour ; legs and underside testaceous.

Mashuanaland (Fort Tuli).

Gen. HYSTRICHOPUS. Bohem.

H. AGILIS.

Elongatus, niger, antennis, palpis pedibusque rufis; prothorace nitido, transverse plicatulo, latitudine longiore, lateribus carinatis, medio profunde canaliculato; elytris elongatis, a medio leviter ampliatis, postice perparum angustis, sub-opacis, singulo sex-costato interstitiis levibus, costa secunda punctis tribis insculpta margineque laterali profunde punctata.

Long. 16, lat. 6mm.

Black, elongated, palpi, antennæ, legs and tarsi reddish; labrum with a few rigid hairs; head smooth, plicated longitudinally above the eyes and with a transverse line between; prothorax black, shining, finely plicate, elongated, gradually narrowed behind, outer sides acute and raised, median groove with a conspicuous depression near the apex; scutellum shining; elytra nearly thrice the length of the prothorax, narrow at the base, slightly ampliated from about the middle and somewhat narrowed posteriorly, black, sub-opaque, each with six raised costæ with intervals smooth, second costa from the suture with four deep punctures; underside black, shining.

Intermediate between *H. vigilans*, Sturm and *H. sulcatus*, Dej.

Cape Colony (Graham's Town).

H. ALTECOSTATUS.

Elongatus, niger, nitidus, palpis pedibusque rufis; prothorace transverse plicatulo, latitudine longiore, lateribus carinatis, medio profunde canaliculato; elytris elongatis, a medio leviter ampliatis, postice perparum angustis, singulo sex-costato, costis alternis reliquis magis elevatis, secunda punctis quinque insculpta margineque laterali profunde punctata, interstitiis tenue punctulatis.

Long. 15, lat. 5mm.

A near ally to *H. agilis*; the colour of the palpi, antennæ and legs, and also the shape and sculpturing of the head and prothorax are the same; the elytra are shining instead of being sub-opaque, the costæ are much more raised with the alternate ones 2, 4, 6 higher than the others, and the narrow intervals very slightly punctate, the second costa bears five deep, round impressions, and the outer margin has a regular series of deep punctures.

Captured in the neighbourhood of Cape Town.

H. PORRECTUS.

Angustus, niger, sub-nitidus ; palpis antennis tarsisque rufescentibus ; capite levi ; prothorace capite haud latiore, fere parallelo lateribus carinatis, in medio profunde canaliculato, nitido transverseque tenuissime plicatulo ; elytris fere rectis, sub-deplanatis, prothorace latioribus, in singulo sex-costatis, costis, modice elevatis, interstitiis angustis, tenuissime rugosis alternisque punctis remotis seriatis vage insculptis.

Long. 13, lat. 4^{mm}.

Black with the palpi, antennæ and tarsi reddish ; head smooth, shining, bi-impressed longitudinally above the eyes ; prothorax nearly linear, black, shining, very finely plicate transversely, disk a little raised and grooved in the centre, lateral margins acute and raised ; elytra sub-opaque, shoulders sloping, sides nearly straight, very little convex on the upper part, each with six moderately raised costæ, interstices narrow, finely rugose, outer margins with a series of not very deep punctures, and each alternate interstice with a series of faint, irregular punctures difficult to see ; underside and legs black ; anal margin with two setæ.

Narrower than any other *Hystrichopus ;* the nearest allied form being *H. angusticollis*, Bohem. I have not seen any female example of this species and it may perhaps prove not to be quite so linear in shape.

Transvaal (Rustenburg).

Tribe : GRAPHIPTERIDÆ.

Gen. GRAPHIPTERUS. Latr.

G. MIMUS.

Niger, nitidus pube brunneo-fulvescente vestitus, capite prothoraceque in medio vitta nigra ; elytris sub-quadratis, vitta atra sat lata apiceque sub-acuminata proper suturam posita in singulo ornatis, margine vage albido-marginata.

Long. 10-12, lat. 5½-6^{mm}.

Black, covered with a light-brown or fulvous pubescence, head and prothorax punctured with a black band reaching from the apex of the head to the base of the prothorax ; elytra sub-quadrate, each one with

a moderately broad, black, tomentose band placed at a short distance from the suture and reaching from the base to a little short of the apex where it becomes acuminated, outer margins slightly albo-marginate.

A reproduction of *G. bilineatus*, Boh., although a little less quadrate, but the suture is not white nor is there any trace of a white line bordering the dorsal black bands of the elytra. Varies also in colour from earthy-brown to light-cinnamon.

Cape Colony (Kimberley), Transvaal (Potchefstroom, Klerksdorp).

G. EGREGIUS.

Niger, flavo pubescens, capite magno, medio late denudato; prothorace lato, angulis anticis valde productis acutisque, vitta mediana angusta, nigra; elytris sub-ovalibus, sutura antice, fascia arcuata communi in medio arcuque apicali nigris ornatis.

Long. 17-18, lat. 8-9^{mm}.

Black, covered with a dense yellowish pubescence. Head very large, punctured with a broad denuded space in the centre; prothorax very broad, short with the anterior angles very acute, and with a black narrow band in the centre; elytra sub-ovate, densely pubescent with a black crescent-shaped dorsal patch, a small triangular one at the apex of each elytron, connected by a broad sutural band which does not reach the apex.

Allied to *G. ancora*, Dej., but the dorsal fascia instead of being straight is slanting and forms in conjunction with the suture a broad crescent with the horns directed towards the base. The apical fasciæ are shaped exactly like in *G. ancora*, and the median black band of the prothorax is much narrower.

An intermediate form between *ancora* and *Westwoodi*. In the three exampies which I have examined, the pubescence of the prothorax is of deeper yellow than that of the elytra.

Transvaal (Rustenburg), Zambeze, ? Limpopo.

G. ZAMBEZIANUS.

Niger, pube ochracea dense vestitus, capite prothoraceque in medio atro-vittatis; elytris sub-quadratis, sutura plagaque communi, triangula, parva, post medium posita nigris.

Long. 13, lat. 6^{mm}.

Shape of *G. cordiger* but the elytra are slightly more quadrate and the colouring of the tomentum is deeper ochraceous. Head with a

black band (denuded) in the centre, antennæ black with the three basal articulations red ; prothorax cordiform, with a broad black median band, the sides of the disk and very tomentose ; elytra with a broad black sutural band reaching from the base to past the middle, where it merges into a triangular black patch, only twice as broad as the sutural band ; the point of the triangular patch stops a little short of the apex.

Easily differentiated from *G. cordiger*, Dej., and *G. hamatus*, Boh. by the shape and size of the dorsal black patch of the elytra.

Captured by Mr. F. C. Selous, near the Zambeze River.

G. FRATERNUS.

Niger, supra ochraceo-pubescens, antennarum basi pedibusque rufis ; capite prothoraceque in medio vittatis ; elytris quadratis, vitta dorsali nigra, lata, ad basim incisa alteraque angustiore prope marginem posita in singulo ornatis.

Long. 13, lat. 6^{mm}.

Black, covered on the upper part with an ochraceous pubescence, the three basal joints of the antennæ, the tibiæ and sometimes the femora, dull-red ; head and prothorax with a black band in the centre, the latter short, broad ; elytra quadrate, with a broad, black, dorsal band reaching from base to apex, but divided in two near the base by a narrow ochraceous line, and with another narrow band placed between the first and the outer margin.

The shape and colouring are those of *G. plagiatus*, Boh., but whereas in *plagiatus* there is only one dorsal band on each side of the elytra incised at the base as in the present species, but broader, there are two distinct ones in *fraternus*.

Transvaal (? Barberton).

Tribe : ANTHIADÆ.

Gen. POLYHIRMA. Chaud.

P. CHAUDOIRI.

Oblonga, glabra, nigra, nitida, capite magno, profonde, bi-impresso ; prothorace cordiformi utrinque sub-gibboso ; elytris depressis, post

humeros sub-ampliatis, postice parum attenuatis, a basi ultra medium in singulo acute quinque costatis, sutura elevata interstitiisque profunde alveolatis.

Long. 35, lat. 7 mm.

Black, shining, hairless. Head as in all the species of this genus, broad and deeply impressed on either side ; prothorax very cordiform deeply grooved in the centre with the disk sub-gibbose on each side, limited near the posterior margin with a smaller groove, and also with a slight crescent shaped line in front ; elytra depressed and rounded at the shoulders, elongated, and ampliated from the shoulders to the middle, from there very little attenuated towards the apex, suture raised, and each elytron with five acute costæ (the sutural one the longest of all) which do not reach further than a little past the middle of the disk, and with the hind part of the wing covers quite smooth, the outer-margin has a duplicate series of punctures and the intervals between the costæ are broadly and deeply alveolated.

This species is very closely allied to *P. Fritschii*, Chaud., and differs from it by having five costæ instead of six on each elytron ; the intervals between the costæ are much broader and deeper, and while in *P. Fritschii*, the costæ show, although nearly obsolete, right to the apex, they have disappeared altogether in *P. Chaudoiri*, leaving a smooth and shining space from past the middle to the apex. The only specimen I possess, a female, has no trace—although not defaced—of the fulvous hairs which cover the hind part of the prothorax and the scutellum of *P. Fritschii*.

Transvaal (Rustenburg).

P. RUTATA.

Elongata, modice convexa, nigra, parum nitida, vitta pubescente sat lata a vertice capitis usque ad medium elytrorum ducta maculaque communi triangula, postica, albida vel pallido-silacea ornata ; elytris utrinque 7-costatis, costis acutis, interstitiis sub-angustis profundeque foveatis.

Long. 21-24, lat. 7-8½ mm.

Black, somewhat shining with a white, sometimes pale-yellow, pubescent band beginning at the vertex of the head, covering the centre of the prothorax, the scutellum and the suture to a little short of the middle of the elytra, and a triangular greyish patch at the apex ; prothorax ovate, elongated—more cordiform in the female ;

elytra moderately convex, more so in the female than in the male, with the suture raised and seven acute costæ on each elytron, with the interstices somewhat narrow and deeply foveate, outer margin bi-punctate and very slightly pubescent.

Very closely allied to *P. suturella*, Chaud., but the white sutural band does not reach the apex of the elytra.

Zambeze, Transvaal ?

Gen. CYPHOLOBA. Chaud.

C. AMATONGA.

Mas. Elongata, nigra, parum convexa, prothorace oblongo, supra deplanato lateribusque ampliatis; elytris nitidis, in singulo quinque costatis, costis apice sub-obliteratis, interstitiis alveolatis, in fundo brunneo-pubescentibus, parte postica margineque laterali vage pilosis.

Femina: a mare differt prothorace magis elongato lateribus sub-attenuatis, elytris a medio ad apicem ampliatis supraque convexioribus.

Long. 17-18, lat. 9^{mm}.

Male: Black, shining, head deeply impressed on both sides, prothorax punctured, cordiform, with the outer sides ampliated in the male, elongated and more deeply and broadly grooved in the centre on the female; elytra with the suture raised, and each with five acute ridges reaching short of the apex, interstices broadly and deeply alveolated and filled with a brown pubescence, apical part and outer margin very slightly pubescent.

Female: Elytra more ampliated from the middle and more convex than in the male.

Closely allied to *Polyhirma macilenta*, Oliv. and *Cypholoba Planti* Chaud. From the first it differs mostly in size and in the shape of the prothorax of the male, the sides of which are more amplified, and by the disposition of the alveolae which are broader; from *C. Planti* it differs also by the shape of the prothorax which in the male is much less elongated and more cordiform—(the difference between the males of both species is very striking)—and by the convexity of the elytra of the female which in *Planti* are almost plane.

Amatongaland, Delagoa Bay.

Tribe: MORIONIDÆ.

Gen. STEREOSTOMA. Murr.

S. MERIDIONALIS

Niger, nitidus; capite utrinque longitudinaliter canaliculato, prothorace transverso, in medio canaliculato utrinque postice profunde impresso; elytris elongatis, fere parallelis, convexis, profunde striatis, interstitiis sub-rotundatis.

Long. 23, lat. $8\frac{1}{2}$mm.

Black, shining, head punctulated and with two lateral long impressions; antennæ, with the exception of the three basal joints briefly pubescent; prothorax transverse with the sides marginated, little convex, with a median narrow groove broadening as it reaches the base, and a broad, deep impression on each side, near the base; elytra broader than the prothorax, elongated, nearly parallel, rounded behind, convex, deeply striated with a narrow line in the striæ and with the intervals moderately convex; legs setulose, anterior tibiæ slightly, intermediate and hind ones strongly serrated outwardly.

Transvaal (Rustenburg).

Tribe: CHLÆNIDÆ.

Gen. CHLÆNIUS. Bonelli.

C. VERECUNDUS.

Supra niger, sub-nitidus, pubescens, subtus æneus glaber; capite prothoraceque viridi-æneis, labro, palpis, antennis pedibusque rufis; elytris deplanatis, elongatis, postice leviter ampliatis, sub-costatis, costis rugosis; plaga rotundata post medium posita maculaque apicali sub-triangula flavo-testaceis in singulo ornatis.

Long. 12, lat. 5mm.

Head coppery green, shining, closely and finely punctured; labrum, palpi and antennæ reddish; prothorax very rugose with the sides rounded, as long as broad, plane, grooved in the centre and deeply impressed on each side from the base to a little past the middle; elytra plane, elongated, slightly ampliated past the middle and rounded at the apex, pubescent, sub-costate with the costæ finely rugose, each with a more or less rounded yellowish patch placed past the middle

on the 5th, 6th and 7th costæ, and with a small triangular patch of the same hue on the suture, first and second costæ, close to the apex ; that pateh forms an apical triangular plaga extending really on both elytra ; in some specimens the apical part of the outer margin is also yellowish ; underside coppery-blue, legs reddish.

I know of no *Chlænius* which this species is closely connected ; it comes in the vicinity of *C. fulvicollis*, Ch., the facies and size being alike ; the postical sub-triangular patch is very much like that of *C. vitticollis*, Boh., but it is far removed from that species in other characters and markings.

Natal (Maritzburg).

Family : HYDROPHILIDÆ.

Tribe : HELOPHORIDÆ.

Gen. Hydrochrus. Leach.

H. capensis.

Ænescens sub-nitidus, elytris brunneis, alte costatis interstitiis profunde punctatis, antennis palpis pedibusque rufescentibus.

Long. 3-3½, lat. 1mm.

Head and prothorax with a bronzy tinge, moderately shining and very briefly pubescent ; head very broadly punctured, palpi and antennæ rufescent ; prothorax with the disk much raised and deeply grooved in the centre ; elytra a little broader than the prothorax at the base, very briefly pubescent, of a semi-metallic light brown colour, and each one with three conspicuous costæ with the intervals deeply and regularly punctured ; legs and tibiæ rufescent.

Cape Colony (Stellenbosch, Hex River).

Eccoptometopus. a new gen.

Near *Ochthebius.*

Labial palpi very short, maxillary ones long, the apical joint fusiform and a little longer than the second ; labrum very long, broadly and deeply incised in front ; epistome separated from the head by a deep impression ; eyes large, convex, faceted ; antennæ with nine joints ; the basal one arcuated, moderately long ; the second, pyriform, shorter than the first, the third arcuated and longer than the first two ; the fourth, fifth and sixth, short, equal ; seventh and eighth short (the eighth one shorter than the seventh,) and fitting closely

against the ninth which is ovate, and the three forming the club ; prothorax sub-transversal, convex narrowed behind ; elytra elongated, moderately convex, with the sides nearly straight in the male, a little ampliated past the shoulder in the female and singly rounded at the apex ; legs of *Ochthebius*.

Differentiated from *Ochthebius* by the shape of the antennæ.* It is very probable, judging from the description only, that *O. megacephalus*, Boh., will have to be included in this genus.

H. SCULPTICOLLIS.

Nigro æneus, sub-nitidus, prothorace in medio late canaliculato, utrinque bi-foveato ; elytris pone humeros sub-ampliatis, in medio utrinque impressis, costulatis, interstitiis profunde punctatis, pedibus rufis, geniculis infuscatis.

Long. 3½-3, lat. 1½mm.

Black with a bronze tinge, moderately shining, basal articulation of the antennæ pale-yellow, palpi black ; labrum long and broadly incised in the middle, head rugose and bi-impressed ; prothorax constricted in the posterior part, with the anterior angles rounded, rugose broadly grooved in the centre, from the apex to the base, the groove broader in the middle, and with two lateral impressions on each side ; elytra broader than the prothorax, ampliated below the shoulders, little attenuated behind where they are separately rounded, not much convex, and with a small median depression on each side of the suture, costulated, with the interstices deeply punctured ; underside black, shining ; legs reddish with knees black.

Cape Colony (Cape Town, Table Mountain).

E. NITENS.

Viridi-æneus, nitidus, prothorace in medio canaliculato utrinque ad basim leviter impresso ; elytris pone humeros sub-ampliatis, convexis postice singulatim rotundatis, costulatis, interstitiis punctatis, femoribus rufoæneis, tibiis rufescentibus.

Long. 2½, lat. 1½mm.

Greenish bronze, shining ; head punctulated, basal articulation of antennæ pale-yellow, palpi black, labrum long and broadly incised in the centre, a broad impression above the epistome ; prothorax with the outer sides slightly ampliated, more narrow at the base than at the

* The seventh, eighth and ninth joints seem at first sight to be one, and a high magnifying power is required to detect the divisions.

apex, the disk raised and with a median, shallow groove, reaching neither base nor apex, and a faint impression on each side of the basal part of the groove ; elytra with the sides nearly straight in the male, a little ampliated below the shoulders in the female, little attenuated behind, where they are separately rounded, convex and costulated with the interstices broadly punctured ; femora bronze-red, tibiæ and tarsi reddish.

Differs from *E. sculpticollis*, in the sculpturing of the head and prothorax, the median groove of which does not reach from base to apex ; there is only one smooth impression on each side of the disk, while in *sculpticollis* there are two on each side with walls very acute, and lastly the elytra have no dorsal impression.

Cape Colony (Cape Town).

E. PROXIMUS.

Nigro-æneus, nitidus, palpis nigris, antennis flavescentibus ; capite postice bi-impresso ; prothorace brevi, lateribus in medio leviter ampliatis, disco obsolete canaliculato ; elytris convexis, sub-costulatis, interstitiis punctulatis, in medium disci obsolete impressis ; tarsis pedibusque rufescentibus.

Long. 2½-3, lat. 1-1¼mm.

Bronze black with a faint blueish tinge, shining, antennæ, pale-yellow, palpi black ; labrum long and broadly incised in the centre, a broad circular impression above the epistome ; prothorax very convex, with a very faint median groove, the lateral sides slightly ampliated in the middle ; elytra convex, elongated, singly rounded behind, convex, with a very faint depression extending on each side of the suture at about the median part of the disk, sub-costated, with the interstices not deeply punctured ; legs and tarsi reddish.

Allied to the preceding species ; the prothorax is still more smooth and the median groove is nearly obsolete ; the elytra are not quite so deeply punctured in the interstices.

Cape Colony.

Gen. HYDRÆNA. Kugel.

H. CAPICOLA.

Viridi-ænea, brevissime tomentosa, antennis, palpis pedibusque flavis, elytris valde convexis, punctulato-rugosis, margine posticali pallide fulva.

Long. 2, lat. 1¼mm.

Greenish-bronze, moderately shining and very briefly tomentose, palpi and antennæ pale-yellow, the five apical joints of the latter covered with a greyish pubescence, head nearly smooth, prothorax convex, faintly impressed laterally, much broader anteriorly than at the base ; elytra convex, dehiscent behind, dark metallic green with the postical part pale-yellow, legs pale-yellow. The breadth of this postical patch varies, being sometimes limited to a broad marginal band, or again invading the whole of the dehiscent postical part and ascending diagonally to about the middle of the length of the elytra.

Found in a small pool of sea-water.

Cape Colony (Cape Town).

H. EXTREMA.

Viridi ænea, elytris elongatis, convexis, pallido testaceis, distincte punctato-striatis, interstitiis levibus, pedibus testaceis.

Long. 2, lat. $1\frac{1}{4}$mm.

Greenish-bronze, little shining ; head finely punctulated, palpi pale-yellow with the exception of the apical joint which is slightly infuscated, antennæ of the same colour with the four apical joints pubescent, grey ; prothorax convex, short, much broader anteriorly than at the base, faintly punctured ; elytra elongated, convex, slightly ampliated past the middle, of a light testaceous colour, briefly pubescent, and regularly and distinctly punctato-striated with the interstices smooth ; legs and tarsi testaceous, but of a darker hue than the elytra.

Cape Colony (Cape Town, Hex River).

Tribe : SPHERCHEIDÆ.

Gen. SPHERCHEUS. Illig.

S. CAPICOLA.

Pallido-flavus, nitidus, capite prothoraceque breviter pubescentibus, punctulatis, illo clypeo recurvo, in medio inciso ; elytris brunneo-tessellatis, ovatis, convexissimis, in singulo quadi-costatis, interstitiis profunde punctatis, subtus infuscatus, pedibus testaceis.

Long. 4, lat. 3mm.

Pale-flavous shining ; head and prothorax briefly pubescent, punctulated, the former with the clypeus recurved, and broadly incised anteriorly ; elytra very convex, nearly transparent, tessellated with

deeper brown, each one with fair briefly setulose costæ, the third one, near the outer margin not very well defined, the interstices very deeply and closely punctured ; underside infuscated, legs yellowish-red.

Smaller and shorter than *S. sulcatus*, Gory, with the costæ of the elytra not so much raised.

Cape Colony (neighbourhood of Cape Town).

S. ALGOENSIS.

Fulvus, sub-nitidus, prothoracis lateribus, elytrisque flavo-testaceis, his quadi-costatis, in dorso nigro maculatis.

Long. 4, lat. 3mm.

Fulvous, moderately shining ; head and prothorax punctulated, slightly pubescent, lateral part of the labrum bi-sinuated, broadly incised in front ; prothorax convex, lateral sides testaceous ; elytra yellowish, briefly pubescent, each one with four setulose costæ, the first one, near the suture is the most raised of the three, the fourth one is not much defined, there is besides a few irregularly arranged, small, black spots ; legs and tarsi testaceous red.

As convex as *S. capicola*, but of a deeper colour ; the costæ of the elytra are more raised, and the elytra are not tessellated with brown.

S. capicola and *S. algoensis* are very different from *S. australis* the elytra of which has no alternate raised costæ.

Delagoa Bay.

Family : PAUSSIDÆ.

Gen. Paussus. Linn.

P. FALLAX.

Oblongus, castaneus, breviter pubescens ; fronte cornu brevi armata, antennarum clava ovali, ad apicem constricta acuteque producta, basi longe spinosa, extus canaliculata ; prothorace bi-partito, parte antica carina elevata, postica in medio valde depressa, quadri-tuberculata : elytris profunde punctatis ; femoribus clavatis, tibiis anticis curvatis.

Long. 5, lat. $1\frac{5}{4}$-2mm.

Oblong, chesnut, slightly pubescent ; vertex of the head produced in a short, conical tubercle, slightly directed forward, club of antennæ

ovate, with a long spine at the base, constricted at the tip and ending in a short spine, not deeply grooved externally and the groove hardly crenulated ; prothorax divided in two, the anterior part very much higher than the posterior and produced in a high ridge with a very few short setæ, the posterior one very deeply excavated in the centre and with two tubercles on each side of the excavation ; elytra parallel, of a lighter colour than the head and prothorax, deeply punctured, and briefly pubescent ; femora strongly clavate in the middle, with the anterior tibiæ much curved inwardly.

This species might be taken at first sight for *P. Bohemani*, but the conical process of the head is much shorter ; the shape of the club of the antennæ is the same, but not so sharp nor so long, the groove of the outer part is not so deep, nor is it crenulated ; the prothorax is shaped in the same manner, although the anterior part does not lean so much forward and is thus more vertical behind ; it is also very briefly setulose all over the upper part, while *Bohemani* is covered with long, greyish, erect setæ, and is more hirsute than any other South African species.

Transvaal (Potchefstroom).

Family : SILPHIDÆ.

Gen. CALYPTOMERUS. Redt.

C. CAPENSIS.

Rufo ferrugineus, nitidissimus, pilis albidis brevissimis adspersus, palpis, antennis prothoraceque flavidis.

Long. 1, lat. $\frac{3}{4}$mm.

Rusty red, very shining ; head very broad, semi-circular in front, very briefly pubescent, antennæ and palpi pale-yellow ; prothorax of a lighter colour than the head and elytra, and with a few scattered whitish bristles ; elytra very convex, not broader than the prothorax at the base, a little ampliated at about the middle, very smooth, with very scattered whitish bristles ; legs pale-yellow.

Cape Colony (Cape Town).

Family : PHALACRIDÆ.

Gen. Olibrus. Erichs.

O. consanguineus.

Rufo-ferrugineus, nitidissimus, elytris convexis levibus, pallide flavis, sutura infuscata utrinque obsolete striata, subtus pubescens.

Long. 2, lat. $1\frac{1}{2}$mm.

Light rusty-red, very shining, antennæ with the clava pubescent, head and prothorax smooth, the latter very convex ; elytra almost gibbose, smooth, with a very faint stria on each side of the suture, very pale-yellow, with the suture infuscated, or yellowish-brown, generally with a triangular dark patch round the scutellum ; underside and legs briefly pubescent.

Resembles much *O. corticalis*. Panz.

Cape Colony (Robben Island).

Gen. Lithocrus. Erichs.

L. promontorii.

Viridi æneus, nitidissimus, antennis pedibus corporeque subtus nigris ; elytris convexissimis, levissime punctato-striatis.

Long. $3\frac{1}{2}$-4, lat. 2mm.

Greenish bronze, very shining, antennæ slightly pubescent, black, with the two basal articulations slightly reddish ; prothorax very convex, smooth, elytra almost gibbose, finely striated, with the striæ faintly punctulated, underside black with a slightly greenish tinge and covered with a very short, flavous tomentum.

The first joint of the posterior tarsi is not very long in this species ; the spurs of all the tibiæ are very distinct, and the shape of the antennæ is that of Phalacrus. In general facies and colouring it much resembles *Olibrus capensis*. Guér.

Cape Colony (Cape Town,) Natal (Zululand).

Family : NITIDULIDÆ.

Tribe : RHIZOPHAGIDÆ. Lacord.

Gen. MIMEMA. Wollast.

M. TABULÆ.

Angustum, sub-nitidum ; capite prothoraceque nigris, punctulatis, antennis basi excepta nigris ; elytris flavis, striato punctatis basi apiceque nigris, pedibus flavidis.

Long. 2-2½, lat. ¾-1mm.

Narrow, parallel, not much shining ; head black, strongly impressed on each side in the anterior part, antennæ black with the two basal articulations reddish ; prothorax black, finely punctured, little convex on the disk with the outer sides nearly straight ; elytra parallel, very little convex, distinctly punctato-striated, yellowish, with a basal triangular black patch round the scutellum and also a narrow line edging the base, and a broad apical one ; underside black, legs yellowish.

Closely allied to *M. tricolor.* Woll., but the colour of the antennæ and underside is different, the punctures of the elytra are deeper, and the apical black patch is much more clearly defined.

Cape Colony (Table Mountain, Hex River).

Family : COLYDIDÆ.

Tribe : BOTHRIDERIDÆ.

Gen. BOTHRIDERES. Erichs.

B. CAPICOLA.

Rufo-ferrugineus, nitidus, prothoracis disco longitudinaliter bi-impresso, elytris utrinque quinque costatis, interstitiis bi-fariam punctulatis, sutura elevata.

Long. 3½-4, lat. 1mm.

Reddish, shining, club of antennæ blackish ; prothorax one half broader at the apex than at the base with the outer sides carinated, the anterior angles rounded, the posterior ones very acute, closely

punctured, like the head, and the disk and with two depressions, the anterior one broader and deeper than the posterior; elytra cylindrical with the suture raised and five sharp carinæ on each side, the interstices with a double series of punctures; underside deeply and closely punctured, tibiæ with the outer edge not crenulated.

Found in the galleries of *Crossotarsus Erichsoni.*

Cape Colony (Seymour.)

B. DISTINCTUS.

Niger vel nigro-rufescens, nitidus; prothoracis disco impressione augusta carinulam elongatam includente; elytris utrinque quinque costulatis interstitiis punctulatis, sutura elevata.

Long. 4-4½, lat. 1mm.

Black or reddish black, shining; head punctulated, prothorax narrow, very convex on the upper part, the anterior part not much ampliated, deeply and closely punctured, the median part with a long, narrow impression including a fine ridge in the centre; elytra cylindrical, each with fine carinæ, the two first dorsal ones conspicuous, the other three less distinct, suture raised and interstices with a double series of punctures; underside punctulated, tibiæ not serrated.

Cape Colony (Kowie).

B. SCUTATUS.

Rufus, nitidus, sub-deplanatus; prothoracis disco impressione lata profundaque tuberculum quadratum includente; elytris seriato punctulatis, sutura costisque dorsalibus tribus utrinque elevatis.

Long. 4½-5, lat. 1½mm.

Red, shining; head punctulated; prothorax broader at the apex than at the base, slightly deplanated, closely punctured, having in the centre a very broad, quadrate, deep impression with two small, short carinæ at the apex; this impression contains a semi-quadrate tubercle, shaped somewhat like an armorial shield; elytra sub-deplanated, finely punctato-striated with the suture and three dorsal intervals raised on each side, the other two are very indistinct; underside closely punctured, outer side of tibiæ vaguely crenated.

Transvaal (Potchefstroom).

Mr. T. Ayres has sent me the cocoons of that species which he found fixed against the bark of a tree. It is of a semi-oval shape, seven mm. long, four broad, and three deep.

Family : CRYPTOPHAGIDÆ.

Gen. CRYPTOPHAGUS. Herbst.

C. PLAGIATUS.

Rufo-ferrugineus, pubescens, prothoracis angulis anticis recurvis, elytris pallido fulvis, plaga triangula dorsali communi lateribusque nigris.

Long. $1\frac{1}{2}$, lat. 1^{mm}.

Rusty red, briefly pubescent, antennæ pale-yellow ; head closely punctured ; prothorax convex, deeply and closely punctured, ampliated in the anterior part with the anterior angles much produced outwardly and recurved ; elytra elongated, convex, rounded and dehiscent behind, deeply and closely punctured, and having on each side a black marginal band reaching neither the shoulder nor the apex, and also a triangular dorsal black patch extending on each side of the suture, and the apex of which reaches the scutellum ; legs pale-yellow.

Cape Colony (Stellenbosch).

Family : PARNIDÆ.

Tribe : TRUE PARNIDÆ.

Gen. STRINA. Redt.

S. PROMONTORII.

Nigra, pube brunnea supra vestita ; elytris convexis, sutura costisque quatuor in singulo elevatis, interstitiis bifariam punctatis, subtus dense luteo pilosa, pedibus rufescentibus, geniculis infuscatis.

Long. 4-$4\frac{1}{2}$, lat. $1\frac{3}{4}$-2^{mm}.

Black, densely covered with a dense, short, brown pubescence with a slightly yellowish tinge ; head and prothorax punctulated, the latter convex, deeply grooved on the outer sides and with a post median transverse ridge and a broad, basal depression ; elytra broader than the prothorax, with the outer sides slightly sinuated before the middle, convex, dehiscent behind with the suture raised and four distinct costæ on each elytron, the interstices are somewhat rounded, and have a double series of deep punctures ; legs rufescent with the apical part of the femora and the basal part of the tibiæ infuscated, underside covered with dense golden hairs.

Cape Colony (Cape Town).

Family : HETEROCERIDÆ.

Gen. HETEROCERUS. Fabr.

H. CAPENSIS.

Niger, pube flavescente tectus ; elytris maculis buatuor luteis evanescentibus in singulo notatis.

Long. 5, lat. 2^{mm}.

Black, covered with a yellowish, short pubescence ; palpi and basal articulations of the antennæ pale-yellow ; prothorax convex, attenuated anteriorly, punctured ; elytra oblong, rounded behind, deeply impressed on each side at the base, convex, covered with close punctures hidden by the pubescence, and each one with a small brownish red dot on the shoulder, a patch in the anterior part of the disk, another one at about the median dorsal part, and a fourth one below the third and produced diagonally towards the lateral margin which from below the shoulder to past the middle is also brownish-red ; these patches are very indistinct, and seem to be almost wanting in several examples ; legs black with the knees and apex of tibiæ, and the tarsi, yellowish-red.

Cape Colony (Neighbourhood of Cape Town).

H. MERIDIONALIS.

Niger, brevissime griseo pubescens, elytorum margine maculisque quatuor in singulo flavis

Long. 4, lat. 1$\frac{1}{2}$^{mm}.

Black, covered with a very short, greyish pubeseence ; palpi and basal joints of the antennæ pale-yellow ; prothorax very convex, much attenuated in front, punctulated, elytra oblong, rounded behind, convex, impressed on each side at the base, very closely punctured, marginated with yellow, and having on each side four patches of the same colour : the first one, short, situated at the base, alongside the scutellum, the second, a bisinuated, one, extending from the margin to the centre of the disk, the third one, also strongly bi-sinuated reaches from the margin to the dorsal part, a little past the middle, and the fourth a small oblong, one is situated on the postical part ; the apical part of the margin is broadly yellow ; legs black, with the tarsi yellow.

Approximates much in the colouring of the elytra *H. parallelus.* Kryn.

Cape Colony (Neighbourhood of Cape Town) ; Namaqualand, (Garies).

Family : LAMLLICORNIA.

Tribe : TRICHIDÆ.

Gen. AGENIUS. Serv.

A. ELEGANS.

Mas : Elongatus, niger, prothorace pectoreque longe hirsutis ; elytris flavis vel rubris, late sed haud profunde punctatis, vitta suturali lata a medion apicem attingente marginibusque nigris.

Femina : Toto nigra.

Long. 15-18, lat. 7-9^{mm}.

Elongated, black, clypeus elongated, that of the male more strongly marginated than that of the female ; head and prothorax strongly punctured, the latter with long greyish hairs in the male, hairless in the female ; elytra plane, elongated, broadly but not deeply punctured, yellow, sometimes brick-red, with a broad sutural black band beginning at or near the middle part and reaching the apex and a narrow marginal band of the same colour beginning at the shoulder and widening at the apex ; pectus covered with long greyish hairs ; the female, a little longer than the male, is completely black, and almost hairless.

Closely allied to *A. grandis*, Péring., the description of which was made from a female example. I have, since that time, received other specimens showing slight variations, but they were all females, and it is possible that *A. elegans* may yet prove to be identical with *A. grandis*.

Cape Colony (Namaqualand, Port Nolloth).

Family : BUPRESTIDÆ.

Tribe : CHALCOPHORIDÆ.

Gen. ÆDISTERNA. Lac.

C. NAMAQUA.

Oblonga, supra viridi ænea, sub-nitida ; prothorace ampliato, vage punctulato, in medio haud canaliculato, ad basim bi-punctato ; lateribus depressis, cyaneis, rugose foveatis, foveis auratis, elytris

modice convexis, leviter punctato-striatis ; subtus nitida, breviter pilosa viridi-cyanea, profunde foveata foveis aureo micantibus, lateribus prothoracis abdominisque dense ochraceo-pubescentibus.

Long. 31, lat. 15mm.

Oblong, brassy green, moderately shining on the upper part, with the lateral sides of the prothorax cyaneous ; head broadly impressed on the vertex, antennæ blueish-black ; prothorax one-third broader than long, irregularly and very slightly punctured, not grooved in the centre but with a very slight, longitudinal depression and two narrow punctures at the base, above she scutellum, outer sides depressed, rounded, roughly foveated with the foveæ golden ; scutellum very short and bi-lobated ; elytra as broad as the prothorax at the base, slightly ampliated from near the shoulders to about one-third of the length, and narrowed from there towards the apex, the outer margin from below the shoulder to about the middle is depressed and has a few, moderately deep foveæ ; the striation is very slight and consists of series of fine punctures with the intervals not raised and more finely punctured than the striæ ; the underside is dark-blue with a greenish tinge, slightly pilose, deeply and irregularly foveated, with the foveæ golden, the sides of the prothorax are clothed with a dense ochraceous pubescence, as are also the sides of the abdominal segments ; legs dark-blue with irregular, deep, golden punctures.

This splendid insect, the underside of which is almost as brilliant as some Madagascar *Polybothris* was captured at O'Kiep, Namaqualand, (Cape Colony.)

O. LIVIDA.

Oblonga, sub-depressa, supra cupreo-ænea sub-nitida ; lateribus prothoracis supra subtusque fulgidis ; elytris punctato-striatis subtus nitida profunda foveata foveis albis pubeque flava dense vestita.

Long. 15-16, lat. 7mm.

Oblong, coppery, not much shining on the upper part ; head very roughly punctured on the vertex ; antennæ brassy ; prothorax nearly twice as broad as long, very little convex, hardly gooved in the centre, and with two narrow deep punctures at the base above the scutellum, vaguely punctured on the disk, with the outer sides rounded from the apex to about the middle, depressed and with a broad, very rugose each aculeated anteriorly and reaching from apex to base, covered with a glowing metallic red tomentum which clothes also the underside where it is more lanuginose : this patch does not invade the

outer margin which is very rugose and has a white pubescence ; the elytra are as broad as the prothorax, slightly ampliated past the shoulder, narrowed past the first third of the length, and from there tapering gradually towards the apex, not much convex, finely striato-punctated with narrow punctures on the intervals ; underside olive-green, very shining, with a thick yellow pubescence on the sides, roughly foveated with the foveæ white and slightly pilose ; legs very rugose.

Allied to the preceding species ; the facies is nearly the same, but the size is constantly smaller, the colouring of the underside is not the same, and the lateral patches of the prothorax are shaped and coloured differently.

Cape Colony (O'Kiep, Namaqualand).

O. MODESTA.

Oblonga, supra ænea, sub-opaca ; prothorace ampliato, in medio late impresso, lateribus deplanatis, scrobiculatis ; elytris modice convexis, sub-costulatis, interstitiis punctatis, subtus nitida, nigro-cyanea, rugose punctata, punctis aureis, lateribus albido pubescentibus.

Long. 29, lat. 12^{mm}.

Bronze, sub-opaque on the upper part, head very rugose, excavated in the centre, antennæ dark-blue ; prothorax ampliated, with the outer sides much depressed, scrobiculated blueish-green and with a white tomentum, the disk with a broad, median, longitudinal line, a few scattered punctures and two deep foveæ at the base above the scutellum ; elytra slightly broader than the prothorax at the base, sinuated below the humeral angles, gradually tapering towards the apex where the suture ends in two broad blunt spines, moderately convex, and having on each side, three hardly distinct costæ, the outer one of which is the most pronounced, and the interstices with a double series of well-defined punctures ; underside and legs dark-blue with deep and irregular golden punctures and foveæ, underside of prothorax and pectus and lateral parts of the abdominal segments clothed with a white pubescence.

Cape Colony (Ladysmith).

O. LIMBATA.

Elongata, supra obscure-ænea, sub-nitida ; prothorace antice breviter rotundato, sub-plano, disco in medio vage canaliculato, concinne punctulato lateribus late deplanatis, scrobiculatis, albido-

pubescentibus ; elytris levibus, a basi ultra medium fere rectis, deinde ad apicem acuminatis, leviter punctulato-striatis, marginibus albo limbatis ; subtus dense flavo-pubescente, in medio denudata, ignea, abdomine utrinque punctis quatuor parvis denudatis, seriatis.

Long. 22, lat. 9mm.

Elongated, brassy, moderately shining on the upper part ; head very rugose with a distinct median ridge on the vertex ; prothorax with the anterior part rounded, disk irregularly punctured, faintly depressed longitudinally and with two narrow punctures at the base, the lateral sides are very much depressed, a little less broad on each side than the discoidal part, strongly scrobiculated, covered with a white tomentum, and with a very small, denuded, irregular dot on each side of the disk, in a line with the eyes ; elytra not much shining, a little broader than the prothorax, with a small, elongated protuberance at the shoulder, nearly straight from there to a little past the middle, from which point they are acuminated towards the apex, not much convex, and very finely and not deeply punctured, the punctures very close and forming regular series with the intervals less vaguely punctured ; underside roughly and irregularly foveated, median part denuded, glowing metallic red, the remainder covered with a dense yellow pubescence, first four abdominal segments with a small denuded dot on each side ; legs fiery, metallic red, deeply punctured, with the punctures filled with a white tomentum.

From O'Kiep, Namaqualand.

Gen. CHALCOPHORA. (CHALCOPLIA). Sol.

C. PATRICIA.

Elongata, supra obscure cuprea ; prothorace in medio sub-canaliculato, ad basim foveato, lateribus deplanatis, rugose foveatis, aureo-pubescentibus maculaque denudata antica, nigra ; elytris sub-parallelis humeris sub-elevatis, vage punctulatis margine laterali punctis viridi-micantibus seriatis ; subtus rugose-foveata, lanuginosa, ignea.

Long. 20, lat. 8mm.

Elongated, of a dark coppery tinge on the upper part ; head rugose with three distinctly raised, sinuated lines on the vertex ; antennæ metallic blue-black ; prothorax with the sides very rounded, disk plane with a median punctulated longitudinal depression, a fovea at

the base above the scutellum, two longitudinal series of punctures on each side of the median depression and a few scattered punctures, the outer sides are much depressed with the outer margin deeply foveated, and have on the upper as well as on the under part a broad oblong patch covered with a golden pubescence; this patch is granulose and has in the anterior part an elongated, denuded spot, which is sometimes bifid; elytra nearly straight from the base to past the middle, aculeated from there towards the apex, very little convex with the shoulders slightly callose, somewhat roughly punctured near the base, and finely punctured from there without any distinct striation, but having on the outer margin a series of moderately large, shining, green foveæ; underside, glowing, metallic red, very roughly foveated, and with long, thin, pale hairs; legs dark-blue above with the under part of the femora igneous.

From O'Kiep, Namaqualand.

C. CONFUSA.

Viridi-ænea, nitida, capite prothoraceque rugosis, hoc sub-convexo, lateribus antice valde rotundatis, in medio haud canaliculato, ad basim impresso: elytris elongatis, post medium acuminatis, rugosis, striatis, interstitiis plagis quadratis, levibus seriatis; subtus, nitida, pubescens.

Long. 23, lat. 9^{mm}.

Coppery-green on the upper part, shining, with a golden tinge on the head and prothorax; the former very rugose, the later convex, broad, very much rounded laterally in the anterior part with the outer sides not much depressed, scrobiculated, roughly punctured on the disk, with no median groove but with a faint impression and also a small fovea above the scutellum; elytra nearly as broad as the prothorax at the base, almost parallel to past the middle, and tapering from that point to the apex, strongly striated with the intervals rugose and having some quadrate, smooth, raised, shining spots arranged in regular series from the base to about the median part, but more irregular from that point to the apex; underside and legs very shiny and rugose.

Allied to *C. Lalandei*, C. and G., but broader; the prothorax is more convex, the outer sides are not so much depressed, and the sculpture of the elytra is very dissimilar.

From ? Damaraland.

Tribe : TRUE BUPRESTIDÆ.

Gen. Acmæodera. Eschsch.

A. zambeziana.

Oblonga, sub-deplanata, nigro-ænea, parce pubescens; elytris cærulis, in singulo quadri-costatis, interstitiis bifariam rugoso-punctatis, maculisque decem flavidis notatis.

Long. 16, lat. 5mm.

Shape and size of *A. caffra*, Thumb., which it much resembles; the sculpture of the elytra, and also the markings are different.

Head, prothorax, antennæ, underside and legs brassy-black; head very pilose, prothorax broader than long, much attenuated on the anterior part, little convex, slightly pubescent, and deeply grooved longitudinally; elytra narrower than the prothorax, long, nearly parallel from the base to a short distance from the apex, depressed, strongly serrated behind, with the suture raised, and four very conspicuous costæ on each elytron having two regular rows of punctures in each interval; they are cæruleous blue, and have on each side ten yellowish maculæ arranged as follows: 3 extending between the suture and the third interval (the first at about the median part, the second past the middle, and the third one at the apex), 1 (a small one) on the third interval at about the middle, 2 on the fourth interval, and 4 on the interval above the margin (the fourth macula above the apical serration.)

From Middle Limpopo (Fort Tuli).

Family : TENEBRIONIDÆ.

Tribe : ADESMIIDÆ.

Gen. Adesmiia. Fisch.

A. (onymachris) agilis.

Nigra, sub-nitida, fronte impressa, vertice sub-canaliculato; prothorace fere levi, antice valde exciso; elytris ovalibus, modice convexis in medio ampliatis, postice aculeatis, sutura costisque sex in singulo elevatis, costis alternis distinctioribus, interstitiis rugosis; epipleuris punctulatis pedibus elongatis, rugosis.

Long. 14, lat. 9mm.

Black, moderately shining ; head punctulated with a median broad impression and a fine groove from the vertex to the centre, ocular ridges much raised, prothorax thickly fringed with yellowish hairs in front, very vaguely punctured, shining, the anterior angles projecting very much, not very convex, and distinctly marginated in front and laterally ; elytra ovate not very convex, ampliated in the middle, aculeated behind with the suture and six raised rugose lines on each side, the 2nd, 4th, 6th, raised lines from the suture much more raised, intervals very rugose, roughly foveated ; epipleuræ punctulated, legs very long, and very rugose.

Probably allied to *A. multistriata.* Haag., and not unlike in shape *A. boschimana.* Péring., but smaller and with elytra much ampliated in the middle.

From Kalahari Desert.

Gen. STENOCARA. Solier.

S. INTERMEDIA.

Nigra, sub-nitida, capite prothoraceque punctulatis, elytris ovalibus, supra depressis, postice declivis, singulo costis sub-elevatis vage serratis tribus, interstitiis sub-foveatis ; pedibus antennis tibiisque rufescentibus, femoribus posticis brevibus, incrassatis.

Long. 6-10, lat. 6-7^{mm}.

Black, moderately shining, with the antennæ, tibiæ and tarsi slightly reddish ; head finely and closely punctured, prothorax convex, attenuated anteriorly, with the angles not much produced, irregularly covered with broad punctures ; elytra ovate, depressed on the upper part, a little ampliated at about the middle and very dehiscent posteriorly ; they have each three dorsal costæ very vaguely serrated, uniting at the apex of the declivity, the outer margin is crenulated, the suture raised and the intervals very slightly and not deeply foveated in the discoidal part, with a tendency to become granulose on the postical declivity ; epipleuræ narrow and broadly punctured, legs short with the hind femora very thick and almost club shaped.

Closely allied to *S. ruficornis.* Sol. ; the costæ of the elytra are more smooth, and the intervals are not so rugose nor are they granulose on the disk.

Bushmanland and Damaraland.

TRIBE : MOLURIDÆ.

Gen. IDRICUS. Fairm.

T. PACIFICUS.

Ovatus, niger, terrenus ; capite plano, vertice longitudinaliter impresso ; prothorace utrinque dilatato, in disco tuberculo valido munito ; elytris ovatis, convexis, sutura anguste elevata, tuberculisque obtusis, tri-seriatis in singulo instructis.

Long. 10, lat. 6mm.

Black, covered with a brown dust ; head plane with a transverse impression between the point of insertion of the antennæ, and a vertical, triangular depression, closely punctured ; prothorax with the outer sides from the apex to about the middle produced in a blunt triangle with the edges slightly raised, narrowed in the posterior part, plane in the upper part, with a conspicuous tubercle in the centre of the disk ; elytra very convex, ovate, very rugose, with the suture slightly raised and smooth, and with three series on each side of obtuse tubercle, the third series from the suture forming the outer margin, the epipleuræ are very rugose ; underside and legs closely punctured.

Larger than *T. diabolicus*, Fairm.,* and without the two erect spines on the anterior margin of the head, the prothorax is shaped alike, but has only one single tubercle in the disk, instead of four, and the seriated tubercles of the elytra are short and blunt, instead of being long and sharp as in *diabolicus*.

Bechuanaland.

Gen. TRACHYNOTUS. Latr.

T. LIGHTFOOTI.

Oblongus, niger, pilis decumbentibus sericeis tectus ; prothorace transverso, lateribus valde angulatis ; elytris oblongo-ovatis, subdeplanatis, postice acuminatis, disco margineque laterali spinis acutis seriatis in singulo armatis.

Long. 11-13, lat. 4-6mm.

Oblong, black, covered with short decumbent silky greyish hairs, and also with a white tomentum leaving two round denuded spots on each elytron, the postical one the largest of the two ; head punctu-

* Transactions South African Philosophical Society, 1888, p. 199, pl. 3, fig. 3

lated, eyes raised ; prothorax transverse with the onter sides acute hardly convex ; elytra oblongo-ovate, little convex, once and a half as broad in its greatest width as the prothorax, and acuminated behind ; each one has on the disk a row of long, sharp spines slightly directed backwards ; these spines are equi-distant from one another ; the outer margin has also a row of short spines arranged in the same manner and reaching from the shoulder to the apex. Some examples (female) have sometimes traces of an intermediate series of very short spines between the suture and discoidal row. The underside is briefly pilose, the legs very long and slender, the claws and spurs reddish.

Captured near Port Nolloth, Little Namaqualand, by Mr. R. Lightfoot, after whom I propose to name it.

Gen. SEPIDIUM. Fabric.

S. ZAMBEZIANUM.

Nigrum, brunneo tomentosum setisque erectis tectum ; prothoracis lateribus valde acutis, processu apicali bi-calloso ; elytris tuberculis validis setigeris trifariam seriatis in singulo instructis.

Long. 13-16, lat. 5-6$\frac{1}{2}$mm.

Black, covered with a brown tomentum and short rigid bristles ; prothorax with the lateral sides produced in the middle in a long, sharp, triangular spine, disk with three series of long, rigid bristles, much raised and ending at the apex in a large, bifid, bristly tubercle, higher than the disk, and ending abruptly above the head which it does not overhang ; elytra a little broader than the prothorax, nearly parallel, but little convex, and each with three series of much developed setigerous tubercles with the intervals reticulated.

Not unlike *S. senegalense*, Klug., but the apical process of the prothorax is much more raised and strongly bifid at the top ; it is also less convex, and the tubercles are much more developed.

Zambeze River, and between the Limpopo and Zambeze Rivers.

TRIBE : PEDINIDÆ.

Gen. TRIGONOPUS.

T. ARMATICEPS.

Oblongus, niger, sub-nitidus, glaber ; epistome arcuato, in medio exciso dentibusque duobus armato ; prothorace sub-rotundato, supra

deplanato ; elytris elongatis, parallelis, deplanatis leviterque striatis ; tibiis totis apice valde deplanatis mediis posticisque externe acute dentatis.

Long. 15-19, lat. 7-8½mm.

Black, moderately shining, hairless ; head punctulated with a deep transverse impression, epistome arcuated, incised in the centre with two sharp short spines on each side of the dent ; prothorax with the sides rounded and the anterior half broader than the posterior, finely punctured, depressed ; elytra less broad than the prothorax, nearly parallel, rounded behind, depressed and finely striated ; anterior tibiæ broadly dilated at the apex, and with an obtuse tooth inwardly, the intermediate and posterior acutely rugose, dilated at the apex with a sharp tooth outside and a blunt one inside, the posterior ones are also sub-falcate.

A very distinct species.

Damaraland (Walfish Bay), and Kalahari Desert.

Tribe : MEGACANTHIDÆ.

Gen. Hoplonyx. J. Thoms.

H. vicinus.

Oblongus, niger, sub-nitidus, capite vertice angusto, punctulato ; prothorace brevi, lato, sub-deplanato, tenuissime punctulato ; elytris modice convexis, elongatis, postice rotundato-acuminatis, striato-punctulatis ; femoribus anticis apice dente valido armatis.

Long. 13, lat. 7mm.

Oblong, black, moderately shining ; head with the ante-ocular ridges not much developed, eyes separated only by a small line, vertex triangular and narrow ; prothorax short, broad, little convex, very faintly punctured ; elytra broader than the prothorax, parallel, rounded and a little acuminated behind, moderately convex, striated, with the striæ closely punctured and the intervals smooth ; antennæ and tarsi slightly pubescent.

Closely allied to *H. ingratus*, Pér. ; differs in the sculpturing of the head ; the eyes are much nearer to one another and the vertical space is short and triangular ; the ante-ocular ridges are not so developed, and the thorax and the elytra are broader.

Transvaal (Rustenburg).

Tribe : PYCNOCERIDÆ.

Gen. Catamerus. Fairm.

C. transvaalensis.

Niger, nitidus, capite profunde punctato verticeque impresso ; prothorace globoso, punctulato, marginato margine laterali utrinque vage serrata ; elytris elongato-ovatis ; convexis, profunde seriato-punctatis, interstitiis convexis ; femoribus anticis apice acute dentatis.

Long. 20, lat. 10mm.

Black, shining, head and epistome deeply punctured, the former with a deep median impression ; prothorax globose, finely but not deeply punctured, marginated all round, the lateral margins with a faint serration ; elytra broader than the prothorax, ovate, elongated convex, slightly dehiscent behind, deeply punctato-striated, with the intervals rounded ; underside punctato-plicate, smooth ; anterior, femora with a strong apical inner tooth.

Differs only in colouring from *C. Revoilii*, Fairm. ; is, however, smaller.

Transvaal (Leydenburg).

Family : MELOIDÆ.

Tribe : CANTHARIDÆ.

Gen. Lytta. Fabric.

L. carneola.

Oblonga, atra, pilis decumbentibus cinereis vestita ; capite, prothoracis disco, elytris, pedibus femorum basi excepta segmentisque abdominis duobus ultimis rufis.

Long. 13-14, lat. 4mm.

Head pilose, reddish, narrower than the prothorax, deflexed, faintly depressed on the vertex, with a circular groove above the epistome ; prothorax convex, a little longer than broad, slightly rugose, depressed in the centre, pilose black with the upper part reddish ; scutellum very tomentose, black ; elytra reddish ; three times as long as the prothorax and slightly broader, convex, rounded at the apex, covered with closely set greyish decumbent hairs ; antennæ, palpi, base of the femora, tarsi, and the four basal segments of the abdomen black and tomentose.

Shape of *L. velata*, Gerst., and *L. jucunda*, Péring: this pretty species is however very distinct.

Ten Miles from Port Nolloth, Little Namaqualand. Captured by Mr. R. M. Lightfoot.

L. AMOENA.

Elongata, viridis, sub-nitide, pubescens; elytris rufo- flavescentibus, cinereo-pilosis.

Long. 9-10, lat. 2-2½mm.

Green, moderately shining and covered with an ashy-grey villosity; antennæ, epistome, mandibles and palpi black; elytra yellowish-red and very tomentose; head and prothorax finely punctured, the latter with a faint depression on the median posterior part of the disk; scutellum rounded at the apex, green villose; elytra elongated, rounded at the apex, slightly convex, rugose and covered with a short light ashy-grey pubescence; underside and legs green, and pubescent.

A very distinct species which cannot be compared to any other South African *Lytta*.

Captured by Mr. R. M. Lightfoot 16 miles from Port Nolloth, Little Namaqualand.

Gen. ZONITIS. Fabr.

Z. PULCHELLA.

Pallide flava, oblonga, antennis articulo primo excepto, palpis, femorum apice, tibiis tarsisque nigris; elytrorum basi margineque apicali anguste coccineis.

Long. 13, lat. 4mm.

Pale-yellow, oblong, palpi, antennæ with the exception of the first articulation, apex of the femora, tibiæ and tarsi black, pubescent; head and prothorax closely punctured and finely pubescent; elytra elongated, briefly pubescent, closely punctured, with two fine raised lines on each, very pale-yellow turning to yellowish-white, and with a narrow basal transverse band and an apical one of a scarlet colour; underside pale-red.

Natal (D'Urban).

Z. PROXIMA.

Oblonga, obscure viridi ænea, subtus nigrescens sub-nitida, pro-

thorace flavo testaceo ; elytris ruguloso punctatis. antennis pedibusque sub-rufescentibus.

Long. 6-8, lat. $\frac{1}{2}$-$2\frac{1}{2}$mm.

Head very dark-green, closely punctured, nearly hairless, palpi and antennæ sub-rufescent ; prothorax convex, yellowish-red, hardly longer than broad, attenuated posteriorly, faintly impressed longitudinally in the centre ; elytra elongated, rounded behind, slightly shagreened, covered with a fine greyish villosity without any trace of raised lines underside almost black, briefly tomentose, legs sub-rufescent.

Allied to *Z. viridipennis*, Fabr. and *Z. ruficeps*, Péring., the colour of the elytra is much darker-green, and the last three abdominal segments are black instead of yellowish as in *viridipennis*, the colour of the head differentiates it from *ruficeps*.

Transvaal (Leydenburg) and Zululand (Eshowe).

Family : CURCULIONIDÆ.

Tribe : TANYMECIDÆ.

Enicoderus, new. gen. near *Siderodactylus*.

Head short, moderately convex, eyes round, rostrum a little narrower than the head at the base and longer, expanding at the apex (in a broad triangle in the male) and with five carinæ in the upper part ; antennæ of *Siderodactylus* with the club very acuminated and the scapus hardly reaching the eyes ; prothorax ovate, very convex ; elytra elongated, not broader than the prothorax at the base, those of the male nearly linear, the female's slightly ampliated ; tibiæ crenulated inwardly, the anterior ones falcate, tarsi long.

E. thoracicus. spec. nov.

Elongatus, niger, indumento brunneo squamisque albidis adspersis vestitus ; rostro in mare ad apicem valde dilatato, supra 5 carinato ; prothorace rotundato, disco in gibbis duabus, granulatis fasciculosisque producto ; elytris elongatis, ovatis, late seriato-punctatis, squamis albidis densioribus balteatis ; tibiis totis valde crenatis, pedibus setulosis.

Long. 10,11 lat. $2\frac{1}{2}$-3mm.

Elongated, black, covered with a dark-brown indumentum and with some scattered silvery-white scales ; rostrum of the male triangularly

dilated at the apex with the sides raised, that of the female much less dilated, and with five carinæ, one median and two flexuose on each side ; prothorax nearly twice as broad as the head, round, strongly granulated, and produced on the disk in two very high diverging protuberances fasciculated with white hairs at the tip ; in the female those protuberances are not so much raised, but they are also fasciculated ; elytra elongated, not broader than the prothorax, nearly linear in the male, a little ampliated in the female, convex, deeply striato-punctate with a few rigid short hairs alongside the suture, and having a supra marginal band of dense silvery-white scales ; the suture is also squamose ; the tibiæ are strongly crenated and the legs setulose.

Little Namaqualand (O'okiep).

TIMUS. new gen.

Head small, rounded, rostrum not broader than the head, straight and a little longer, antennæ moderately short with the scapus not reaching the eyes, the articulations closely set, the club oblongo-ovate and very acuminated ; eyes ovate, slightly prominent and with a small orbital ridge ; prothorax globose with the sides ampliated in the middle ; elytra elongated, convex, nearly parallel in the male, tibiæ dented inwardly.

Allied to *Enicoderus*, but differentiated by the shape of the antennæ, the articulations of which are shorter and less slender.

T. SIMPLEX.

Niger, squamis griseis dense tectus ; capite rostroque breviter setosis prothorace gibboso, supra deplanato, rugose granulato, in medio canaliculato lateribusque ampliatis ; elytris prothorace angustioribus, subcylindricis, postice angustatis, profunde seriato-punctatis, lateribus squamis densioribus albidis sub-balteatus ; pedibus setulosis.

Long. 9, lat. 2^{mm}.

Black, densely covered with greyish scales ; rostrum and head with short, rigid bristles ; prothorax with the sides much ampliated and the disk raised, moderately plane on the gibbosity, very strongly granulated and with a narrow median groove ; elytra narrower than the prothorax, sub-cylindrical, narrowed apically, deeply striato-punctate and with a lateral band, more or less defined, of whiter and denser scales ; legs and tarsi setulose, all the tibiæ serrated inwardly.

Cape Colony (Van Wyk's Vley), Namaqualand (O'okiep).

T. PLANICEPS.

Niger, elongatus, squamis griseis albidis tectus; rostro capite longiore, antice leviter angustato, in medio sub-carinulato, capite plano, palpebris sub-elevatis; prothorace sub-globoso, antice transversim impresso, granulato, pilis brevibus erectis adsperso; elytris angustis, sub-cylindricis, postice acuminatis, seriato-punctatis; tibiis omnibus inferne crenulatis.

Long. 9, lat. 2^{mm}.

Elongated, black, covered with greyish scales; rostrum longer than the head and slightly attenuated at the apex, with a small carina in the centre, head plane with the ocular ridges moderately raised; prothorax globose with an anterior transverse margin, deeply foveated with the walls of the foveæ raised so as to form a granulation, slightly grooved in the centre, and with a few rigid bristles; elytra narrower than the prothorax, almost cylindrical, acuminated behind, and deeply seriato-punctated; legs and tibiæ setulose, all the tibiæ crenated inwardly.

Cape Colony (? Little Namaqualand).

Tribe: ATTELABIDÆ.

Gen. APODERUS. Oliv.

A. BALTEATUS.

Pallido flavus, nitidus, rostro, antennis, capite utrinque nigris; elytris tenuiter punctatis, utrinque ad basim bi-costatis, flavidis vel rufescentibus, fascia basali marginalique nigra; pedibus apice tarsisque nigris.

Long. 6, lat. 3$\frac{1}{2}^{mm}$.

Pale-yellow, shining, the rostrum, lateral sides of the head and antennæ black, head grooved in the centre and with a deep transverse impression between the eyes; prothorax attenuated in front, convex, deeply impressed transversely at the base, grooved in the centre, and faintly impressed on each side of the anterior part of the groove; elytra sub-quadrate, plane in the anterior part, slightly punctato-striated, the humeral angles much pronounced, and on each side two basal costæ which disappear before they reach the median part; they are pale-

yellow turning sometimes to red, and have a broad marginal black band invading the base also on each side but not coalescing below the scutellum ; legs pale-yellow with the apex of tibiæ and the tarsi black.

I have seen two examples from the Transvaal in which the head is black with a narrow, median pale-yellow line, and the marginal black band of the elytra is produced diagonally at the base.

Allied to *A. submarginatus.* Gyllenh.

Transvaal, Zululand (Eshowe).

A. NIGRIPENNIS. Fabric.

VAR. DORSALIS.

Rufo-testaceus, elytris nigris, macula communi quadrata dorsali rufa.

Brick-red, shining ; head convex, grooved in the centre and with two diagonal impressions between the eyes; prothorax much attenuated in front, faintly grooved in the centre, very convex and deeply impressed transversely above the base ; elytra regularly punctato-striated, smooth, shining, with the basal and apical part of the suture, the hind margin and a broad quadrate dorsal patch red ; legs reddish, the tip of the 4th joint of the tarsi infuscated.

Closely allied to *A. nigripennis,* var. *cinctipennis.* Jek., the sutural red band of which has in *dorsalis* invaded the discoidal part of the elytra.

Cape Colony (Graham's Town).

Family : LONGICORNIA.

Tribe : CERAMBYCIDÆ.

Gen. PHYLLOCNEMA. J. Thoms.

P. PRETIOSA.

Elongata, chalybeate, clypeo, mandibulis, antennis pedibus, tibiis posticis exceptis, elytrorum apice segmentisque abdominis ultimis castaneo-rufis, tibiis posticis utrinque valde foliaceis.

Long. 16-17, lat. 4^{mm}.

Elongated, chalybeate, clypeus, mandibles, antennæ and legs with

the exception of the foliated hind tibiæ chesnut-red. The hind femora are, in some examples, sometimes blueish ; head and prothorax very rugose, deeply pitted, the latter with the outer sides obtusely triangular and the disk without impression ; elytra finely shagreened, elongated, nearly parallel and each one with a conspicuous dorsal raised line ; they are of a deep-blue colour with a rufous patch on the extreme apical part ; underside silky-pubescent with the two last abdominal segments rufous ; posterior tibiæ broadly spatulated on the inner and outer sides, the inner edge fringed with short blackish hairs.

Allied to *P. triangularis* Auriv.

Neighbourhood of Limpopo River.

Gen. LITOPUS. Serville.

L. SUTURALIS.

Supra æneo-viridis, subtus prasinus ; prothorace plano, lateribus in medio dilatatis vittis angustis tribus purpureis supra notato ; elytris rugosulis, fere planis, postice sub-angustatis, æneis vel æneo viridibus vittaque suturali purpurea ornatis ; antennis pedibusque rufis, geniculis tibiisque posticis chalybeis.

Long. 19-20, lat. 4^{mm}.

Head green, finely aciculated with a narrow longitudinal groove ; antennæ red with the apical part of the articulations chalybeate ; prothorax nearly rounded on the sides, depressed above, with a transverse sub-apical, two lateral and a supra-scutellary depression, also a fine longitudinal groove in the centre, dark brassy-green with a purplish median band and two sub-lateral ones ; scutellum green ; elytra finely shagreened, nearly straight, slightly tapering at the apex, plane, brassy-green, with a broad dark purple band running on both sides of the margin ; underside bright metallic green covered with a very short whitish pubescence ; legs red with the apical part of the femora and also the tibiæ of the hind pair chalybeate.

Closely allied to *L. latipes*, Fab., but differentiated by its colouring.

Cape Colony (East London), Natal (D'Urban).

Tribe: LAMIIDÆ.

Gen. ZALATES. Thoms.

Z. PULCHRA.

Elongata, pube grisea, brunnea varicgata dense tecta; fronte tuberculis duobus conicis; prothorace lateribus spinosis supra 5 tuberculato; elytris fasciculis minutis ochraceis scriatis adspersis.

Long. 24, lat. 9mm.

Elongated, covered with a thick greyish tomentum variegated with brown; head with a longitudinal carina ending in a conical tubercle at each end on the frontal part; antennæ with the basal joint dented inwardly, annulated with brown at the tip of each articulation and with the four basal ones thickly covered with brown hairs; prothorax convex, much constricted at the base, with the outer sides spinose and with five tubercles in the centre of the disk; two elongated one, enclosing two smaller ones forming a sort of groove, and a very acute conical one at the very apex; elytra nearly parallel, not very convex, the shoulders very prominent and covered with a dense grey tomentum relieved by regular series of very short, brown fascicles.

Transvaal (Rustenburg).

Gen. PHRYNETA. Cast.

P. NUPERA.

Oblonga, nigra, dense luteo tomentosa; prothorace supra tuberculato, lateribus utrinque spina valida armatis; elytris ad basim snb-denudatis, granulatis, fasciaque obscuriore obliqua, post medium posita, in singulo ornatis, mesothorace subtus utrinque plaga alba notato.

Long. 26-32, lat. 10-12mm.

Oblong, black, covered with a thick, yellow tomentum; prothorax acutely spinose on the sides and with nine tubercles on the disk; three small ones on the edge of the apical margin, four in the median part, and one on each side near the posterior margin; elytra broader at the base, with the humeral angles callose, strongly granulated diagonally from the base to about the first third of the length, and punctulated from there to the apex, thickly tomentose, with the granulated part denuded, and a diagonal deeper-yellow band beginning

at about the middle of the elytra and running parallel to the humeral granulation ; underside very tomentose, the mesothorax with a white patch on each side.

A very distinct species.

From between the Limpopo and Zambeze Rivers.

Family : PHYTOPHAGI.

Tribe : CRIOCERIDÆ.

Lema. Fabric.

L. mashuana.

Oblongo-parallela, capite, prothorace, antennarum articulo basali pedibusque rufis ; elytris cyaneo virescentiqus, profunde punctato striatis, subtus tarsisque nigris.

Long. 6, lat. 2mm.

Oblong, parallel, head red with the anterior part infuscated and with a deep quadrate impression between the eyes, and one on the vertex, antennæ black with the exception of the basal joint which is red ; prothorax red, nearly smooth, truncated in front and behind, subglobular in the anterior part ; elytra elongated, nearly parallel, convex, slightly impressed obliquely below the base, deeply punctato-striated, shining, with the intervals smooth ; underside and tarsi black, pubescent.

Allied to *L. erythrodera*, Lac., but coloured differently.

Mashuanaland.

Tribe : GALERUCIDÆ.

Gen. Diacaftha. Chevrol.

D. balteata.

Elongata, supra flava, nitida, subtus pedibusque nigris, elytrorum fascia lata communi post medium posita, nigra.

Long. 10, lat. 5mm.

Elongated, yellow, shining ; head deeply impressed transversely, palpi black, antennæ slightly pubescent, black, with the three basal

joints yellowish; prothorax smooth, shining, with the outer sides attenuated towards the base, moderately convex, impressed transversely and produced in an acute tubercle in the middle of the base above the scutellum; elytra elongated, nearly straight, somewhat convex, faintly punctulated with the base produced in a conical tubercle on each side of the scutellum, and having a broad transverse black band reaching both the outer margins; underside and legs black, with the exception of the last two abdominal segments which are yellow.

Female like the male, but without any tubercles on each side of the scutellum.

Not unlike in shape *D. conifera*. Fairm.

Transvaal (Leydenburg).

RECTIFICATIONS TO PREVIOUS CONTRIBUTIONS.

Omophron capense. Chaud. Second Contrib 1888. pl. 1. fig. 1. lege. *O. capicola.*

Pheropsophus Alstoni. Pér. Second Contrib. 1888. p. 72 = *Brachinus nobilis*. Dej.

Piezia albosignata. Pér.: First Contrib. 1885. p. 77 = *P. albolineata*. Wallengr. Ent. Tidsk. II. 1881. p. 12.

Graphipterus univittatus, id. ibid. p. 78 = *G. Lugens*. Chaud.

Podoces. nov. gen. Pér. Second Contr. p. 122 = *Carchares*. Pascoe Ann. & Mag. Nat. Hist. 1887. vol. xx. p. 12.

Trachynotus scrobiculatus. Pér. First Contr. p. 110 = *T. Batesi*, Haag-Rut.

„ *attenuatus*. Pér. Sec. Contr. p. 125. *T. gracilipes*. Haag-Rut

The following names having been preoccupied, I propose the following:

for. *Eutrapela unicolor*. Pér. 2nd Contrib. 1886. p. 139. *E. concolor.*

Lytta lugubris. Pér. l.c. p. 140. *L. moesta.*

„ *albolineata*. do. do. p. 140. *L. designata.*

Zonitis apicalis. do. do. p. 142. *Z. posticalis.*

Apoderus miniatus. do. do. p. 176. *A. cardinalis.*

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