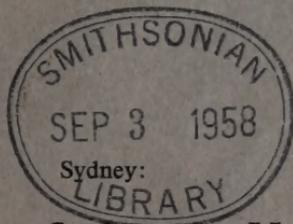


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PROCEEDINGS
OF THE
**Royal Zoological
Society**
OF
NEW SOUTH WALES
for the year 1956-57

Price, 4/-

(Free to all Members and Associates)



Published by the Society, 28 Martin Place

June 27, 1958

Registered at the G.P.O., Sydney, for transmission by post as a periodical

ROYAL ZOOLOGICAL SOCIETY OF NEW SOUTH WALES

Established 1879.

REGISTERED UNDER THE COMPANIES ACT 1899 (1917).

Patron:

His Excellency Lieutenant-General Sir Eric Woodward,
C.B., C.B.E., D.S.O.

Vice-Patrons:

Sir Edward Hallstrom, K.B., F.R.Z.S.
The Right Honourable Sir John Greig Latham, G.C.M.G.

COUNCIL, 1956-57.

President: Ernest Jeffrey Gadsden

Vice-Presidents:

Aubrey Halloran, O.B.E., B.A., LL.B., F.R.Z.S.
James Roy Kinghorn, FR.Z.S., C.M.Z.S., F.C.A.S.

Emil Herman Zeck, F.R.Z.S.

James Allen Keast, M.Sc., M.A., Ph.D.

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Honorary Solicitor: Aubrey Halloran, O.B.E., B.A., LL.B. F.R.Z.S.

Honorary Editor: Gilbert Percy Whitley, F.R.Z.S.

Honorary Treasurer: Geoffrey Alan Johnson.

Members of Council:

Lieut.-Col. Henry Burgh

John Hallstrom

Percy Fincham Harvey

Anthony Irwin Ormsby, LL.B.

Elizabeth Carington Pope, M.Sc.,

F.R.Z.S., C.M.Z.S.

Ellis Le Geyt Troughton, F.R.Z.S.,
C.M.Z.S.

John David Waterhouse.

Leonard Webber.

Garnet Halloran, M.D., B.Sc.,

F.R.C.S. (Edin.), F.R.A.C.S.,

F.R.Z.S.

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Acting Honorary Treasurer: R. Murnin.

Honorary Auditor: M. S. Davies, F.C.A. (Aust.)

Honorary Librarian: Mrs. P. R. Johnston.

Assistant Honorary Secretary: Miss J. M. Coleman.

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Hon. Sec.: Mrs. O. Wills

Ornithological Section:

Chairman: E. J. Gadsden

Hon. Sec.: A. R. McGill, F.R.Z.S.

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Hon. Sec.: R. D. Mackay

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Budgerigah Section:

Chairman: W. Hastings

Hon. Sec.: J. L. Bright

General Section:

Chairman: Miss E. Pope, M.Sc., F.R.Z.S., C.M.Z.S.

Hon. Secretary: Miss B. Dew, B.A.

ROYAL ZOOLOGICAL SOCIETY

OF

NEW SOUTH WALES

The Seventy-seventh Annual Meeting was held at Taronga Zoological Park, Mosman, on Saturday, 27th July, 1957, at 2.30 p.m. About ninety members and their friends were present. The President presented the

77th ANNUAL REPORT

MEMBERSHIP: At the 1st of July, 1957, the membership of the Society was 533, consisting of:

- 1 Endowment Member,
- 4 Associate Benefactors,
- 8 Honorary Members.
- 57 Life Members,
- 348 Ordinary Members,
- 18 Life Associate Members,
- 5 Honorary Associate Members,
- 74 Associate Members and
- 18 Junior Members.

During the year the Society lost 9 members by resignation, 6 by death and 20 in terms of Article 9 of the Constitution, making a total of 35 members. It is very pleasing to note that the total membership has increased by 29 members, the first over-all increase in many years.

COUNCIL: Eleven Council Meetings were held with an average attendance of 11 Councillors at each meeting. Two new Councillors were elected during the year in terms of Article 26: Prof. N. W. G. MacIntosh and Mr. R. D. Mackay.

VICE-PATRON: Sir Edward Hallstrom was elevated to the position of Vice-Patron of the Society.

THE SOCIETY'S DIPLOMA was awarded to Mr. K. M. Moore of Lisarow for compiling a complete Entomological Index for the 12 Volumes of the Australian Zoologist.

PUBLICATIONS: On the 8th May, 1957, the Proceedings for 1955-56 were published. This is the last issue to be printed in this size. To save the Society a considerable amount the future issues will be slightly smaller.

During the year the Society accepted for publication a Handbook of the Birds of the Sydney District by K. A. Hindwood and A. R. McGill, towards the cost of which £25 was donated anonymously. Setting up of the Reclassification of the Odonata (Dragonflies) by Lieut.-Col. F. C. Fraser, I.M.S., has commenced and this work should be ready for distribution by September.

THE LIBRARY was available for research by appointment on application to the Hon. Secretary.

Photographic reproductions of the Watling drawings of molluscs were purchased from the British Museum and some will appear in our publications as soon as the captions arrive for them.

We were ably represented at the A.N.Z.A.A.S. Conference in New Zealand by Mr. E. Troughton and Mr. G. P. Whitley.

Two Budgetrigar Shows were held, one at Admiralty House and the other in conjunction with Crown St. Women's Hospital Auxiliary.

THE SYLLABUS, which all members have received, and which is tabled here today, covering all meetings of the Society for the year 1957-1958, is the outcome of a reorganisation of the Society initiated by myself to Council with the objects of

- (a) Widening the field of the Society's activities;
- (b) Drawing members together in all fields of Zoology, rather than perpetuating isolation in Sections;
- (c) Utilising the evenings we have available in the Society's rooms to the greatest extent possible, having in mind the almost prohibitive rental the Society is now having to find in relation to its income.

The scheme was submitted to executives of sections at a combined meeting with members of Council and was approved unanimously. Then aided by Section leaders and the untiring work of at least two members of Council, the Syllabus you now have was evolved.

ZOOLOGY vitally affects almost every phase of our National Life whether it be in the field of Agriculture, Industry, Medicine or Health; we are all dependent on the work of the Zoologist in one way or another.

Yet, after all the years the Society has been in existence we are still occupying rented premises, paying a very high rent which is absorbing much of our income, which should go to the advancement of the Society's objectives, such as increased zoological publications.

The Government, through the Education Department, grants the Society the small sum of £50 per annum; it is now forcing our landlords to apply for an increase in our rent of £300 per annum to pay our share of the land tax the Government has recently imposed.

To cover, or remedy, this huge expenditure in relation to our income, we have several alternatives:

- (a) Increase our membership, which can only be done within the capacity of our rooms;
- (b) Move into less expensive premises;
- (c) Approach the Government for a larger subsidy or land tax relief;
- (d) Find a group of public spirited men or firms, who will assist us in conjunction with our Building Fund to acquire our own premises.

This is the position the Society has to face in the coming year if it is to advance and take the place it should in the community.

Similar societies in other parts of the world have advanced far beyond anything we have done here, surely we Australians living in a land of plenty and with the most unique fauna in the world can do better with our Society than we have done so far.

A Society is only as great as its members make it. I ask each one of you, "What are you doing and what will you do during this year to advance the interests of the Society?" This is the question I wish to leave with every member today, particularly the younger members with whom the future of this society rests.

In conclusion, I would like to draw attention to the splendid work of our Honorary Secretary, Mrs. Harford; it has been due to her continuous efforts in every phase of the Society's work that we have maintained the position we hold, this applies particularly to the handling of foreign correspondence and literature, and I would like this meeting to put on record its appreciation and thanks.

The adoption of the Annual Report was moved by Dr. G. Halloran, seconded by Mr. E. Troughton, and carried.

The Treasurer's Report was read by Mr. G. A. Johnson, seconded by Mr. J. Waterhouse, and adopted.

The six retiring members of Council were all re-elected.

The alteration of Article 41 of the Society's Constitution by substituting September for July was moved by Mr. H. E. Gatliff, seconded by Mr. S. L. Vellenger. Carried.

The Guest of Honour was Mr. A. Strom, representing the Chief Secretary, who was unable to attend. Mr. Strom addressed the meeting on the work of the Fauna Protection Panel and its plans relating to national parks and faunal reserves; and the place of animals in our culture.

A hearty vote of thanks to Mr. Strom was proposed by the President, seconded by Mr. G. P. Whitley, and carried by acclamation.

Members and their friends then partook of tea and inspected the zoological gardens.

OFFICERS FOR THE YEAR 1957-58.

President: Mr. E. J. Gadsden.

Vice-Presidents: Dr. G. Halloran, Messrs. A. Halloran, E. Zeck and J. R. Kinghorn.

Honorary Secretary: Mrs. L. Harford.

Honorary Treasurer: Mr. G. A. Johnson.

Honorary Solicitor: Mr. A. Halloran.

Honorary Editor: Mr. G. P. Whitley.

Honorary Librarian: (Vacant).

Honorary Auditor: Mr. M. S. Davies.

Assistant Honorary Secretary: Miss J. M. Coleman.

Assistant Honorary Treasurer: Mr. R. Murnin.

Assistant Honorary Solicitor: Mr. A. I. Ormsby.

SMITHSONIAN
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ROYAL ZOOLOGICAL SOCIETY OF NEW SOUTH WALES

REVENUE ACCOUNT FOR THE YEAR ENDED 30th JUNE, 1957

GENERAL ACCOUNT

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ROYAL ZOOLOGICAL SOCIETY OF NEW SOUTH WALES

BALANCE SHEET AS AT 30th JUNE, 1957

	£	s.	d.	£	s.	d.
LIABILITIES						
ACCUMULATED FUNDS:						
Balance as at 30th June 1956	3160	16	2			
Add surplus for year ended 30th June 1957—Publication Account	23	9	5			
	3184	5	7			
Less Deficiency for year ended 30th June 1957—General Account	6	16	2			
	3177	9	5			
BUILDING FUND:						
Balance as at 30th June 1956	985	6	7			
Add Interest received for year	30	16	10			
	1016	3	5			
Subscriptions paid in advance	145	7	0			
Marine Section Fund	37	16	3			
	1016	3	5			
	£4376	16	1			
ASSETS						
FURNITURE AND FITTINGS:						
Office, Lecture Room, Furniture and Equipment at cost	494	7	11			
Library, Books	503	4	6			
"Parrot" Paintings	500	0	0			
Projector at cost	54	18	6			
	1552	10	11			
INVESTMENTS AT COST:						
Australian Commonwealth Inscribed Stock	1104	7	6			
Australian Commonwealth Treasury Bonds	100	0	0			
	1204	7	6			
COMMONWEALTH SAVINGS BANK:						
Current Account	598	14	3			
Cash in Hand	5	0	0			
	603	14	3			
BUILDING FUND INVESTMENTS:						
Australian Commonwealth Treasury Bonds	980	0	0			
Commonwealth Savings Bank	36	3	5			
	1016	3	5			
	£4376	16	1			

AUDITOR'S REPORT TO THE MEMBERS OF THE ROYAL ZOOLOGICAL SOCIETY OF NEW SOUTH WALES

I hereby report that I have Audited the books and accounts of the Royal Zoological Society of New South Wales for the year ended 30th June, 1957, and have obtained all the information and explanations I have required, and, in my opinion, the above Balance Sheet exhibits a true and correct view of the state of the Society's affairs as at 30th June, 1957, according to the best of my information and the explanations given to me and as shown by the books of the Society.

I have examined the Register of Members and other records which the Society is required to keep by Law or by its Articles and am of the opinion that such records have been properly kept.

SYDNEY, 24th July, 1957.

(Signed) M. S. DAVIES, F.C.A. (Aust.), Hon. Auditor.

OBITUARY NOTICES

ERNEST JOHN BRYCE, F.R.G.S.

The late Ernest John Bryce was born in Melbourne in 1878. At the age of six he was taken to Europe to be educated, first at Hamburg, then Stuttgart, and finishing at Glashutte College, Dresden. He remembered vividly that first voyage, leaving Sydney in the Orient Company's liner "Orient" in full sail, then a supplement to steam. In 1954 the Orient Company presented him with a book as the only passenger they knew living who had remembered the ship. His education was directed to fit him to take his place in the family business, Bosch Barthel. His hobbies led him to study geography (he was a Fellow of the Royal Geographical Society for 35 years), history, music, and zoology. Later he spent two years in London qualifying for a Fellowship of the Spectacle Makers' Company and another year in the United States of America to gain experience. When he returned to Sydney he opened a business on his own account in Martin Place. His interests were wide: he was a Major in the Australian Militia and, when he was not accepted for overseas service in the 1914-18 War he joined the firm of Heath and Company, Greenwich, England, to do special instrument work. After the war in 1918 he returned to Australia, retired from business, and with his wife travelled the world. In forty years of travel they visited all countries. They went from the Cape to Cairo, 1,000 miles on the Amazon, 1,000 miles on the Irawaddy, and overland from Bombay to Helsinki (now becoming a regular route). His love of music brought him frequently to the music centres of Europe. His compassion for the underprivileged was great. He with his wife helped the Armenian refugees, making Aleppo their base. After World War II they took an active part in helping the refugees of Occupied Europe. His principal humanitarian interest was the Australian aborigine and all dark races. He gave an area of land to the Kuring-gai Council, New South Wales, for a natural-history park. Mr. Bryce was a member of a number of societies. After living for some years at Killara, Sydney, he died suddenly at Stanhope Gardens, London, England, on November 1, 1957.

Mr. Bryce joined the Royal Zoological Society of New South Wales in 1919 and was a member of Council from 1926 to 1944, Secretary 1928-30, and President 1933-34. He represented the society at various overseas conferences and often gave most entertaining lantern lectures about his travels. He contributed three papers to our *Proceedings* in the 1930's: "Journeys of a Nature Lover," "Zoological Institutions Abroad," and "The Ninth International Ornithological Congress at Rouen."

--B B.



THE LATE E. J. BRYCE.

DAVID GEORGE STEAD, F.L.S. (1877-1957).

After a long illness, the death occurred at his Watson's Bay home, Sydney, on 2nd August, 1957, of the noted fisheries naturalist, Mr. D. G. Stead, in his eight-first year.

Born at North Sydney, March 6, 1877, Stead was appointed Naturalist to the Board of Fisheries, New South Wales, from 1902 to 1910. He had many subsequent appointments as a fisheries official, managed the State Trawling Industry from 1915-1920, was Acting Director of Food Supplies to the British Government in Malaya, 1921-1923, Rabbit Menace Enquiry Commissioner, 1925, and President of a number of societies, and one of the founders of the Royal Zoological Society of New South Wales, and the main one responsible for founding the Wild Life Preservation Society.

Although the State Trawling Industry showed a financial loss, at least it pioneered the ground for subsequent development. Mr. Stead was Managing Director of the Australian Whaling Co. Ltd.

He was a many-sided man, very keen on the conservation of the Australian fauna. He was interested in and worked on trawling, acclimatisation, fish-culture, legislation on fisheries, and was an enthusiastic aquarist, geographer, town-planner, forester and oceanographer. He made great collections of Australian and Malayan fishes which are now preserved in the Australian Museum, Sydney.

Although his work lay mainly in the field of biology he was intensely interested also in geography and was for many years President of the Geographical Society of N.S.W., and editor of its Journal "The Australian Geographer." This interest dated from an early age when he discovered in 1897, signs of a recent elevation of the foreshores of Port Jackson in the form of raised barnacle and oyster beds. Until this time it had been generally considered by geographers that the movements of this shoreline had all been in a downward direction resulting in the formation of Sydney Harbour and other coastal estuaries, due to the drowning of the river valleys. Stead's evidence of a slight but definite upheaval was questioned by several geographers, but was recognised by E. C. Andrews (later Government Geologist of N.S.W.) in his book "An Introduction to the Physical Geography of N.S.W." Much later—during the early years of World War II—Stead confirmed this evidence to his own satisfaction by the discovery of quite recently fossilised remains of vegetation during the excavations for the Captain Cook Dock and because these fossils could be identified as species still flourishing round Sydney Harbour he estimated this slight upheaval as not more than 250 years old.

Stead was for many years a protagonist for peace in international affairs and was very outspoken against war, as recently as 1945 issuing a pamphlet protesting against rocket tests in Australia.

One of his fellow workers paid the following tribute to Stead: "As founder and chairman of the World Peace Campaign of 1936 he ranks with the pioneers; and through all the crises that have affected the peace movement since then he remained staunch to the very end, a source of inspiration and courage to his fellow-workers in the same great struggle."

Stead was a prolific writer and lecturer. He joined the Linnean Society of New South Wales in 1898 as its youngest member, and exhibited specimens before that body from that year onwards. At the time of his death he was the oldest member of that Society. His published articles, papers and reports on many subjects would constitute a formidable bibliography; his best-known books are: "Fishes of Australia" (1906), "The Edible Fishes of New South Wales" (1908) and "Giants and Pigmies of the Deep" (1933)—still most readable and authoritative—and "General Report upon the Fisheries of British Malaya" (1923).



THE LATE D. G. STEAD.

He was general editor of the Shakespeare Head Australian Nature Books and left a completed manuscript of a book on Australian Sharks and Rays.

Mr. Stead is survived by his widow, a teacher and natural history writer, well-known under her maiden name, Thistle Y. Harris, and a family of three sons and three daughters, one of whom is the famous novelist, Christina Stead. Another son predeceased him.

David Starr Jordan (*Days of a Man*, ii, 1922, p. 212) wrote of him,

"David G. Stead, the competent scientific expert of the fisheries of New South Wales, is prominent as an advocate of peace, with a large interest in world affairs generally. In 1917, visiting the United States, he came to Stanford as the guest of Gilbert* and myself. In 1918 he paid us the joint compliment of naming his fourth boy Gilbert Jordan Stead. His other sons are Darwin, Huxley, and Kelvin, a 'galaxy of science' as the proud father observes."

—G.P.W.

DR. HAROLD THOMPSON.

News of the death of Dr. Harold Thompson in a hospital in Edinburgh on May 29, 1957, only three years after his retirement, has been received with regret by his many friends. Dr. Thompson was the first Chief of the Fisheries Division of the Council for Scientific and Industrial Research at Cronulla, New South Wales; a kindly man and a considerate employer, who realised that the economic development of fisheries, to be most effective, had to be based on the best scientific advice. He was born at Aberdeen, Scotland, in 1890 and interrupted his university studies there to serve in World War I, in which he attained the rank of Captain. In 1921, he was appointed a naturalist of the Fishery Board for Scotland. His work on the fluctuations in numbers of Haddock is regarded as a fisheries classic. In the 1930's Thompson worked on the fisheries of Newfoundland and became Director of Fisheries Research there. In 1937, he arrived in Sydney to take charge of Australian fisheries research which had lapsed since the loss of the F.I.V. "Endeavour" in 1914. After inspecting several local sites, Dr. Thompson selected the old fish-hatchery buildings at Cronulla as ideal for his headquarters. Pure scientific research being impeded by World War II, he acted as Controller of Fisheries in the Department of War Organization of Industry as well as Chief of the C.S.I.R. Fisheries Division. The buildings at Cronulla were extended and, when Dr. Thompson retired, his staff and associates, at a very pleasant and memorable ceremony, named the very fine fisheries library there in honour of their Chief.

A portrait of Dr. Thompson appeared in *Fisheries Newsletter* (Canberra) xiii, Dec. 1954, p. 11, in an article from which some of the bibliographical data above have been taken.

—G.P.W.

DR. HUGO FLECKER.

Zoology lost a distinguished worker through the death in June 1957 of Dr. Hugo Flecker, of Cairns, Queensland, at the age of 72.

Apart from being a distinguished radiologist, he was an outstanding zoologist, particularly in Marine Zoology in which he had done much

* Professor Charles Henry Gilbert, U.S. ichthyologist (1859-1928).

research and had a number of species named after him. He was a Major in the Australian Army Medical Corps in World War I, serving in Egypt and France.

He was a Fellow of the Royal Geographical Society of Great Britain. He went to Cairns in 1932, studied venomous sea animals, and was a foundation member and for 13 years President of the North Queensland Naturalists' Club.

He also received a Federal Grant to advance his work in Botany, in which he had a world wide reputation.

—E. J. GADSDEN.

FRANCIS BUCKLE.

Mr. Francis Buckle, a member of the Australian pioneer shipping family, died on 27th August, 1956. He was 89.

In 1886, when he was 19, Mr. Buckle joined his father in running a pearl shipping fleet from Broome, Western Australia.

In 1896 he returned to Sydney and started the firm of F. Buckle and Sons, running small steamships up the east coast of Australia and a fleet of tugboats well known in Sydney and Newcastle.

Mr. Buckle was a keen cricketer and was chairman of the Wentworth Park Trust for about 30 years.

He joined the Royal Zoological Society as a Life Member in 1927, and was a leading member of our Avicultural Section.

MRS. LEONE WOOLACOTT.

(See "The Marine Zoologist" memorial number, page 81.)

MY FRIEND OLIVER

BY TOM IREDALE.

With the passing of Dr. W. R. B. Oliver of New Zealand I have lost my oldest friend. We met as youths in New Zealand half a century ago and as we were both interested in natural history we joined together and spent all our week-ends and holidays together. I was solely studying (that is the best word) birds and had done so since I was able to read. The birds of New Zealand were fascinating, being so very different from the British birds with which I was familiar, and likewise strange to Oliver, who was Tasmanian born. Oliver was a student of every kind of natural object and had been then collecting shells which were quite foreign to me. We found birds were very scarce and as a sideline I started on shells while he did both, and then branched on to Botany. I don't even know what started him on this, but he applied himself very seriously and, as we all know, reached the top in that branch of Biology. Furthermore (again I am unable to give any reason) he specialised in Ecology, then quite a novel subject. Soon I was concentrating on the Mollusca and he was studying Botany seriously. When the subject of the exploration of the Kermadec Islands was first mooted by an outsider we agreed it would be a wonderful object but neither of us had any idea of getting there. The initiator faded out and Oliver and I began building castles in the air each on the summit of Moumoukai, the peak of Raoul or Sunday Island, the only inhabitable one of the group. Curiously (that is another story) the dream became clearer and we drew up plans to the most minute detail

but there were still bridges to be crossed, or better ladders to be climbed before we conquered Moumoukai. It is now history, ancient history, that we achieved our ambition.

We were assisted to the extent of a grant of ten pounds by the New Zealand Institute, otherwise the Expedition was at our own expense. That was really the beginning of our careers, as we had hoped, but it did not seem so upon our return when only a cold welcome awaited us. Oliver had to go back to his work, and I went back to England. Oliver sensed an opportunity when the First World War broke out, volunteered and went through the campaign. He visited me in England and worked at the British Museum (Natural History) mainly on his botany. At the Kermadecs I was in charge of the Birds and Shells, while Oliver undertook the Botany, especially an Ecological Survey, and anything else as the Mammals (one), Fishes, Geology, etc. Later, receiving large collections of Shells and Birds from the Kermadecs through Roy Bell, whom I had enthused, he wrote, with my assistance, upon these also. By this time he had reached his ambition and was attached to the Dominion Museum, Wellington, New Zealand, of which, comparatively soon, he became Director. Statistics dealing with his scientific career will be published by someone in New Zealand, better acquainted with the details. I only know the results. Oliver had a power of concentration beyond the normal student, applying himself without much recourse. Hence he was not easy to get on with, nor did he care, he was sufficient to himself. Consequently, I was going to say, he was studying in all his spare time, but he never had any spare time, he was always studying. He was very solid, even stolid, very careful and methodical, and allowed no distractions, not being by any means social, most acquaintances found him the opposite. This virtue of untroubled application enabled him to achieve all his ambitions so that I can truly say he was the best all-round scientific worker in natural history in New Zealand since the unparalleled Hutton. I mentioned above that he was not a "native son," but he definitely made New Zealand his real home. I know this as once in his earlier days when he was offered an excellent chance elsewhere he preferred to remain in New Zealand, and was well rewarded for his allegiance. On account of his excellent work, both in the field and in the Museum, he received practically all the honours possible in New Zealand and other honours outside. Thus he became Director of the Dominion Museum, and after his retirement he acted as Director of the Canterbury Museum, Christchurch, both, of course, in New Zealand. He received the Hector and the Hutton Medals, the only ones he could aspire to. He was President of the Wellington branch of the New Zealand Institute, and later when the Royal Society was formed he became President of that also. Furthermore he became President of the Royal Australasian Ornithologists' Union, the highest honour of its kind in Australia. His thesis for his Doctor's degree was a Monograph of the Genus *Coprosma*, one of the most difficult of all plant groups. He edited the second edition of Cheeseman's "New Zealand Flora," and in addition to his ecological work on the Kermadec flora he visited Lord Howe Island and prepared a similar account of its flora. Other botanical papers also came from his pen.

On the zoological side he prepared a handy and very useful reference book on New Zealand birds, and lately he revised this, enlarging it, and saw its publication just before his death. In his first book on birds he incorporated notes on the wonderful extinct birds of New Zealand, and continuing prepared a Monograph of these fossil flightless birds, the Moas. As his Presidential Address to the Royal Australasian Ornithologists' Union he provided an improved classification of Birds. Oliver was conservative, and his breach of tradition has not yet been accepted but that does not mean it will not play some part in the future. Ornithologists generally are more conservative even than Oliver. His name will take a high place in New Zealand natural science and will live always in his works.

A TRIBUTE TO LILIAN MEDLAND

When Georgian House published Tom Iredale's beautiful book on the *Birds of Paradise and Bower Birds* in 1950, its author had already started to write the two-volume *Birds of New Guinea* which was printed in 1956 and distributed in March 1957.

There have been only two works dealing with New Guinea birds as a whole, and neither of these is available to the ordinary worker, or even museum. The first, by John Gould, is a large series of folio volumes of coloured plates, issued over sixty years ago, and now worth many hundreds of pounds when, rarely, a copy comes on the market. The second, by Salvadori, consists of three volumes in Italian and Latin, issued over fifty



THE LATE LILIAN MEDLAND.

years ago, and now scarcer, but not more valuable, than Gould's work, as there were only 80 copies issued, and there are no illustrations, only systematic descriptions.

In the present work by Tom Iredale some 650 species are described, and 1,500 subspecies are indicated, with 35 plates figuring 347 birds in colour. The colour plates by Lilian Medland, the author's wife, are in the best tradition of ornithological illustration, and will enable the field worker to identify easily every species illustrated.

The artist unfortunately died, after a brief illness, in December 1955, but though she did not see the completed work, the proofs of her coloured plates had all been shown to her, and these volumes are her memorial.

Miss Lilian Medland had been interested in birds all her life and when she was approached to make drawings for a book on British birds she was very doubtful of undertaking the task. She had easy control of pencil and coloration, and was a painter of miniatures, but had never attempted work for publication. However, she was persuaded and drew all the birds, learning

all the way. She visited the London Zoological Gardens, sometimes three times a week, making sketches of the birds in all their attitudes. She was later commissioned to illustrate a larger book but, after many illustrations were prepared, the First World War caused its discontinuance. After the end of the war, she began the illustrations for a Handbook of the Birds of Australia, illustrations so superb and characteristic that even the weakest amateur can identify the birds easily. This has been proved in practice as a traveller to New Guinea determined nearly every bird by its means yet he had never seen a New Guinea or Australian bird before, having been acquainted only with British birds. Miss Medland also prepared a series of plates showing the heads, feet, feathers, etc., of New Zealand birds, but usually she showed the whole bird in a lifelike attitude. Each bird was, moreover, painted scientifically accurately to a degree never equalled by other ornithological artists. In previous works illustrated, as in the *Birds of Paradise* and *Birds of New Guinea*, Lilian Medland gained (and deserved) more praise than the writer of the texts, which is as things should be. The illustrator is commonly denied praise though, without his (or her) work, when well done, very little advance in understanding or scientific research can be made.

Lilian Medland (Mrs. Tom Iredale) came to Sydney in 1923. Her illustrations of the Bird of Providence and the Fairy Wren have graced the *Australian Zoologist* and she was a member of the Royal Zoological Society in the 1930's and 1940's. Owing to deafness, she was unable to take an active part in the Society's affairs and indeed rarely visited the city from her home in Manly, but her memorial lives on in the glowing and exquisite coloured figures of birds and their fledglings in Mathews' and Iredale's books and scientific papers.

Mrs. Iredale's illustrations in *Birds of Paradise and Bower Birds* did much to draw attention to that work, which was described by one critic as the most beautiful book ever published in Australia. It contained 33 plates figuring 138 birds in colour. *Birds of New Guinea* contains even more, and will surely rank as one of the finest bird books published anywhere in the present century.

REPORTS OF SECTIONS

General Section

The 1956-57 Session of the General Section has been a successful one although it has concluded with the dissolution of the Section. This has not been due to lack of interest in it but to a scheme of reorganisation within the Society which was largely sponsored and brought about by the General Section.

The handbook project has continued satisfactorily and work on it will be continued.

Average attendance at lectures was a fraction over 14 per evening. A resume of the year's activities is as follows:

In July an evening devoted to "Zoological Curiosities" was held and four members tabled and gave very interesting short talks about their exhibits.

In August great interest was shown in Mr. Kinghorn's talk on "Reptiles of the World."

In both September and November the evenings were devoted to work on the handbook and various notes and exhibits were dealt with.

At the October meeting Mr. John Waterhouse showed a most delightful series of Kodachromes to illustrate the ecology and occurrence of "Birds Around the Sydney Area."

In December the General Section discussed at length a scheme for the reorganisation of the Society which involved its own dissolution and re-erection in its place of sections of "Reptiles and Mammals" and "Entomology." The General Section passed the following motion which foreshadowed its own end: "That this new scheme of pre-arranged and published syllabus for all sections of the Society and re-arrangement of the sections be supported by the General Section."

In March the meeting was devoted at the Council's request to giving entomologists a chance to elect office-bearers and form a new section. This was done and Mr. L. Haines and Mr. Gregg were elected as Chairman and Hon. Secretary to bring the new section into existence. An interesting and a most instructive talk was then given by Mr. D. McAlpine on "Some Australian Wonder Insects."

The April meeting was also devoted to the formation of another new section when Dr. A. Keast and Mr. R. Mackay were elected Chairman and Hon. Secretary respectively of the Reptile and Mammal Section. They were empowered to organize the new section. This was followed by a talk by Dr. N. Stephenson on "Geckoes." This was the best attended meeting of the year.

An unusual subject "What is a Bryozoan?" by Mr. L. Thomas was given in May and was illustrated by slides and tabled exhibits. This proved to be a most fascinating subject.

In June, two meetings were held devoted to winding up the General Section's business. An ordinary meeting was held first and normal business transacted. This was followed by the last Annual General Meeting and as no elections were necessary the Chairman's address was delivered on "Interesting Australian Earthworms." The results of a collecting expedition

to Kyogle for Giant Earthworms was described and a colour film showing the habitat and collecting of the worms was shown by Miss M. Dive.

In the absence of the President of the Society Miss Pope then invited Mr. Kinghorn, who had had so much to do with the foundation of the General Section in 1949, to close the formal proceedings of the Section. This was followed by a small informal party to wish the new sections luck.

ELIZABETH C. POPE, Chairman.
BARBARA DEW, Hon. Secretary.

21st June, 1957.

Marine Zoological Section

During the year we suffered a few set-backs owing to lecturers who were unable to attend; however the balance was well maintained by members of our section and several excellent guest lecturers. One very interesting lecture was given by Mr. E. Slater with superb coloured transparencies of the marine life of the Great Barrier Reef. The lecture given by Dr. D. F. McMichael on his trip to New Guinea to collect Land Snails was most informative.

Our thanks go to Mr. Jose and Dr. Stephenson and to all who were kind enough to give us their valuable time.

Some of our members have been absent during the year: Mrs. J. Kerslake who has been interstate, Mr. F. McCamley who visited England and America, and Mrs. K. Rutland who is still overseas. We hope that all these members will be with us in the coming year.

Because of the new Lecture Programme inaugurated by the Royal Zoological Society, members decided that the Marine Section will meet on the first Tuesday of every second month instead of every month so as to enable the Royal Zoological Society to include more sections. The "Conchology Study Group," formerly incorporated with the "Marine Section" will become a full section, "The Conchological Section" and will hold the usual monthly meetings.

The attendance this year was a little below average and it is hoped that, with the aid of the new printed programme, members will be able to attract more visitors and gain new members.

The following is a list of lectures given during the past twelve months:

1956.

July: "Coral Cay," by Mr. E. Slater.

August: "Inland Cretaceous Seas," by Mr. Jose.

October: "Bustard Head," by Miss G. Thornley.

November: "Rare Frogs of New Zealand," by Dr. W. Stephenson.

December: "Marine Curiosities," by Miss G. Thornley.

1957.

February: "The Value of Shells," by Mr. S. Kellner.

March: "Land Shells of New Guinea," by Dr. D. F. McMichael.

April: "Sydney to Tilbury," by Mr. F. McCamley.

May: "Film Night," by Mr. E. Thornley.

During the year there were also eleven meetings of the "Conchology Study Group" at which interesting discussions were held on the location, distribution, zoogeographical variation and the habits of various molluscs.

Miss Thornley displayed a large and interesting collection of Pectinidae and Mrs. Woolacott brought in 48 different species of Strombidae for her lecture. Mrs. Trenerry displayed a most fascinating selection of Sea Urchins, Crabs and Star Fish, and Miss Thornley and Mr. Laseron showed various drawings which were of great interest. Other families studied were Naticidae, Mytilidae, Thaididae, Cypraeidae, Triphoridae and the common Bivalves of N.S.W. Members appreciate the work and patience needed to prepare these talks which made the nights so pleasant and instructive.

Eight Field Days were held and one week-end. The collecting was rather poor, probably due to heavy rains and flooding. Shells found in abundance on our local beaches in the past are few and far between or entirely missing. Favourite places like Long Reef and Kurnell have proved disappointing. The tidal flats at Gunnamatta Bay still hold a little, but not the variety of past years. During the Katoomba week-end we visited Mr. Melbourne Ward's Natural History Museum and he kindly showed us his collection of Shells, Crabs and Australiana, which was most interesting and enjoyable.

The following is a list of Field Days:

1956

5th August: Kurnell.

6th September: Long Reef.

3rd November: Gunnamatta Bay.

1st December: Bottle and Glass Rocks.

1957

19th January: North Harbour.

16th February: Gunnamatta Bay.

16th March: Long Reef.

13th April: Gunnamatta Bay.

25th May: Katoomba.

MRS. O. WILLS,
Hon. Secretary.

Ornithological Section

The Section has enjoyed a successful year. Regular monthly meetings were held and at most of these interesting and informative lectures were delivered, among which may be mentioned: "Birds of the Rain Forest," by Ellis McNamara; "Ornithology in England," by David Condon; "Life in the Takahe Country, New Zealand," by Baughan Wisely; "Bird Migration in Europe," by David Griffin; "Habitat, Nomadism and Nesting Seasons," by Dr. Allen Keast; "Birds of New Guinea," by Tom Iredale; "Birds of the Cairns District," by Norman Chaffer; "Breeding Activities of Sea-birds on the Offshore Islands of New Zealand," by Dr. W. Dawbin; and "Bird Life Along the Murray," by E. J. Gadsden. Keen ornithological field study was evident throughout the year and many items of specific interest were reported. Three evenings were devoted solely to observations—a resume of various field trips (November), members' night (March), and the bird year around Sydney (June). The popularity of colour photography has created a good deal of interest among members and either films or slides were screened at practically every meeting.

The attendance was encouraging, the average of 56 for each meeting being noticeably higher than that of the previous year, with seating accommodation usually taxed to the limit. Members of the New South Wales

Branch of the Royal Australasian Ornithologists' Union held their meetings in conjunction, by invitation, as in previous years. Visitors included Messrs. Jack Jones and Roy Cooper (Victoria), M. S. R. Sharland (Tasmania), R. Ford (Western Australia), Lindsay Hyem (Barrington), and Jack Devitt (Wollongong). Congratulations were extended to the Section Chairman (Mr. E. J. Gadsden) on his election as President of the Society, and to Dr. Allen Keast (Vice-Chairman) on attaining vice-presidential office.

Conservation matters, as usual, proved various and numerous. Delegates attended two general conservation conferences, convened by the Chief Guardian of Fauna. The formation of a National Parks Association was a big step forward. Protests were lodged with the authorities concerned in regard to the granting of a mining lease in the Colong Caves Reserve and the construction of a road resulting in a good deal of habitat destruction in Forest Reserves of the upper Williams River. Honorary Rangers reported instances of wilful destruction of bird life, which was particularly noticeable in the Windsor district among ducks, which arrived there in good numbers during dry conditions inland. The finding of a dead Glossy Ibis (a rare bird near Sydney) at Pitt Town Lagoon was indicative that anything was "fair game." Such wanton destruction by "trigger-happy" hooligans is one of the serious problems of the present day and some strong concerted effort should be made to eradicate it. In one instance a fine of £50 was imposed. The continuous discharge of guns is quite a common sound on Saturdays and is certainly most disconcerting when heard in localities which have long been regarded as excellent ones for the study of certain species of birds. Drainage work by the Water Board at Red Point has caused concern. The only known mainland colony of Wedge-tailed Shearwaters is situated there and examination of the area in March showed that many of the burrows had been covered by the bulldozed soil and many young birds (some had been banded during the season) had almost certainly succumbed.

At the Annual Meeting all retiring officers were re-elected unopposed.

Chairman: Mr. E. J. Gadsden.

Vice-Chairman: Dr. Allen Keast.

Secretary: Mr. A. R. McGill.

Assistant-Secretary: Mr. F. G. Johnston.

Committee: Messrs. N. Chaffer, A. H. Chisholm, N. C. Fearnley, G. R. Gannon, K. A. Hindwood, W. R. Moore, J. A. Palmer and J. D. Waterhouse.

ARNOLD R. MCGILL,
Section Secretary.

Mitchell's Hopping Mouse

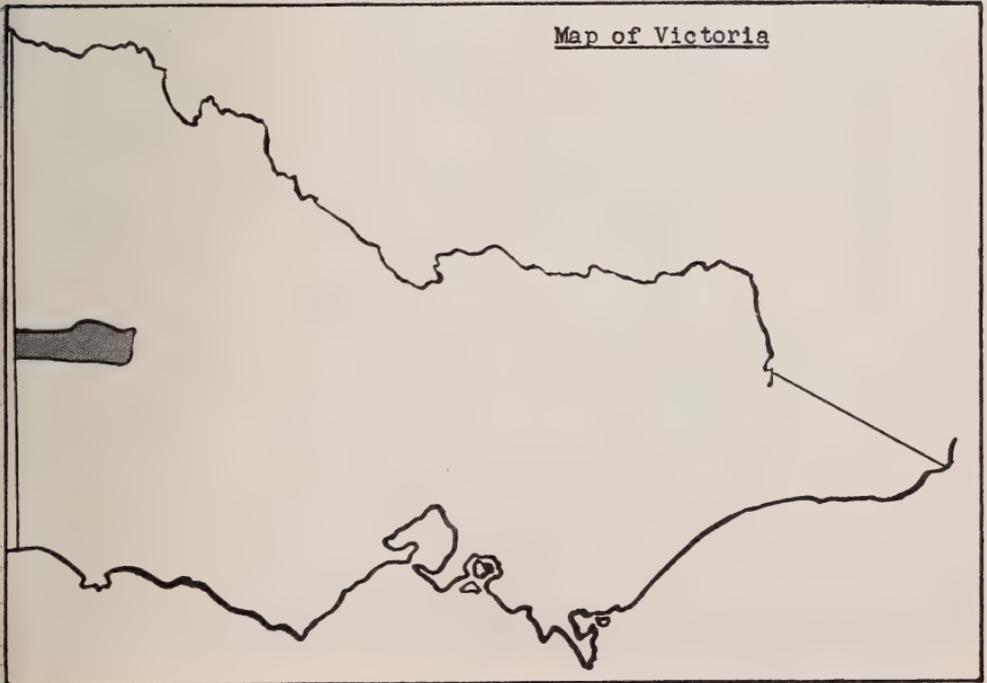
By C. W. BRAZENOR.

(Director, National Museum of Victoria, Melbourne.)

Mitchell's Hopping Mouse, *Notomys mitchellii*, is a greyish brown Australian rodent with elongate, jerboa like hind limbs. It was described by Ogilby (1838) from the junction of the Murray and Murrumbidgee Rivers, N.S.W. Oldfield Thomas (1921) recognised a subspecies which he called *Notomys mitchellii macropus*, from Kangaroo Island, South Australia, or possibly from the mainland area in that vicinity. He described it as a long-haired race, paler and greyer than the typical *mitchellii*, and with longer and stouter feet. In 1934 a further subspecies from Central Australia, *Notomys mitchellii alutacea*, was described by the author (Brazenor, 1934).

The National Museum possesses a long series of *N. mitchellii mitchellii*, taken more than 100 years ago by the Museum's first zoologist, William Blandowski. It is more than probable that this race is now extinct. The Museum also has one specimen, taken in the "Victorian Mallee" in 1918, which must be ascribed to *N. mitchellii macropus*. Brazenor (1950) expressed the opinion that the subspecies might still survive in Victoria, though it had not been seen for over 30 years. Some five years later this pious hope was realized, and in July 1955 a fresh specimen of *N. mitchellii macropus*, which had accidentally been captured in a rabbit trap near Nhill, Victoria, arrived at the Museum. Since then I know of five further specimens having been taken, and it is obvious that an upsurge of a periodic population fluctuation is in progress. As far as I know, no work on

Map of Victoria



Location and area of Little Desert.

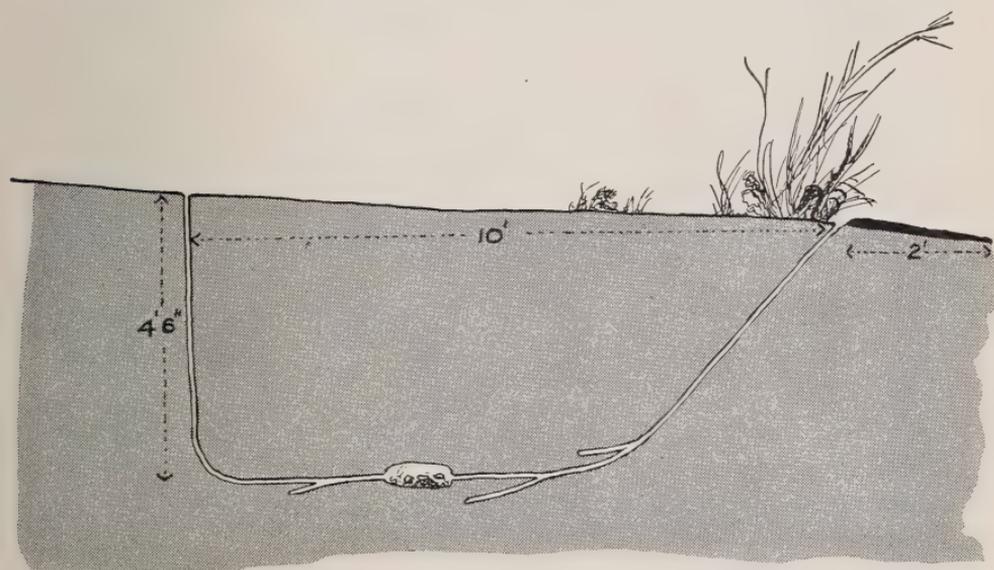


Mitchell's Hopping Mouse.

mammalian population phenomena has been done in Australia, but there are a number of practical demonstrations of species at apparent extinction level making at least a temporary recovery. The period involved is often long, covering twenty or even a greater number of years, and, superficially, it seems impossible to correlate it with observable climatic variation.

As the literature is apparently silent on the habitat of *Notomys mitchellii*, an effort was made to explore and photograph the location and architecture of its burrow. In this I gratefully acknowledge the help of Mr. R. Smith of Ballarat, and Mr. K. Hately of Kiata, who both by preliminary observation and the physical exertion of digging are largely responsible for the operation's success.

All six recent records of *Notomys* are from the vicinity of Nhill and four are from the area to the south known as the "Little Desert." This



Burrow of Mitchell's Hopping Mouse.

narrow strip of country stretches from approximately the South Australian border eastwards to the Wimmera River; its northern boundary follows a line a little south of the Western Highway, and it extends southwards almost to reach the Horsham-Goroke railway line. The area consists of sandy plain crossed by low sandhills, with here and there clay-pans and outcrops of sandstone. The whole is thickly clothed with scrub plants and there is no human habitation except along the margins.

The mice-burrows investigated were situated on the sandy rises south of Kiata, and the area contains at least two salt lakes of several acres in extent, and one spring of drinkable water. The crests of the rises exhibit a scattering of Brown Stringybark (*Eucalyptus capitellata*) and the sides and hollows are well scrubbed with stunted *Banksia* (*ornata* and *marginata*), *Casuarina*, *Leptospermum*, *Calythrix*, *Zieria* and many other sand-loving species.

Nowhere in this area does *Notomys* appear to be common. Along the sides of some of the sandhills there is the visible evidence of its presence,

but the small colonies are well isolated one from the other, and the number of animals in each must be few. Of perhaps a dozen burrows located in an area only three or four appeared to be in active use, and each comparatively simple burrow would scarcely house more than a single pair and family. Each burrow is marked by a low mound of yellow sub-sand, often deeper in colour than that on the surface. It covers an area of from eighteen inches to three feet in diameter (see figure). On the perimeter of the mound and usually at, or very near, the base of a shrub is the small, almost circular hole of about one and one quarter inches in diameter, which is the burrow entrance. The burrow descends at an angle of about 40 degrees for some four or five feet and then tends to level for a further foot before it opens into a nesting chamber six to eight inches in diameter and three or four inches high. Within this is a nest composed principally of leaves and dried fibrous roots, compacted on the floor but more loosely constructed on sides and roof. Between the entrance and the chamber there may be from one to three "blind" burrows varying from a few inches to over a foot in length. On the opposite side of the chamber the main burrow continues horizontally for several feet and then turns and rises in an almost true vertical to a small opening at the surface. This escape hole is exceedingly difficult to find, is unmarked by excavated sand, and often partly or completely obscured by debris. It exhibits no noticeable signs of use and would appear to be used entirely as an emergency exit.

Some five burrows were investigated though it was obvious that not all were in current use. In each case the investigation entailed the digging of a trench ten to twelve feet in length, four to five feet deep and up to three feet wide. For a small animal whose body length does not exceed four inches, making a burrow of such length and depth would appear to present a quite considerable task. However, the surface soil is loose and sandy, and the probable reason for the depth of the burrow is that the closer, more compacted subsoil provides firmer walls for the burrow and nesting chamber. Living as it does so far below the surface, the only enemies of *Notomys* would appear to be snakes. That these reptiles could constitute a menace was practically demonstrated whilst examining one of the sites, for after excavating the burrow for some six feet a very lively common brown snake, *Demansia textilis textilis*, emerged from the hole. The snake was about two and a half feet long and quite capable of swallowing a mouse.

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The Hooded Parrakeet (*Psephotellus dissimilis*)

By MRS. F. J. BLAXLAND.

The Hooded Parrakeet is a native of the Northern Territory and is exclusive to that part of Australia. It is generally seen in pairs or small flocks inhabiting open forest lands and spinifex country where it is usually observed feeding on the ground on seeds of grasses and other plants.

This beautiful parrakeet is very often mistaken for the Golden-shouldered Parrakeet. The Hooded is the lovelier, and by far the better known.

The word Psephotus is a Greek word, which means "Inlaid with pebbles," the originator had in mind that although members of the group were uniform in build they differed greatly in colour pattern and taken as a group resembled somewhat the colourful mosaic design adopted by the Greek.

The group comprises seven species indigenous to Australia. They are:—the Red-backed or Grass Parrot, known as the "Grassie"; the Mulga, or, as it is commonly known in some parts, the Many-coloured; the Blue Bonnet, and the little Blue Bonnet or "Naretha," the Hooded, the Golden-shouldered and the Paradise Parrot. The latter is the most beautiful of the family, and is now almost extinct. The size of this family is between the Rosella and the Neophema group, they are all grass seed eaters.

The Red-backed, Many-coloured, Blue Bonnet, and the "Naretha" all choose hollows in the limbs and trunks of trees to build their nests, whilst the three rare species, the Hooded, Golden-shouldered and the Paradise prefer the termite mounds which are peculiar to their habitats.

The Hooded is slim and has a relatively long tail. There is a very marked difference between the sexes. The adult male has a black head, which commences on the forehead and extends to the back of the neck, its name is derived from this hood.

The back is a dark greyish-brown; the upper wing-coverts rich yellow; rump and upper tail-coverts turquoise blue; central tail-feathers bronze green becoming blackish at the tips; under tail-coverts salmon red margined with white. The hinder face, sides of the neck, throat, breast, abdomen, sides of the body and under wing-coverts are turquoise blue. Neville Cayley in "Australian Parrots" calls it Turquoise; Dr. Alan Lendon described it as a vivid bluish green in his book "Parrots in Captivity." I have noticed this colour alters in appearance in difference lights. The bill is greyish white; legs and feet a mealy brown. The average length in the flesh is about 11 inches.

The colouring of the adult female is mainly yellowish olive green with a pale bluish tinge on the cheeks, lower breast, abdomen and rump. The under tail-coverts are salmon tipped with white as in the male.

The immature birds almost exactly resemble the female apart from the yellowish beak which later changes to a horn colour. Hoodeds, whether trapped or aviary bred seem to come into breeding condition in the autumn. I purchased my first pair of Hooded in August, 1952. They went to nest late in March 1953, four eggs were laid and four chicks were duly hatched and reared, two hens and two cocks.

Early in August the hen commenced a second clutch, five eggs being laid, one chick was hatched and reared, a cock.

In 1954 they went to nest towards the end of March. There were three nests, five eggs in the first nest, and five chicks were hatched and reared; 3 cocks, 2 hens. The other two nests had four and five eggs respectively, all were infertile.

In 1955, there were two nests, 5 eggs in each, two chicks were hatched and reared in each nest.

There was only one nest in 1956, 5 eggs, all infertile.

This year, 1957, 4 eggs were laid in their first nest, two chicks hatched and were reared, they are just about to go to nest again.

The incubation period takes twenty-one days and the young birds leave the nest in approximately twenty-eight days, when they are fully feathered.

Incubation is carried out by the hen. The male takes no part in it, except to feed the hen whilst on the nest.

It is difficult accurately to sex the immature birds, although some show brighter blue cheek patches. Both parents feed the young and after they leave the nest continue to feed them for about four weeks, although they are quite capable of fending for themselves soon after leaving the nest. After about a month the parents become very intolerant of their presence, when they have to be removed.

Two clutches are usual in a season, but, occasionally, there are three.

The youngsters are lovely and very playful, they have great fun with a ping pong ball, which I give them to play with.

Towards the end of November the parents begin their moult. The young Hoodeds undergo a moult of body feathers when about three, or four months old. Young males do not begin to assume adult plumage for some considerable time and the transition is not completed until they are about fifteen or eighteen months old.

The nest I use is an elongated box type, 14 in. x 9½ in. x 6½ in., with a hinged lid and spout; decayed wood is used for nesting; the nest is hung in the front part of the shelter.

The aviaries are of wood construction for flights, with fibro shelters, and roof of corrugated fibro; they are approximately 12 ft. x 6 ft. x 3 ft., shelter 5 ft., with earth floor. Ti-tree is placed in the aviary and renewed from time to time, this is hung in the front part of the shelter, it is essential to have twiggy branches for the birds. They have access to iodine nibbles, cuttle bone, charcoal, grit, sand, rock salt, roots and a piece of decayed wood which they spend a lot of time chewing. Their seed is a mixture of 6 parts Hungarian Millet, 1 part Jap, 2 parts White, 2 parts plain Canary; Hulled Oats, rape and Linseed, ½ a part of each. Also plenty of green feed and seeded grasses, including Milk thistles, Dandelion heads, chickweed, also carrot, apple, orange, red crataegus berries. When they are feeding their young they eat a large amount of green peas.

During the mating season the display of the Hooded is very pleasing. The cock alights with great ceremony on the perch near the hen or follows her along the ground in a series of exaggerated hops, the shoulders being simultaneously depressed and the feathers on the head erected in the form of a tiny crest. He also puffs the feathers on his lower breast so that they stand out separately and performs graceful short flights around the hen, holding himself very upright, alighting and walking with a great deal of dignity

The Hooded is a hardy and most attractive aviary bird, but quite unsuited in a mixed collection on account of its pugnacity. In Neville Cayley's "Australian Parrots" under Aviary Notes, it is stated "the Hooded is quite unsuited to cage life," and Tavistock says "no parrakeet suffers more quickly from the effects of very close confinement, even six months in a cage on hard perches will produce overgrown and deformed bill and toenails, wry tail feathers and a general disfigurement."

The Hooded and its kin excavate nesting tunnels in termite mounds or "ant-hills." It is natural for parrots to nest in hollow trees but the Hooded, the Golden-shouldered and Paradise Parrots inhabit sparsely timbered plains where "ant-hills" are often taller and more numerous than the trees. Insufficient hollow trees cause these Parrots to utilise termite mounds. These mounds are numerous, and are from four to twelve feet high and from eighteen inches to ten feet in diameter. They burrow into the mounds to a depth of about one foot and about three-quarters of the way from the bottom of the mound. The entrance is just large enough for the bird to enter, but the nest itself is about six inches in diameter. The eggs are laid on the dirt of the ant bed. They first centred their attention on the holes of the Kingfishers who also find the "ant-hills" the only suitable nesting site in the same flat country. It is interesting to note that any break or exposure of the "ant-hills" upsets their air-conditioning circuit and disastrously affects them and must be urgently and promptly repaired by the termites. If the hard sun-baked clay-like outer wall of the mound is broken a host of brown-coloured termites will be found. These are the workers; the white termites are blind and can only live confined to darkness.

The tough brown-skinned worker can see and face the outside world, his work is to build and repair any breaks, he is as indispensable to the nesting birds as to the termite colony. The birds excavate the burrow but the brown termites make it habitable for them by repairing the break and smoothly plastering over the wall of the tunnel and nesting chamber, and once more the white ants are sealed off; thus the birds and the termites share the same abode and each enjoys its own privacy.

A New Papuan Python

By ERIC WORRELL.

This spectacular python was sent to Sir Edward Hallstrom in 1955. It was kept for several months in the reptile section of Taronga Zoological Park, Sydney, and then died from a head infection.

ACKNOWLEDGMENTS.

Sir Edward Hallstrom, chairman of Taronga Zoological Park Trust, gave me permission to describe the species. Mr. G. Cann, curator of reptiles at Taronga Zoological Park assisted me with the taking of photographs in life. Mr. A. Loveridge of Harvard College, Cambridge, Massachusetts checked the first draft and offered valuable suggestions which have been incorporated in this paper. The drawings were skilfully reconstructed from photographs by Mr. J. Dwyer as the head of the type is swollen and distorted by the infection responsible for its death.

LIASIS TARONGA, sp. nov.

Type: An adult ♂ taken at Lae, Papua, by Mr. T. G. Downs, District Commissioner of Goroka, in 1955. It is now lodged in the Australian Museum, Sydney.

Diagnosis: The scalation most nearly resembles *Liasis childreni* Gray, of northern Australia. Characterized by 48 midbody scale-rows; 282 ventrals; single anal; 57 pairs of subcaudals. Yellow and black above; underside anteriorly lemon-yellow, posterior half black.

Description: Head distinct from neck, form robust. Premaxillary teeth present. Grooved rostral visible from above; internasals less than half length of anterior prefrontals which are separated from frontal by a small ovate azygous shield; frontal almost as broad as long, about as long as but wider than supraoculars; 2 pairs of parietals, posterior pair followed by border of enlarged shields; single nasal; loreal area broken into small shields; 2 preoculars; 2 postoculars; temporals broken into small scales; 8 supralabials, first to third grooved, fifth and sixth enter eye; 14 infra-labials, third to seventh deeply pitted. Total length 246 cm. or 8 ft. 2 in.; tail 25 cm. or 10 inches.

Colour: Above, blue black, a yellow spot inside each nostril, labials posteriorly edged with yellow; flanks with yellow diagonal stripes that merge into the belly colouring. Below, anteriorly lemon yellow with black spots under head; posterior half black with occasional yellow spots.

DISCUSSION.

Liasis taronga is a much larger python than *Liasis childreni*¹. Its head is broader and snout shorter, the labial pits are differently situated and in *childreni* there is only one distinct pair of parietals. It has no close affinity with any known python.

To date only the type-specimen has been recorded. An interesting note accompanied the python from Lae and mentioned that the snake fed on "water-birds, eggs and paw-paws." Mr. George Cann fed the reptile exclusively on rats.

¹ Gray, 1842, Zool. Miscell., p. 44: northwest Australia.

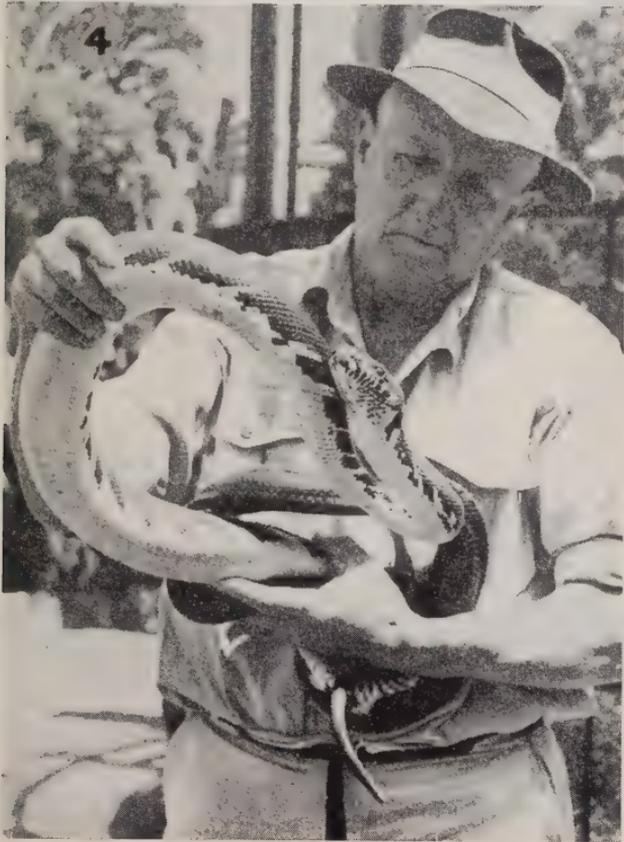
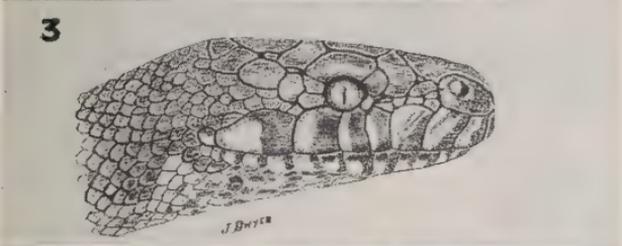
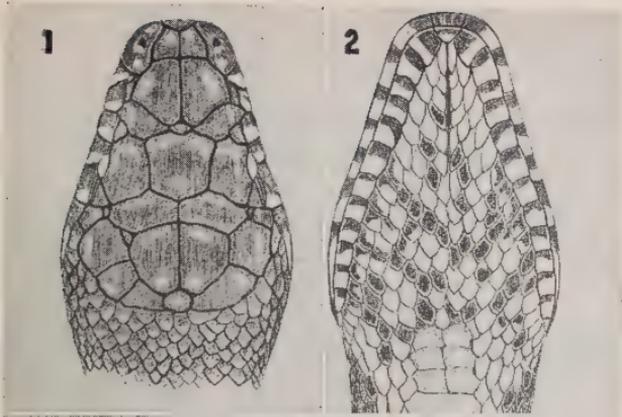
EXPLANATION OF PLATE.

Figure 1. Dorsal aspect of *Liasis taronga*.

Figure 2. Ventral aspect of *Liasis taronga*.

Figure 3. Lateral aspect of *Liasis taronga*.

Figure 4. Mr. G. Cann, curator of reptiles at Taronga Zoological Park, with *Liasis taronga* in life.



Descriptions and Records of Fishes

By GILBERT P. WHITLEY, F.R.Z.S.

(Figures 1-12.)

(Contribution from The Australian Museum.)

Family ALBULIDAE.

Genus ALBULA Scopoli, 1777.

ALBULA VULPES NEOGUINAICA Cuv. & Val., 1846.

Albula vulpes (Linnaeus) McCulloch, Austr. Mus. Mem. v, 1929, p. 35 (refs. & synon.).

Albula neoguinaica Whitley, Austr. Zool. ix, 1940, p. 398, fig. 2.

One (Austr. Mus. regd. No. IB.3753) from Darwin, presented by Mr. T. Milner, constitutes a new record for the Northern Territory.

Family CYPRINIDAE.

Genus RASBORA Bleeker, 1860.

Rasbora Bleeker, Nat. Tijdschr. Ned. Ind. xx, 1860, p. 435. Genus *coelebs*. Tautotype, *Cyprinus rasbora* Buchanan, Fish. Ganges 1822, p. 329, pl. ii, fig. 90, according to Jordan's Genera of Fishes, but Bleeker (Atlas Ichth. iii, 1863, p. 28) selected *R. cephalotaenia* Bleeker.

RASBORA LABUANA, sp. nov.

(Figure 1.)

D. 2, 7; A. 3, 5; P. i. 12; V. 2, 7; C. 17 branched rays. L. lat. 29. Tr. $\frac{1}{4}/1/2\frac{1}{2}$. Sc. round caudal peduncle, 12. Predorsal sc. 12. Preventral sc. 11.

Lower jaw scarcely projecting. Predorsal profile bowed. Form compressed. Head (11 mm.) 3.8, depth (11) 3.8 in standard length (42). Depth of caudal peduncle (6) 1.5 in its length (9). Interorbital (5) 2.2, eye (4) 2.7, snout (4) 2.7 in head. Dorsal (9) 1.2 in body-depth, its origin two scales behind insertion of ventrals, equidistant from ventrals and anal, and over 10th scale of L. lat. Anteriorly projected dorsal-hypural distance falling over front of eye. Anal (9) 1.2 in body-depth. Fins obtusely rounded. Pectoral (10 mm.) reaching anterior ventral rays, whose tips reach anal origin. Lateral line complete.

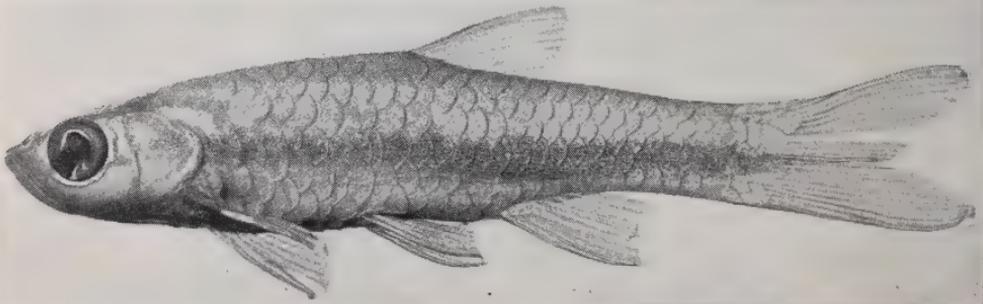


Figure 1.—Labuan Rasbora, *Rasbora labuana*. Type from Labuan.

Photo.—Dr. A. A. Racek.

Colour, in alcohol, straw yellowish, without dark reticulations; fins lighter, plain. A dull grey stripe along middle of back before dorsal fin. Eye blue. An irregular broad dusky grey band extends from gill-opening to tail; its upper margin is ragged or festooned; it is broadest (equal to depth of cheek) about the lower half of the caudal peduncle and narrows to a stripe along middle caudal rays; it crosses all the lateral line tubes except for eight of these above ventral fins. Apparently no light lateral stripe over the dark band. No supra-anal band.

Total length of holotype, 55 mm. A smaller paratype is similar but has some infuscation on dorsal fin, traces of a dark stripe along sides of head, and 12 instead of 11 pre-ventral scales. Australian Museum regd. No. IB.1429.

Loc.—Labuan, off Borneo; presented in 1945 by Flying Officer P. H. Durie who considered it a potential mosquito-destroyer.

Differs from Buchanan's figure of the type-species, *R. rasbora*, in having no dip in the profile over the eye, lower caudal lobe less produced; no dusky caudal marginal, more numerous scales and differs also in the form of the lateral band as described above. The new species is distinguished by its coloration and squamation from the various Malayan ones discussed by Brittan (Bull. Raffles Mus. Singapore, xxv, 1954, p. 129). The colour-pattern is similar to that of *R. einthoveni* in Bleeker's Atlas, but the dark lateral band is straighter, broader, and has its upper edge ragged.

Family LEPTOCEPHALIDAE.

Genus FORSKALICHTHYS Whitley, 1935.

FORSKALICHTHYS NOORDZIEKI (Bleeker).

(Figure 2.)

Conger noordzieki Bleeker, Act. Soc. Sci. Ind. Neerl. Amboyna ii, 1857, p. 86. Amboina (fide Weber & Beaufort, Fish. Indo-Austr. Archip.).

Here figured from a specimen 456 mm. or 18 inches long, from Murray Island, Queensland; the inset shows upper teeth and labial grooves. The teeth are small, uniserial along sides, incisorlike, and there are no teeth outside the closed mouth. Having the dorsal origin above the pectoral instead of behind it, this fish agrees better with Bleeker's species than *cinereus* (Ruppell, 1831) of which the former has sometimes been regarded as a synonym.



Figure 2.—Conger, *Forskalichthys noordzieki*. Queensland.

G. P. Whitley del.

Family ECHELIDAE.

Genus MURAENICHTHYS Bleeker, 1864.

MURAENICHTHYS GODEFFROYI Regan.

(Figure 3.)

Muraenichthys godeffroyi Regan, Ann. Mag. Nat. Hist. (8) iv, Nov. 1, 1909, p. 439. Bowen, Queensland. *Id.* McCulloch & Whitley, Mem. Qld. Mus. viii, 1925, p. 135 (listed). *Id.* Schultz & Woods, Journ. Wash. Acad. Sci. xxxix, 1949, p. 172 (in key). *Id.* Munro, Fisher. Newsletter xvi, 5, May 1957, p. 16; Handbook Austr. Fish. xi, p. 46, No. 328.

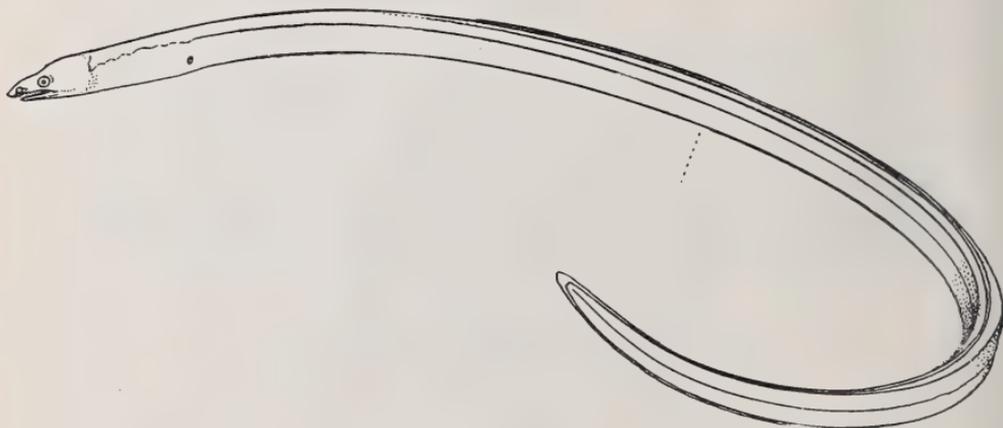


Figure 3.—Worm Eel, *Muraenichthys godeffroyi*. Holotype. Queensland.

A. Fraser-Brunner del.

Some years ago, Mr. A. Fraser-Brunner kindly made the drawing of the holotype in the British Museum from which the accompanying illustration is taken.

Family MURAENIDAE.

Genus FIMBRINARES Whitley, 1948.

FIMBRINARES MOSAICA Whitley.

(Figure 4.)

Fimbrinares mosaica Whitley, Rec. Austr. Mus. xxii, 1948, p. 72. Point Banks, New South Wales.

The holotype of this species is still unique and is here figured for the first time.

Genus LYCODONTIS McClelland, 1844.

Genus LYCODONTIS LONGINQUUS Whitley.

(Figure 5.)

Lycodontis longinquus Whitley, Rec. Austr. Mus. xxii, 1948, p. 73. Mackay, Queensland.

Here illustrated from the holotype.

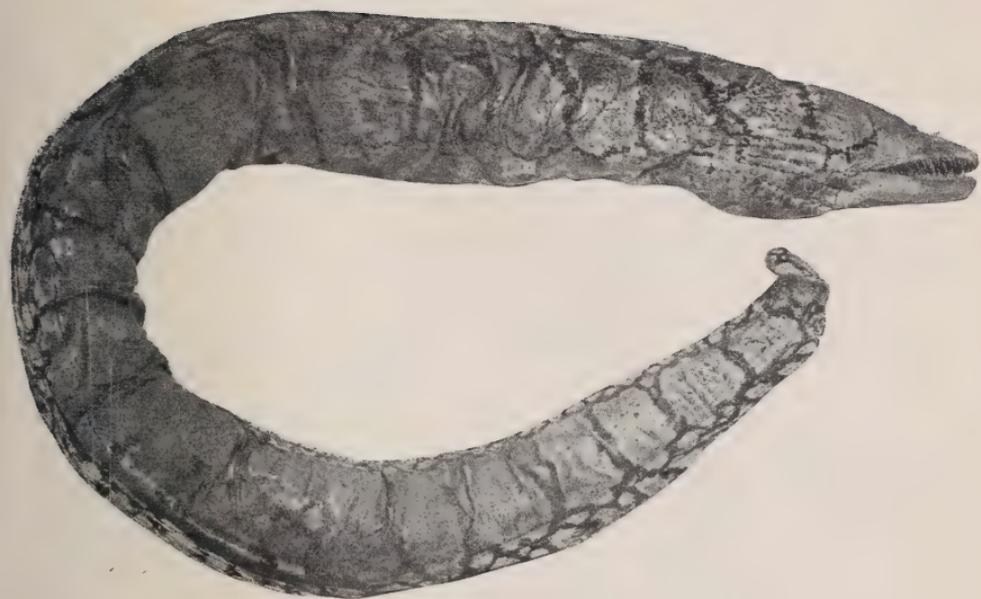


Figure 4.—Reef Eel, *Fimbrinares mosaica*. Holotype. New South Wales.
G. C. Clutton photo.

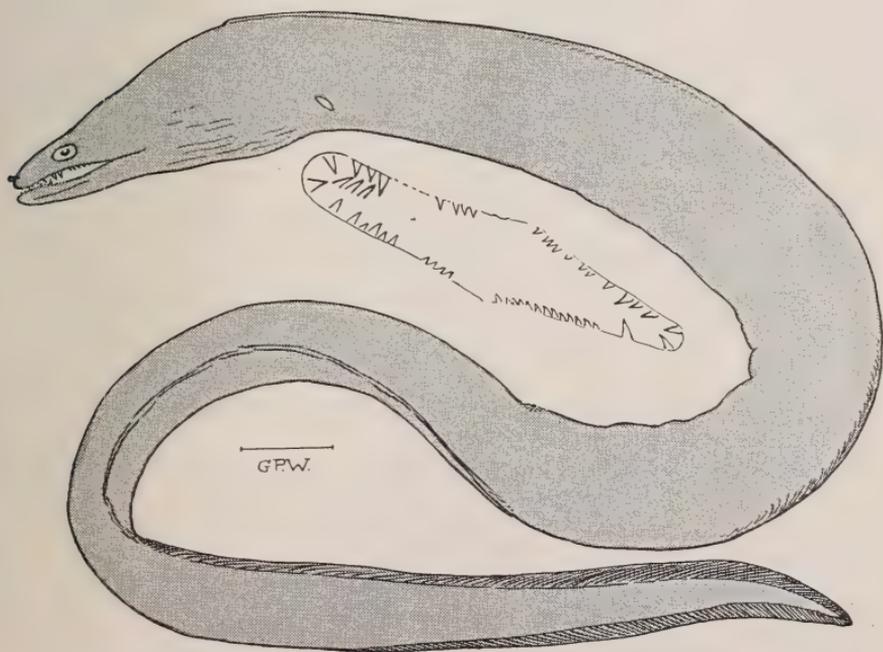


Figure 5.—Moray, *Lycodontis longinquus*. Holotype. Queensland.
G. P. Whitley del.

Family EVERMANELL.

Genus EVERMANELLA Fowler, 1901.

EVERMANELLA BORODINI, sp. nov.

Odontostomus balbo atlanticus Borodin, Bull. Mus. Comp. Zool. lxxii, 3, 1931, p. 78.

Anticipated by *Evermannella atrata atlantica* Parr, Bull. Bingham Ocean. Coll. iii, 3, 1928, pp. 7, 163, and 166.

Since *Odontostomus* is preoccupied and has been made a synonym, of *Evermanella*, it follows that Borodin's name is anticipated; and I accordingly rename his species *borodini*.

Family STROMATEIDAE.

Genus SERIOLELLA Guichenot, 1849.

SERIOLELLA NOEL, sp. nov.

D. x (+?, injured), 31; A. 2, 30; P. 14; V. i, 5; C. 15 main rays.

L. lat. circa 95 to hypural joint + 8 or so to tail.

Head (91 mm.) 3.6, depth (100) 3.3 in standard length (331).

Eyes (20 to 22) 4.1 to 4.5 in head. Gill-rakers 8/16 (incl. 2 rudiments).

Top of head and predorsal area naked, gelatinous. Mouth not reaching eye. Very fine teeth on jaws, none on vomer or palatines. Nostrils near tip of snout. Maxillary slipping under preorbital.

Body robust, elongate, without conspicuous pores.

L. lat. follows curve of back with about 95 tubes to hypural joint + 8 to base of tail, just over a hundred altogether. Dorsal with at least ten spines, lower than lobe of dorsal fin. Pectorals slightly falcate, 38 mm. long, not reaching level of dorsal rays or vent, and with fewer rays than usual in the genus.

Dark purplish grey above gradating to silvery grey below. Coloration uniform; no conspicuous dark spot behind head or on body. Fins dark brownish-grey. Inside of gill-openings blackish. Inside of mouth leaden grey. Pupil greyish blue. Iris grey with silvery and coppery areas.

Described from the unique holotype, Austr. Mus. regd. no. IB.3890, a specimen 15 inches overall and 2 lb. in weight.

Locality: Beauty Point, Middle Harbour, near Sydney, New South Wales; December 17, 1957. Mr. Basil Davidson.

Distinguished by its fin-counts, reduced pectorals, coloration, etc., from its congeners:—

ampla Griffin, Trans. N. Zeal. Inst. lix, 1928, p. 376, pl. lviii, fig 3. New Zealand.

antarctica Carmichael, Trans. Linn. Soc. Lond. xii, 1819, p. 501, pl. xxv. Tristan da Cunha.

brama Gunther, Cat. Fish. Brit. Mus. ii, 1860, p. 390. New Zealand (syn. *Neptonemus travale* Castelnau, 1872)

caerulea Guichenot in Gay, Hist. Chili (Peces), ii, 1849, p. 242. Juan Fernandez Id.

christophersenii Silvertsen, Res. Norweg. Exp. Tristan da Cunha, xii, 1945, p. 23, pl. i, fig. 16. Tristan da Cunha.

crassa Starks, Proc. U.S. Nat. Mus. xxx, 1906, p. 784, fig. 8, Callao. Peru.

dobula Gunther, Proc. Zool. Soc. Lond. 1869, p. 429. Tasmania.

maculata Forster, Neuesten Reisen i, 1794, Tagebuch White, p. 131-132, No. 7. New South Wales. (Syn. *Scomber punctatus* Bloch and Schneider, 1801 and *Neptonemus bilineatus* Hutton, 1872.)

porosa Guichenot in Gay, Hist. Chili (Peces), ii, 1849, p. 239, pl. vii, fig. 2. Chile.

velaini Sauvage, Arch. Zool. Exper. viii, 1879, p. 32, pl. i, fig. 2. St. Paul.

violacea Guichenot in Gay, Hist. Chili (Peces), ii, 1849, p. 241, pl. vii. Chile.

Family MELANOTAENIIDAE.

Genus ANISOCENTRUS Regan, 1914.

ANISOCENTRUS CAMPSI Whitley.

Anisocentrus campsi Whitley, Rec. Austr. Mus. xxiv, 1956, p. 26, fig. 1. Jimmi River, New Guinea.

Centratherina tenuis Nichols, Amer. Mus. Novit. 1802, 1956, p. 1, fig. 1. Kondiu, Wahgi Valley, New Guinea.

Nichols' species is evidently a synonym of mine, of earlier date, his name having been published December 7th and mine November 23rd, 1956. The few discrepancies in our descriptions may be accounted for by variation.

Family MENIDAE.

Genus MENE Lacepede, 1803.

MENE MACULATA (Bloch & Schneider).

Zeus maculatus Bloch & Schneider, Syst. Ichth., 1801, p. 95, pl. xxii. Tranquebar.

Mene anna-carolina Lacepede, Hist. Nat. Poiss. v, 1803, p. 479. Based on a Chinese painting ceded to France by Holland.

Meneus Rafinesque, Anal. Nature, 1815, p. 88.

Mene maculata of modern authors. *Id.* McCulloch, Mem. Qld. Mus. vii, 1922, p. 241, pl. xiv, fig. 2 (Queensland).

This remarkable fish, for which I suggest the popular name Razor Trevally, may now be recorded from New South Wales since Mr. H. W. Lane of Ballina preserved a specimen from the estuary of the Richmond River in July 1957 (Austr. Mus. regd. No. IB.3784).

Family CHANDIDAE.

Genus GYMNOCHANDA Fraser-Brunner, 1954.

GYMNOCHANDA FILAMENTOSA Fraser-Brunner.

Gymnochanda filamentosa Fraser-Brunner, Bull. Raffles Mus. xxv, 1954, p. 210, fig. 4. Southern Malaya.

Ambassis lala Todd, Tropical Fish Book (Fawcett Book 307), 1956, p. 124, fig. Not *Chanda lala* Hamilton Buchanan, Fish. Ganges, 1822, 114, pl. xxi, fig. 39.

Gymnochanda filamentosa (as a new genus and species) Boeseman, Zool. Meded. xxxv, 7, 1957, p. 75, pl. iii. Singapore.

Boeseman's homonym is also a synonym of Fraser-Brunner's name for the Glass Angel Fish of the aquarists.

Family APOGONIDAE.

Genus APOGON Lacepede, 1802, s. 1.

APOGON NOUMEAE, sp. nov.

D. vii/i, 10; A. ii, 9; P. i, 13-14; L. lat. c. 20 to hypural; Tr. 2/1/7; Predors. 3.

Head (27 mm.) 2.4, depth (27) 2.4 in standard length (67).

Eye (10) 2.7 in head; snout (8), and interorbital (8) 3.3; length of

upper jaw (12) 2.2; least depth of caudal peduncle (11) 2.4 in head. Longest pectoral ray (18) 3.7 in standard length.

Anterior nostril with tube, posterior a pear-shaped opening. Teeth villiform, no canines, present in irregular rows on vomer and along palatines. Tongue rounded. Anterior margin of preoperculum entire, posterior margins serrated. Suborbital entire, also maxillary, which reaches below pupil. Less than 20 gill-rakers on first gill arch, many longer than gill-filaments.

Form rather deep and compressed. No silvery gland. Lateral line complete. Scales ctenoid, with about 12 basal crenulations, deciduous. Caudal peduncle nearly a quarter of standard length.

Third dorsal spine longest (16 mm.), slightly longer than spine in front of second dorsal fin. Two dorsal fins separate. Ventral rays reach second and spine. Caudal fin bilobed.

Colours in formalin: Ground-colour creamy yellow finely punctulated with brownish grey. Head more densely infuscated with ill-defined oblique dusky bars from eye across preopercle. Body with several irregular blotches of purplish to brownish grey colour; the first descends from spinous dorsal base to behind pectoral fin in a wedge tapering below, the second is ill-defined below the second dorsal and has a horizontal similar bar below it and above the dusky area over anal base; the last dark blotch occupies most of the back and posterior part of the caudal peduncle. The wedge-like first bar and the horizontal one below the second have milky reflections. Pectoral base infuscated but not dark or dusky. Most of the fins (except the white pectorals) very dark greyish brown tending to form a black blotch on the middle soft rays of the dorsal fins. The dark fins have lighter areas near their bases. Eye blue. Inside of mouth pale greenish.

Described from the unique holotype, a specimen slightly more than $3\frac{1}{2}$ inches long, from Noumea, New Caledonia, from Dr. R. Catala's Aquarium Austr. Mus. regd. No. I.B. 3844.

Distinguished from its congeners in the above combination of characters.

Perhaps nearest *A. novaeguineae* Valenciennes (Nouv. Ann. Mus. Hist. Nat. Paris, i, 1, May, 1832, p. 53, pl. iv, fig 1), but has more fin rays and blotched coloration.

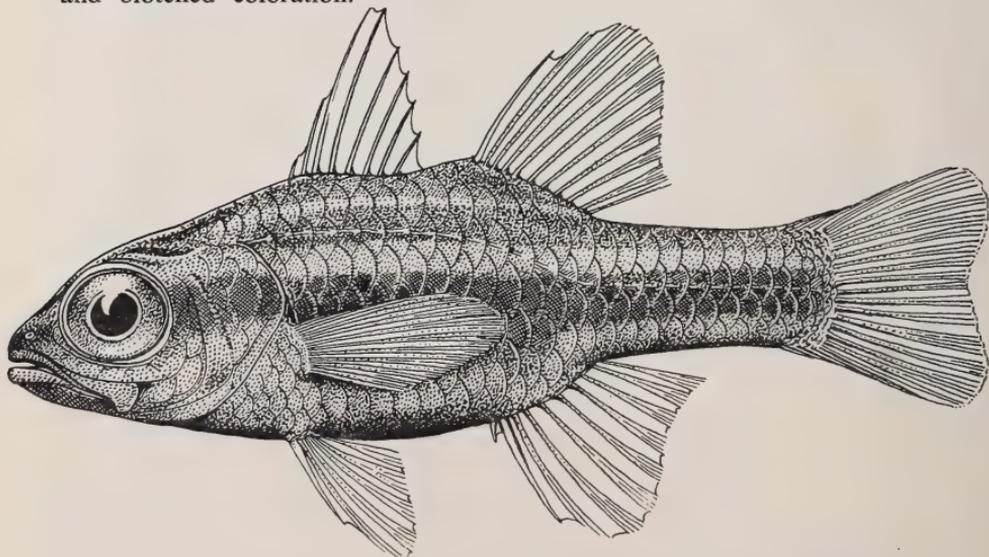


Figure 6.—Black Soldier Fish, *Apogon aterrimus*. Holotype. Queensland.
A. Fraser-Brunner del.

APOGON ATERRIMUS Gunther.

(Figure 6.)

Apogon aterrimus Gunther, Ann. Mag. Nat. Hist. (3) xx, July 1, 1867, p. 58. Cape York, Queensland. *Id.* Macleay, Proc. Linn. Soc. N. S. Wales v, 1881, p. 346; Descr. Cat. Austr. Fish. i, 1881, p. 46. *Id.* McCulloch & Whitley, Mem. Qld. Mus. viii, 1925, p. 146.

Figure 6 was made from the still unique holotype of this species in the British Museum (Natural History) by Mr. A. Fraser-Brunner and is the first illustration thereof.

Family MALACANTHIDAE.

Genus MALACANTHUS Cuvier, 1829.

MALACANTHUS HOEDTI Bleeker.

Malacanthus hoedti Bleeker, Act. Soc. Sci. Indo-Neerl. vi, 1859, p. 18. New Guinea. *Id.* Marshall, Ich. Notes i, 3, 1957, p. 121. And of authors.

This species was recorded from Australia for the first time by Marshall (1957), from off Cape Moreton, Queensland. It occurred in New South Wales many years ago, a drawing of one captured on a line at Byron Bay having been so identified by the late A. R. McCulloch in 1914.

New record for New South Wales. The Australian Museum has specimens from Nauru, Bali and Lord Howe Island.

Family AMPHIPRIONIDAE.

Genus AMPHIPRION Bloch & Schneider, 1801.

AMPHIPRION CHRYSOGASTER Cuv. & Val.

Amphiprion chrysogaster Cuvier & Valenciennes, His. Nat. Poiss. v, July, 1830, p. 400. Bourbon (type) & Mauritius. *Id.* Schultz, Proc. U.S. Nat. Mus. ciii, 1953, p. 193, pl. ix, fig. E (q.v. for refs. & synonym.).

One specimen, 43 mm. long (Austr. Mus. regd. No. 1B. 3893), from Heron Island, Capricorn Group, Queensland, given to Mr. Harold Cogger by an aqualung diver who obtained it in more than 15 feet of water over the reef edge on December 31, 1956.

New record for Australia.

Family CALLYDONTIDAE.

Genus CETOSCARUS Smith, 1956.

Cetoscarus Smith, Rhodes Univ. Ichth. Bull. i, Jan. 1956, pp. 4 & 16. Orthotype, *Scarus pulchellus* Ruppell.

CETOSCARUS BICOLOR (Ruppell).

(Figure 7.)

Scarus bicolor Ruppell, Atlas zu Ruppell (Senckenberg. Nat. Ges.), Fische 15, 1829, p. 82, pl. xxi, fig. 3. Djetta, Red Sea.

? *Scarus lunulatus* Cuvier & Valenciennes, Hist. Nat. Poiss. xiv, 1839, p. 268. Red Sea. And as *bicolor* on p. 196.

Petronason bicolor Swainson, Nat. Hist. Classif. Fish. Amph. Rept. ii, 1839, p. 226.

Pseudoscarus nigripinnis Playfair, Fish. Zanzibar, 1866, p. 105, pl. xv, fig. 2. Zanzibar.

Pseudoscarus bicolor Bleeker, Atlas Ichth. i, 1862, p. 33, pl. xiv. *Id.* Weber, Rept. Siboga Exped., Fische, 1913, p. 384.

Callyodon bico'or Fowler & Bean, Bull. U.S. Nat. Mus. 100, vii, 1928, p. 496 (refs. & synon.). *Id.* Marshall, Ichth. Notes i, 1951, p. 5 (Mackay, Q.).

Scarus ophthalmistius Herre, Copeia 1933, p. 21. Jolo, Philippines.

Cetoscarus bicolor Smith, Rhodes Univ. Ichth. Bull. i, 1956, p. 17, pl. xlv, figs. C, D, & E.

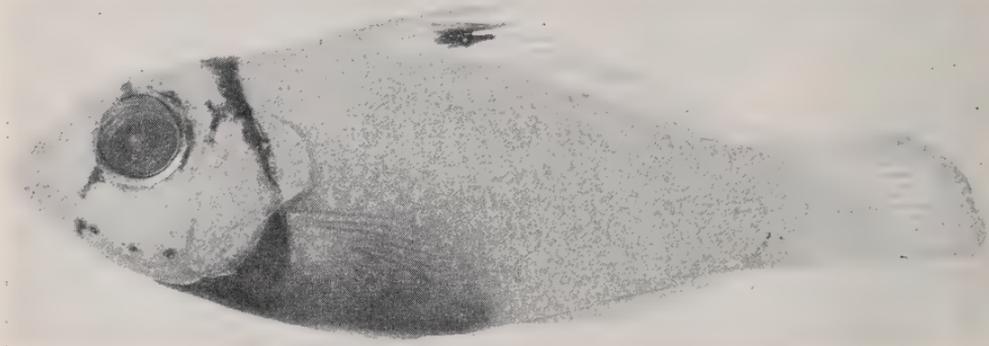


Figure 7.—Young Parrot Fish, *Cetoscarus bicolor*. New Caledonia.
Photo.—A. A. Racek.

Here figured from a juvenile, 28.5 mm. in standard length or $1\frac{3}{8}$ in. overall (formalin specimen No. 1B.3830) from the aquarium at Noumea, New Caledonia (Dr. R. Catala). Another example trebled the size of this one yet retained the juvenile coloration, which is like that shown on Smith's plate xlv, fig. C.

Fishes with prominently marked opercular regions, popularly regarded as being like a face bandaged for toothache, are unusual and are sometimes associated with coelenterates. Whether *Cetoscarus bicolor* has any preference for the vicinity of corals or sea-anemones is not known, but *Amphiprion* and *Actinicola* are commensal with anemones, Franz's "Seranidae nov. spec." (Abh. Akad. Wiss. Munchen, Suppl. Bd. iv, 1911, p. 42, pl. 1) is symbiotic with the soft coral *Astraea*, and *Tetradrachmum* favours certain corals. Other fishes with conspicuous light opercula are juvenile *Promicrops*, some *Scolopsis* such as *vosmeri* and some young *Coris*.

J. L. B. Smith (Ichth. Bull., Rhodes Univ. 8, 1957, p. 118) remarked of "*Coris greenovii*" juveniles of *Coris formosa* and *C. gaimard africana*, "at rest on the bottom they exactly resemble fragments of shell and are difficult to recognise as fishes except at close range."

Family CORIDAE.

Genus GUNTHERIA Bleeker, 1862.

Guntheria Bleeker, Proc. Zool. Soc. London 1861 (April 7, 1862), p. 413; Versl. Akad. Amsterdam xiii, 1862, p. 101. Orthotype, *Halichoeres coeruleovittatus* Ruppell, Neue Wirbelth. Abyssin., Fisch, 4, 1835, p. 14, pl. iv, fig. 1, from Djetta, Red Sea.

The type-species differs from the new one to be described below in having the ventral fins reaching farther back, caudal truncate, in its coloration (large red blotches on head joined to zigzag marks on body) and is of larger size (about 7 as against about $3\frac{3}{8}$ inches long).

Key to Australian species of *Guntheria*:—

- A. A dark zigzag band from below eye to behind soft dorsal fin
Guntheria ziczac (De Vis, 1885)
- AA. No zigzag band.
- B. Small scales on cheeks and large scales on opercles. Pale yellow with olive band along upper sides; oblique dusky bars through eye; small dark blotch on side near tip of pectoral; black spot on upper part of root of tail *devisi* Whitley, 1941
- BB. Patch of scales over upper part of operculum. Greenish to yellowish with diffuse dark blotch on side and a smaller dark spot on upper portion of caudal peduncle
trimaculata (Griffith, 1834)
- BBB. A few vestigial scales behind eye over opercle. No dusky spots or bars *vestalis*, sp. nov.

GUNTHERIA VESTALIS, sp. nov.

D. ix, 11; A. iii, 10; P. 14; L. Lat. 27. Tr. 2/1/9. About 10 small predorsal scales reaching about level of eye.

Head (25 mm.) 3.2, depth (23.5) 3.5 in standard length (80). Eye (5) 5, interorbital (6) 4.1 in head.

Head practically naked, only a few vestigial scales behind eye over opercle. Curved canines not flaring outwards, four in front of upper and lower jaws; a couple of smaller canines behind those of upper jaw anteriorly. Lateral teeth uniserial. Two posterior canines. Lips normal. Preopercular margin entire. Gill-membranes united to each other and to isthmus. Form rather deep, compressed. Thoracic scales not enlarged.

L. lat. continuous, bent behind. No scaly sheaths to dorsal and anal fins. Dorsal spines not elevated, their membranes penicillate, the front spines not divergent. Ventrals pointed, reaching four scales from the vent. Pectorals rounded, upper rays longest. Caudal rounded.

Colours in life (*teste* Mr. T. C. Marshall): "General colour light olive above, whitish below, each scale with a slightly crescentic bar: an orange bar from snout to eye, another below eye and some orange spots behind eye and on top of head: a bright canary-yellow spot, as big as eye, on caudal peduncle: dorsal hyaline pink with vermiculations of pale orange; caudal similar but very pale: a very small black spot at base of pectoral."

Described from the holotype, 94 mm. or about 3 $\frac{3}{4}$ inches long. Registered No. 1229 in the Department of Harbours and Marine, Brisbane, Queensland, submitted to me for report in 1952.

Locality.—Lady Musgrave Island, Queensland.

Family SARDIDAE.

Genus PARATHUNNUS Kishinouye, 1923.

Parathunnus Kishinouye, Journ. Coll. Agric. Univ. Tokyo viii, 1923, pp. 433 & 442. Haplotype, *Thunnus mebachi* Kishinouye.

PARATHUNNUS MEBACHI Kishinouye.

Thunnus mebachi Kishinouye, Sui. Gak. Ho i, 1915, p. 19, pl. i, fig. 11. Japan.

Parathunnus mebachi Kishinouye, Journ. Coll. Agric. Univ. Tokyo viii, 1923, p. 442, figs. 4, 22, 47 & 49. *Id.* Fowler, Proc. Amer. Philos. Soc. lxxxii, 1940, p. 764, fig. 43. *Id.* Godsil & Byers, Calif. Fish. Bull. lx, 1944, p. 3, figs. 1 et seq. *Id.* Munro, Ich. Notes i, 3, 1957, p. 145, fig. 1. *Id.* Collier, Anglers' Digest Shooters' Monthly (Sydney), Dec. 1957, p. 7.

This species may be added to the New South Wales list as Mr. Bert Collier has sent me notes and a photograph of it from off Coff's Harbour.

He observed these Big-eyed Tuna from February to April in various years since 1939. They are of an "old lead" colour, with yellow finlets, and reach about 12 lb. in weight. Japanese fishermen catch this species off the eastern Australian coastline.

Family SYNAPTURIDAE.

Genus TRICHOBRACHIRUS Chabanaud, 1937.

Trichobrachirus Chabanaud, Mem. Inst. Egypte XXXII, 1937, p. 47; Bull. Mus. Hist. Nat. Paris (2) xv, 1943, p. 292. Orthotype, *Synaptura villosa* Weber, 1908, from southern New Guinea.

The following species is tentatively ascribed to this genus pending detailed osteological study for which sufficient specimens are not available. It seems feasible that *Brachirus salinarum* Ogilby and *breviceps* Ogilby from Queensland and *Synaptura villosa* Weber from New Guinea may ultimately prove to be synonyms of *selheimi*. The generic name *Brachirus* is pre-occupied and *Synaptura* is of doubtful status. According to Chabanaud (Comptes rendus seances Soc. Biogeogr. 281, 1955, p. 103) Cantor's genus *Synaptura*, in the strict sense, contains six species, the genotype being *commersoni*, a species which Chabanaud had earlier (Bull. Mus. Nat. Hist. Paris (2) ix, 1937, pp. 193 et seq.) regarded as being of very doubtful status, as had also Fowler (Proc. Acad. Nat. Sci. Philad. xci, 1940, p. 383). Originally described from the Isle of France, the species usually regarded as *commersoni* has since been figured by Chabanaud (Arch. Mus. Paris (6) xv, 1938, p. 85, pl. ix, fig. 24, text-figs. 1 & 5-8). The Australian Museum has one of Day's specimens of "*commersoni*" from Sind, India. This elongate species (its depth is less than 30% of its total length), with pointed tail, more numerous and more strongly ctenoid scales, and both lips fimbriated, differs very markedly from *selheimi*.

TRICHOBRACHIRUS? SELHEIMI (Macleay).

(Figure 8.)

Synaptura selheimi Macleay, Proc. Linn. Soc. N. S. Wales vii, 1, May 23, 1882, p. 71. Palmer River, Queensland. Types lost. *Id. ibid.* ix, 1884, p. 51, and of later Australian lists. *Id.* Ogilby, Commerc. Fish & Fisher. Qld., 1916 ed., p. 13; 1954 ed., p. 23. *Id.* Chabanaud, Bull. Soc. Zool. France lix, 1934, p. 434 (may be a *Zebrias*). *Id.* T. C. Marshall, Ichth. Notes iii, 1957, p. 136 (Tate R., Q.). *Id.* Boyes, Brisbane Aquarium Club Monthly Newsletter xiv, 1957, p. 2 (Mitchell R., Q.).

Brachirus selheimi Norman, Biol. Res. Endeavour v, 1926, p. 294.

Zebrias selheimi Whitley, Proc. Roy. Zool. Soc. N. S. Wales 1954-5 (1956), p. 41.

Trichobrachirus selheimi Whitley, Aqua Life ii, Dec. 1957, p. 24, fig. . . .

This species was described from the Palmer River, a tributary of the Mitchell River, north Queensland, three-quarters of a century ago, the types were lost many years ago, and the species was known only from Macleay's description until 1957 when T. C. Marshall (loc. cit.) recorded it from the Tate River, another tributary of the Mitchell. Mr. Marshall very kindly lent me a specimen of this rare sole for figuring. In Brisbane, in June 1957, we both saw a living specimen in Mr. Frank Boyes' aquarium; it had been two years in captivity and was about $2\frac{3}{4}$ inches long; originally it had come from the head waters of the Mitchell River. It usually lies buried in sand but is a very active swimmer when disturbed. At night, it sometimes sticks to the glass of the aquarium by its blind side. Its dark brown head and body changed to yellowish-brown and, like the deep straw-yellow fins, were plentifully speckled with dark sooty spots, those along the lateral line forming a notable row. There were other dark spots on the eyelids and the blind side was milky blue to whitish.

Following is a description of a Tate River fish (Dept. of Harbours and Marine, Brisbane, registered No. 1774), with a diagram.

D. 69; A. 54; P. left 5, right 4; V. 5; C. 15. About 80 scales along straight part of l. lat. to hypural joint, plus a few more on tail; about 100 such scales on blind side.

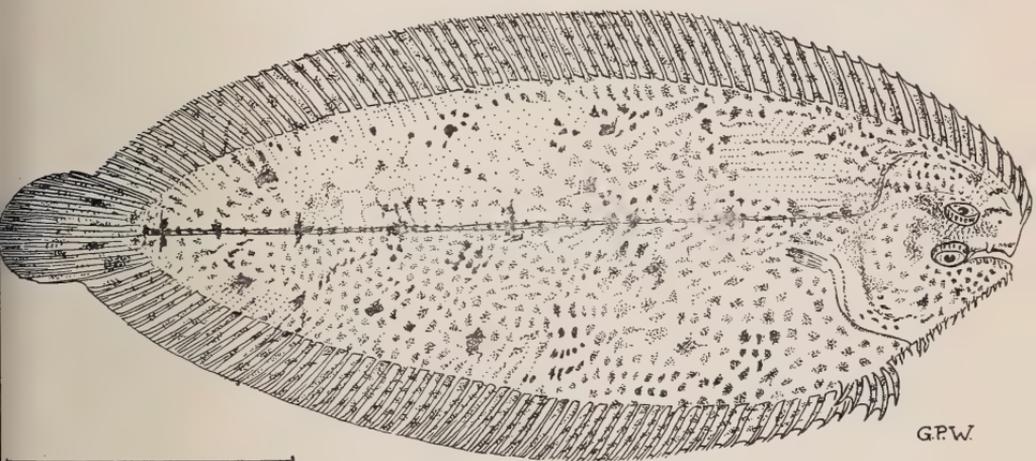


Figure 8.—Freshwater Sole, *Trichobranchirus selheimi*. Tate River, Queensland.

G. P. Whitley del.

Head (15 mm.) 5.2 in standard length or 6.1 in total length (92) or 19% and 16% of same respectively. Depth (29 mm.) 2.7 in, or 37% of, standard length or 3.1 in, and 31% of, total length. Eyes (4) 3.7 in head, Postorbital (9) 1.6 in head. Gape (5 mm. or 4 on blind side) subequal to snout (nearly 5). Length of pectoral fin, 4 mm. on eyed side, 3 on blind side. Length of caudal nearly 19 mm. Standard length 78 mm. Total length 92 mm., nearly $3\frac{3}{4}$ inches.

Snout not produced into a long hook; dorsal rays not extending to its tip. Upper jaw slightly longer than lower. Lower lip fimbriate on eyed side, entire on blind side. Inhalant nostril of eyed side a short tube overhanging upper lip, nearer eye than tip of snout; exhalant nostril just before lower eye. Nostrils of blind side hidden by sensory flaps. Interorbital concave, scaly; five rows of scales between tops of eyes. Upper eye largely in advance of lower which is near rictus; a shallow depression behind upper eye. Interbranchial septum not perforated. Gill-openings wide, united across isthmus. The branchiostegal membrane ends before the pectoral base on the eyed side and overlaps the uppermost pectoral ray on the blind side.

Head, body, and most of fins scaly. Scales of head subequal to those on body, with convex anterior margins. Anterior, lower and posterior surface of blind side of head with skinny papillae. Scales of eyed surface strongly ctenoid; of blind side weakly ctenoid, becoming cycloid anteriorly on head and body. About 27 to 30 rows of scales between lateral line and belly or back, plus small ones on fin bases. Lateral line along middle of sides with steeply ascending pericranial portion. Vent between ventral fins, displaced to left of median axis. Two small urinary papillae, to left of first anal ray and close to anus.

Dorsal fin originating over front of snout at level of upper eye, its tenth ray 6 mm. long and middle ones 7. Anal fin originating between ventrals, 15 mm. from chin; its anterior rays 5 mm. long and middle ones 7. Both pectoral fins developed, though small, with four or five rays. Pectoral of eyed side very slightly longer than diameter of eye, the 2nd and 3rd of its 4 rays longest. Ventral fin each side of median line, slightly asymmetrical, its second ray longest, its base ending before level of pectoral base; its last ray not modified and joined to side of fish by membrane, not to anal fin. Caudal rounded, its rays all branched, like the majority of the unpaired fins' rays, and extending beyond the posterior rays of the dorsal and anal fins, which are united to it by membrane.

Family SOLEIDAE.

Genus LIACHIRUS Gunther, 1862.

Liachirus Gunther, Cat. Fish. Brit. Mus. iv, 1862, p. 479. Haplotype, *L. nitidus* Gunther, from China. *Id.* Ogilby, Mem. Qld. Mus. v, 1916, p. 141. *Id.* Weber & Beaufort, Fish. Indo-Austr. Archip. v, 1929, p. 158. *Id.* Chabanaud, Bull. Mus. Hist. Nat. Paris (2) xxii, 1950, p. 563, especially concluding paragraph.

The following species was discovered in north-western Australia by the late Arthur Livingstone in 1929, but was named (in error) as from "la cote orientale du Queensland, district de Livingstone." The correct type-locality is between Broome and Cape Bossutt, Western Australia.

LIACHIRUS WHITLEYI Chabanaud.

(Figure 9.)

Aseraggodes sp. Whitley, Austr. Mus. Mag. ix. 11, 1949, pp. 383 & 384, fig.

Liachirus whitleyi Chabanaud, Bull. Mus. Hist. Nat. Paris (2) xxii, 5, 1950, p. 563. *Id.* Musgrave, Austr. Journ. Sci., Aug. 1952; Austr. Sci. Abstr. suppl. xxx, 1, 1952, p. 1, ex Whitley, MS. (correct type-loc.).

D. 76; A. 56; P.O.; V. 5; C. 18. L. Lat. 73 from shoulder to hypural + 5 on tail. L. tr. 24/1/24.

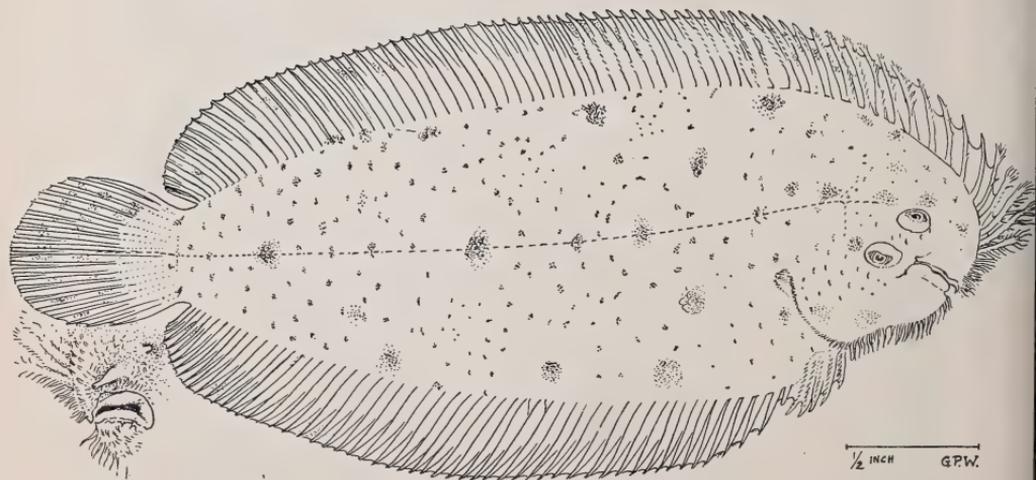


Figure 9.—Bearded Sole, *Liachirus whitleyi*. Holotype. Western Australia. G. P. Whitley del.

Head (18 mm.) nearly 4.3, depth (30) 2.6 in standard length (77) or about one-third of total length (93.) Eyes, 3 mm.; snout, 7; interorbital, 1.6; postorbital, 9; depth of caudal peduncle, 9; caudal fin about 15 mm.

Eyes on the right side, separated by scaly, concave interorbital more than half their diameter. About 7 scales between upper eye and back; 3 to 4 between eyes; 15 postocular. Upper eye level with 1. lat. Lower eye under posterior half of upper. On the eyed side, the anterior nostril has a large tube opening backwards above the lips and before lower eye, and overlying the posterior nostril which opens near the upper lip. On the blind side, the anterior (inhalant) nostril has a long tapering tube over front half of mouth and the posterior (exhalant) nostril is a simple opening above end of mouth; neither is dilated or fimbriated. Snout with a slight hook. Mouth-opening strongly curved, reaching below anterior half of lower eye. No teeth. Lips not fimbriate; on the blind side they are curled and fleshy with a pad of plicae inside the mouth. Anterior edge of head with numerous sensorial fringes. Gill-openings fimbriate on both sides.

Body strongly compressed, covered with cycloid scales (some scales near tail are weakly ciliated) of about the same size on both sides and not extending over fins. Scales of head, breast and back on blind side with sensory filaments; on eyed side without any filaments. Lateral line descending on both sides from near level of upper eye to caudal base, its tubes simple, extending along most of exposed surfaces of scales. It divides into three short branches behind upper eye and above origin of ventral fin but there is no accessory 1. lat. system on top or front of head on either side. Urinary papilla displaced to left side, not scaled behind ventrals.

Dorsal originating at level of lower eye, little above mouth; first few rays largely free of membrane and tasselled; height of dorsal about $3\frac{1}{2}$ in body below it. Anal similar to posterior part of dorsal, its first and last rays short. Fin-rays (except in caudal) simple, those of dorsal, anal and ventrals with broad proximal folds forming backwardly directed scoops, sometimes with short lateral processes. No pores at bases of rays. Pectorals absent. Ventral united to one another and to anal by membranes; the right ventral is slightly larger than the left and its longest rays reach third anal ray. Caudal rounded, most of its rays branched, free from dorsal and anal fins which have no posterior membranes.

Colour, in alcohol, uniform sandy-brown on blind side; eyed side sandy-brown with about seventeen large scattered reddish-brown blotches on head and body and, apart from these, numerous dark brown spots; a few spots extend on fins but the latter are mostly plain. Eyes sandy with some silver near the blue pupil.

Described and figured from the holotype, 93 mm. or $3\frac{3}{4}$ inches overall. Austr. Mus. regd. No. IA.4227.

Loc.—Dredged between Broome and Cape Bossutt, Western Australia, in 5 fathoms, by Mr. A. A. Livingstone in September or October 1929.

LIACHIRUS KLUNZINGERI (Weber).

(Figure 10.)

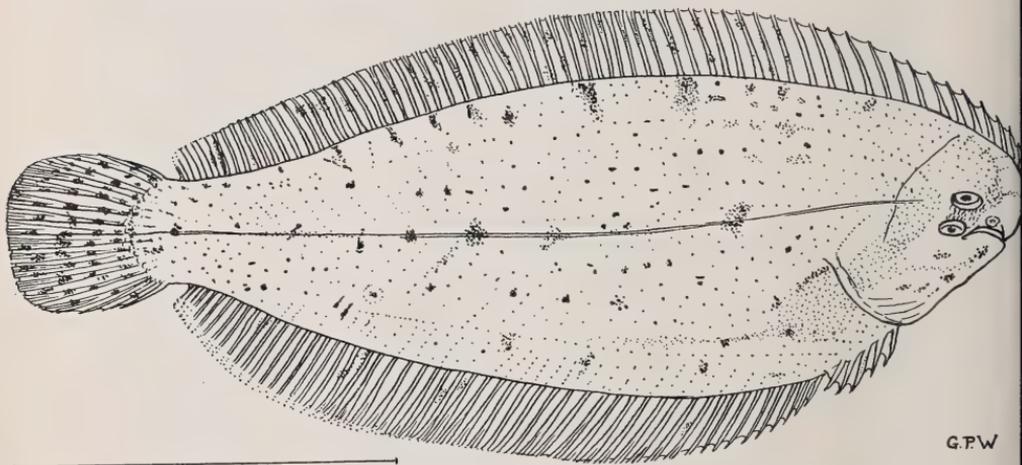
Pardachirus klunzingeri Weber, Nova Guinea v 2, 1908, p. 250, pl. xiii, fig. 2. Merauke River, New Guinea.

Aseraggodes klunzingeri Weber, Nova Guinea ix, 4, 1913, p. 588. *Id.* Weber & Beaufort, Fish. Indo-Austr. Archip. v, 1929, p. 157. *Id.* Chabanaud, Zool. Meded. xiii, 1930, pp. 186 & 190.

Achirus klunzingeri Weber, Siboga Exped. lvii, 1913, p. 417.

Liachirus klunzingeri Glauert, W.A. Nat. vi, 3, Nov., 1957, p. 81. *Id.* Whitley, Aqua Life ii, 8, Dec. 1957, p. 26, fig. . . .

NOT *Pardachirus klunzingeri* Norman, Biol. Res. Endeavour v, 1926, p. 288, footnote, which is referable to *Achirus rautheri* Chabanaud, Zool. Anzeiger xciii, 1931, p. 95, figs. 1-10 from Port Darwin.



G.P.W

Figure 10.—Kimberley Sole, *Liachirus klunzingeri*. North-western Australia.
G. P. Whitley del.

I identify as this species some small soles sent to me from the Ivanhoe Crossing of the Ord River, East Kimberley division, north-western Australia (freshwater) by Mr. L. Glauert.

D. 68; A. 55; P.O.; V. 5/5; C. 3 plus 12 plus 4. L. Lat. c. 80. Tr. c. 23/1/26.

Head (13 mm.) 4.4, depth (22) 2.6 in standard length (58).

Eyes little over 2 mm.; snout 3. Gape, 4 mm. Postocular (7) nearly 54% of head.

Front of head smooth and scaleless. Three rows of scales between eyes. Minute teeth on blind side of jaws. Gill-openings wide, united across isthmus, extending upwards to level of point of chin. Nostril-tubes short and thick. Many short cilia around front of head and operculum of blind side. No barbels around anterior edge of head. On the blind side there is a short extra lateral line along top of back anteriorly, ceasing before deepest part of body and (joined to it above the mouth) another short line lying above the true lateral line. A branch of the latter curves round the mouth and gives off a short branch behind the mouth.

Body deepest at anterior third of fish. On the eyed side the lateral line extends forward nearly to eyes, sending off a dorsal and ventral (operculo-cleithral) branch over the site of the preoperculum. Between this commissure and the hypural joint there are about 72 scales, plus a few more on root of tail. Maximum number of scales on straight part of lateral line 81, and about 80 on blind side. Depth of caudal peduncle equal to postorbital.

Dorsal fin originating on end of snout at level of upper eye. Longest dorsal and anal rays less than half length of head. Dorsal and anal fins free from caudal, united to peduncle by very small membranes, their rays without suprabasal pores. No pectoral fins. Scales extend on some ventral

and caudal rays but leave other fins naked. Most of the dorsal and anal rays appear to be divided, but some are incomplete in my specimens. Ventral origin behind the level of the operculo-cleithral commissure of the lateral line. Adpressed ventral rays reach front anal ones. Ventral fins asymmetrical, the one on the left side of the body smaller than the right which is along the median axis; its third ray is longest and the last very short ray appears to be joined to the body near anus. Caudal rounded, about one-sixth total length.

Colour in preservative: Head, body and tail fin pale brown with numerous dark spots and flecks, some of the larger ones tending to be arranged in rows along body. Dorsal, anal and ventral fins plain or with few dusky blotches.

Described and figured from a specimen 68 mm. or nearly $2\frac{3}{4}$ inches in total length, from freshwater at Ivanhoe Crossing, Ord River, East Kimberley district, Western Australia, received from Mr. L. Glauert of Perth. A smaller example from the same locality has D. 69 and A. 52.

In New Guinea, the species is said to reach $4\frac{3}{4}$ inches.

Family GOBIOMORIDAE.

Genus BELOBRANCHUS Bleeker, 1856.

BELOBRANCHUS BELOBRANCHA (Cuv. & Val.).

Eleotris belobrancha Cuvier & Valenciennes, Hist. Nat. Poiss. xii, March 1837, p. 243. Manado, Celebes.

Belobranchus belobrancha Koumans, Fish. Indo-Austr. Archip. x, 1953, p. 361, fig. 88 (q.v. for refs. & synonym.).

One specimen, 125 mm. long, from Buin, Bougainville Island, Territory of New Guinea; 21 May, 1939, Rev. Father J. B. Poncet, S.M. (Australian Museum regd. No. I.B.381). Native name Buleapa.

Genus CULIUS Bleeker, 1856.

CULIUS ROBUSTUS (De Vis).

(Figure 11.)

Eleotris robustus De Vis, Proc. Linn. Soc. N. S. Wales ix, 3, Nov. 29, 1884, p. 692. Queensland coast. And of Australian lists.

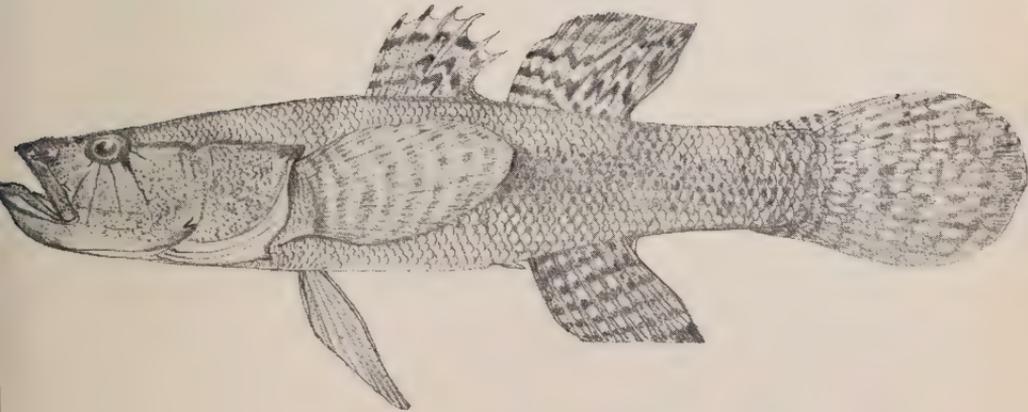


Figure 11.—Gudgeon *Culius robustus*. Queensland.

G. P. Whitley del.

Culius robustus Anon., Brisbane Aquarium Club Monthly Newsletter (roneo), xii, March 1957, p. 2. *Id.* Williams, Australas. Aqua Life ii, 4, 1957, p. 20.

The President of the Brisbane Aquarium Club, Dr. F. W. Whitehouse, has sent many interesting freshwater fishes from Queensland to the Australian Museum. Amongst them were four gudgeons from Innisfail which evidently belong to De Vis's long-lost species. The largest specimen (regd. No. IB.3712) is 78 mm. or slightly more than 3 inches long.

D. vi/i, 8; A. i, 8; P. 16; V. i, 5; C. 14. Sc. 51. Tr. 15 at second dorsal origin. About 40 predorsal scales.

Head (21 mm.) 2.8, depth (14) 4.3, predorsal length (27) 2.2 in standard length (60). Eye 4) 5.2, interorbital (5) 4.2, pectoral length (16) 1.3 in head.

Scales on cheeks and opercles and extending forward to middle of interorbital. A spine on preoperculum. Head criss-crossed by minute papillae in rows which are mostly vertical. Mouth almost reaching below eye. Teeth small and sharp, in bands, some on sides of lower jaw slightly enlarged. Lower lip laterally extensible. Tongue broadly rounded. Nostril flap overhangs lip. Furrow from eye to above pectoral. Gill-openings wide, extending forwards nearly below preoperculum.

General facies of *Culius melanosoma* (Bleeker) but pectoral reaching below origin of second dorsal and different coloration. Fifth ventral ray longest.

Greyish-brown, darkest on interorbital, cheeks and flanks. Fins spotted or chequered black and white with tinges of purple. Dusky blackish blotch at top of opercular flap. Belly plain yellowish-white. Eye blue.

Four specimens show little variation: P. 15-16; Sc. 46-51; Tr. 12-15; and predorsal scales 36 to 42. De Vis says the species reaches $4\frac{1}{2}$ inches in length. Queensland.

Family GOBIIDAE.

Genus GNATHOLEPIS Bleeker, 1874.

GNATHOLEPIS INCONSEQUENS, sp. nov.

Agrees well with the description of *Gnatholepis scapulostigma* Herre (Philip. Journ. Sci., lxxxii, 1953, p. 193) from Eniwetok, but differs in the following respects:

Scales in about 23 series between head and hypural joint. Interorbital (1.9 mm.) 1.3 in eye (2.6) which is 3.8 in head. Caudal (8) 4.4 in standard length (35). No canine teeth. Several vertical rows of small sensory papillae on cheek. The dorsal spines are broken in my specimen. Last dorsal ray not reaching caudal when adpressed. Pectoral extends well beyond level of second dorsal and anal origin. Caudal rounded, less than head.

The colour, because of copper-stained formalin, is green without definite markings, apart from an indistinct dusky bar from below eye to behind mouth and a dark smudge over pectoral axil occupying three scales.

Described from the unique holotype, 35 mm. in standard length or $1\frac{5}{8}$ inches overall. Australian Museum registered No. IB.3916.

Loc.—Heron Island, Capricorn Group, Queensland; Mr. R. Slack-Smith. Collector's No. J.75.

The snub nose, scaly head, and long pectoral fins separate this goby from all the others of Australia.

Family TETRAROGIDAE.

Genus AMBLYAPISTUS Bleeker, 1876.

Amblyapistus Bleeker, Versl. Akad. Amsterdam (2) ix, 1876, p. 297, and xvi, 1876, pp. 5 & 73. New name for *Platypterus* Swainson, 1839, preocc. Orthotype, *Apistus taenionotus* Cuv. & Val., 1829.

Small scorpion-fishes with stinging spines. Typical *Amblyapistus* has tips of anterior dorsal spines well separable by extensive membranes, fin-rays branched and scaly body, according to Bleeker.

PAROCOSIA, subgenus nov.

Orthotype, *Amblyapistus (Parocosia) slacksmithi*, sp. nov.

A Queensland scorpion-fish, distinguished from all the others known from Australia by having 17 dorsal spines, the first originating over front half of eye, and 3 anal spines. Pectoral without free rays. Body naked (a few vestigial scales near lateral line tubes). V. i, 5.

Superficially like *Ocosia* Jordan & Starks (Proc. U.S. Nat. Mus. xxvii, 1904, p. 162), but more elongate, has dorsal origin farther forward, lacks spines on top of head, and base of pectoral is before that of ventral.

AMBLYAPISTUS (PAROCOSIA) SLACKSMITHI, sp. nov.

D. xvii, 8; A. iii, 6; P. 12; V. i, 5; C. 13. L. Lat. 20-23 tubes.

Head (11 mm.) 2.7, depth (10) 3 in. standard length (30).

Upper profile of head concave, steep; lower convex. Lower lip terminal. No barbels. Mouth small, maxilla deep, reaching below front of eye. Teeth villiform, in bands on jaws, vomer and apparently on palatines. Tongue rounded, free. Two nostrils each side, one with small tube. Interorbital strongly convex. Eye longer than deep, its horizontal diameter a trifle more than interorbital width and subequal to depth of caudal peduncle (3 mm.). Some weak ridges along suborbital. Two small hook-like pre-orbital spines, upper reaching above tip of maxillary. A spine at preopercular angle, with two smaller spines below. Two weak opercular spines and a blunt opercular flap. No other spines on top and sides of head and no postocular groove. Gill-openings wide, united across narrow isthmus. Gill-rakers rudimentary.

Form compressed, deeply arched anteriorly, back dipping below posterior dorsal spines, tapering to shallow caudal peduncle. Skin smooth. Body practically naked, scales being microscopically vestigial in places, notably near the spineless tubes of the lateral line, which is parallel with the back and runs along middle of side of caudal peduncle with its tubes separated before the tail. An arched branch of the l. lat. ascends head behind eye, around which are some pores. No dermal flaps. Vent a little distance ahead of anal fin.

Dorsal fin continuous, originating over front half of eye, its first spine short, second longest (7.5 mm.), spines thence decreasing, rising and dipping again before the soft dorsal fin (longest, sixth, ray, 6.5 mm.), the last ray of which is joined by membrane to proximal part of uppermost caudal ray. Anal origin below posterior dorsal spines and tip of pectoral. Anal spines strong, increasing in length to third (6.5 mm.), its third and fourth rays longest, its base (8 mm.) greater than its height. Pectoral without free rays, all rays simple. Ventrals with a strong spine and five unbranched rays, united by membrane to body, their origin behind level of pectoral base. Caudal of irregular rhomboid outline, middle rays longest, all rays simple.

Colour (in formalin): Brown in varying tones. Head and posterior half of body dark brown; intermediate body-area cream to light brown, junctions of tones irregular, some of the dark brown extending along

back and lateral line. A silvery spot on anterior third of lateral line. Breast and belly whitish. Front of head milky-white from chin to dorsal origin. A cream dumb-bell-like blotch below each cheek. Fins creamy to light brown, irregularly streaked or mottled with darker brown; no conspicuous dark spot on spinous dorsal. Pectoral, ventral, and caudal fins with denser, dark, lacework-like mottling and all white-tipped. No axillary pattern.

Described from the unique holotype, $1\frac{1}{2}$ inches long (standard length 30 mm., total length 38). Australian Museum regd. No. 1B.3893. Collector's no. 51-25-3.

Loc.—Heron Island, Capricorn Group, Queensland; Mr. R. Slack-Smith, after whom I have pleasure in naming this species.

Rather like *Amblyapistus binotatus* (Peters) as illustrated in Smith's "Sea Fishes of Southern Africa," but outline of first dorsal more peaked and 17 dorsal spines. The dorsal outline is more like that of *A. macracanthus* as figured in Day's "Fishes of India" but that has D. xvi, 9, more anal rays, longer anal base, and branched fin-rays. Bleeker's 1876 figure of his *macracanthus*, illustrated again in his "Atlas Ichthyologique," has dorsal beginning before eye and with sail-like membranes as in *crista-galli* Gunther, 1860. My fish is more like the Bali "*Amblyapistis taenianotus*" figured by Fowler (Proc. Acad. Nat. Sci. Philad. lxxxvi, 1934, p. 77, fig. 19).

The new species is distinguished by its white face, form and formulae of fins, practically naked body, and simple fin-rays.

Family TRIGLIDAE.

Genus PARATRIGLA Ogilby, 1911.

AOYAGICHTHYS, subgen. nov.

Orthotype, *Trigla vanessa* Richardson (Proc. Zool. Soc. Lond. 1839, p. 97) = *Paratrigla (Aoyagichthys) vanessa*.

Differs from typical *Paratrigla* in having D. x/16 to xi/17; A. 15 to 17 (instead of D. ix/14 to 15; A. 14 or 15) and greater total length ($12\frac{1}{2}$ inches maximum instead of from $4\frac{1}{2}$ to 7), and from *Lepidotrigla* Gunther, 1860, in having spined scutes along lateral line as well as along both sides of both dorsal fins. The interorbital is deeply concave and the pectoral fin is equal to or longer than the length of the head.

Named after the esteemed Japanese ichthyologist Hyozi Aoyagi.

PARATRIGLA (AOYAGICHTHYS) VANESSA (Richardson).

A record-sized specimen, $12\frac{1}{2}$ inches long, was trawled by the Red Funnel Trawlers in southern New South Wales in January, 1958, and sent to the Australian Museum from the Sydney Fish Markets by Mr. J. C. Woore (regd. No. 1B.3903). New record for New South Wales. The species which may be called the Admiral Gurnard, because *vanessa* is the name of the Admiral Butterfly, was previously known from South Australia, Victoria, Tasmania, and New Zealand. It is featured in Waite's "Fishes of South Australia."

Genus LEPIDOTRIGLA Gunther, 1860.

LEPIDOTRIGLA SPILOPTERA Gunther.

Lepidotrigla spiloptera Gunther, Rept. Voy. Challenger, Zool. i, 6, 1880, p. 42, pl. xviii, fig. C; *ibid.* xxii, 1887, p. 64. Ki Island, Arafura Sea. *Id.* Alcock, Zool. Investigator, Fishes, 1899, p. 67. *Id.* Weber, Siboga Exped., Fische, 1913, p. 511. *Id.* Matsubara & Hiyama, Journ. Imp. Fisher. Inst. xxviii, 1932, pp. 16 & 38, fig. 14.

(misprinted *spiroptera*). *Id.* Kuronuma, Bull. Biogeogr. Soc. Japan ix, 1939, p. 237, fig. 4, and of other Japanese authors. *Id.* Herre & Kauffman, Proc. Biol. Soc. Wash. lxxv, 1952, p. 29.

Lepidotrigla grandis Ogilby, New Fish. Qld. Coast, 1910, p. 122 (reprint of a suppressed paper). Off Cape Moreton, Queensland; 73 faths. Cotype in Austr. Mus. *Id.* McCulloch & Whitley, Mem. Qld. Mus. viii, 1925, p. 165 (listed).

A cotype of *Lepidotrigla grandis* Ogilby, 1910, in the Australian Museum (No. I.12512) is 200 mm. in total length. Ogilby's name is evidently a new synonym of *L. spioptera* Gunther.

This species is thus now known from Queensland to the Arafura and Timor Seas, Indonesia, Japan, the Philippines and India.

Family BLENNIIDAE.

Genus GRAVICEPS Fowler, 1903.

The following new species differs from the genotype (*Petroscirtes elegans* Steindachner) and its congeners in fincounts and its distinctive coloration.

GRAVICEPS DARWINI, sp. nov.

Because next year sees the centenary of the publication of the great Charles Darwin's *Origin of Species*, and because this beautiful new blenny comes from Port Darwin in the Northern Territory of Australia, I name it *darwinii*.

D. 12 + 19 = 30; A. 2 + 21 = 23; P. 13; V. 2; C. 11 main rays. L. lat. 11 tubes, extending to below 7th dorsal spine, obsolete posteriorly.

Head (9 mm.) 3.5, depth (6) 5 in standard length (32) or 4.1 and 6.1 in total length (37) respectively. Eye (2) equal to snout, slightly exceeding the rather flat interorbital.

Head without tentacles or occipital crest. Mouth slightly inferior with about two dozen teeth in each jaw flanked by a canine, largest in lower jaw. Gill opening a short, curved, oblique slit above level of pectoral base. Dorsal fin originating over opercular flap. Eleven dorsal spines, slightly shorter than the following rays, the longest of which (4.55 mm.) is less than postorbital (5).

Anal fin about as high (3 mm.) as anterior dorsal rays. Dorsal and anal fins attached by membranes to base of caudal, not to the fin proper. Pectorals (6 to 7 mm.), shorter than head; ventrals (6 mm.) longer than postorbital. Caudal rounded.

Colour in alcohol, light brown with a series of broad darker bands or chevrons down sides of head, but not joining across isthmus; the first runs from eye to mouth, the second drops from the eye and curves backward below, the third runs from nape to below head via behind the eye, the fourth and fifth across the gill-covers, and the sixth runs down pectoral base; these alternate with upright rows each of about four dark brown spots. Top of head with large dark spots.

Indistinct dusky patches along middle of body; about 14 dark brown blotches along back below dorsal fin, these extend along some of the dorsal membranes as fuscous bars.

Dorsal and caudal fins with obscure oblique dusky bars along some of their membranes. Anal fin infuscated; other fins plain, but a small dark spot over bases of upper pectoral rays.

Described from the unique holotype, a specimen 37 mm. or nearly 1½ inches in total length (Austr. Mus. regd. No. IA.4298).

Loc.—Port Darwin, Northern Territory of Australia; collected by Mr. Arthur A. Livingstone in 1929.

It is perhaps related to *Salarias furcatus* De Vis (Proc. Linn. Soc. N.S.W. ix, 1884, p. 696) from Moreton Bay, Queensland, which seems to have a different colour-pattern, forked tail and more dorsal rays, but I have no specimen of De Vis' species. In Chapman's key in Weber & Beaufort (Fish. Indo. Austr. Archip. ix, 1951, pp. 357-359) the Darwin fish comes nearest *Petroscirtes kochi* (Nova Guinea v, 2, 1908, p. 263) from Merauke, New Guinea, but Weber's species differs considerably in proportions apart from coloration. It is more like *Petroscirtes lineolatus* Kner (Sitzungsber. Akad. Wiss. Wien, lviii, 1868, p. 331 (39) pl. vi, fig. 17 from Candavu, Fiji) but the oblique bars on the head run from the vertex towards the front in my species with few spots between them, whereas in *lineolatus* they run from the eye downwards and backwards and have more numerous dark spots between them, and the pectoral base is darker and the dusky bars of the dorsal and anal fins cut across the rays more.

Genus ISTIBLENNIUS Whitley, 1943.

ISTIBLENNIUS EDENTULUS (Bloch & Schneider).

Blennius edentulus Bloch & Schneider, Syst. Ichth., 1801, p. 172 and as *B. truncatus*. Huaheine, Pacific Ocean.

Salaris rivulatus Ruppell, Atlas Rupp., Reise (Senckenb. Nat. Ges.), Fische, 1830-31, p. 114. Tor, Red Sea.

Salarias forsteri Cuv. & Val., Hist. Nat. Poiss. xi, 1836, p. 315. Huaheine. *Id.* Richardson, Rept. 12th meet. Brit. Assn. Adv. Sci. 1842 (1843), p. 24. "Australia" [= Huaheine].

Salarias quadricornis Cuv. & Val., Hist. Nat. Poiss. xi, 1836, p. 329, pl. 329. Isle-de-France. *Id.* Waite, Trans. Roy. Soc. S. Austr. xl, 1916, p. 454 (Lord Howe and Norfolk Iss.).

Blennius cinereus Castelnau, Res. Fish. Austr., 1875, p. 26. Queensland. And of Australian lists.

Salarias edentulus Gunther, Journ. Mus. Godeff. iv, 13 (Fische Sudsee vi), 1877, p. 206, pl. cxvii, fig. A (and as *quadricornis* on p. 209, fig. B). *Id.* Chapman, Fish. Indo-Austr. Archip. ix, 1951, p. 328 (q.v. for refs. & synon.).

Salarias atratus Macleay, proc. Linn. Soc. N. S. Wales vii, 1882, p. 361. Port Moresby, Papua. And of lists. *Id.* Chapman, Fish. Indo-Austr. Archip. ix, 1951, p. 346. *Id.* Whitley, Proc. Roy. Zool. Soc. N. S. Wales 1952-3 (1954), p. 28 (N. S. Wales).

Salarias rivulatus Jordan & Starks, Ann. Carneg. Mus. xi, 1917, p. 460. *Id.* McCulloch & McNeill, Rec. Austr. Mus. xii, 1918, p. 15, pl. iii, figs. 3-4. *Id.* McCulloch, Rec. Austr. Mus. xiv, 1923, p. 125. *Id.* Whitley, Rec. Austr. Mus. xvi, 1928, p. 303.

Istiblennius edentulus Norman, Ann. Mag. Nat. Hist. (11) x, 1943, pp. 811-812. *Id.* Inger, Pacific Science ix, 1955, p. 298.

Blennius cinereus Castelnau, 1875, is a common synonym of *edentulus*; another synonym, as was demonstrated by McCulloch in 1923, is *Salarias atratus* Macleay, 1882.

Family TEUTHIDAE.

Genus TEUTHIS Linne, 1766.

TEUTHIS NIGRORIS (Cuv. & Val.)

Acanthurus nigroris Cuvier & Valenciennes, Hist. Nat. Poiss. x, Sept. 1835, p. 208. Sandwich Islands. *Id.* Randall, Pacific Science x, 1956, p. 187, figs. 1, 2 & 12 (q.v. for refs. & Synon.).

One specimen, 136 mm. in standard length, from Heron Island, Queensland; from Mr. R. Slack-Smith.

New record for Australia.

Family CERATIIDAE.

Genus CRYPTOPSARAS Gill, 1883.

CRYPTOPSARAS PENNIFER Regan & Trewavas.

(Figure 12.)

Cryptosaras pennifer Regan & Trewavas, Dana Rept. ii, 1932, p. 98, fig. 157. North of New Zealand. New South Wales.

Cryptosaras pennifer Whitley, Fish. N.S.W. (McCulloch), ed. 3, 1934, suppl. *Id.* Graham, Treasury N.Z. Fish., ed. 2, 1956, p. 413.

Cryptosaras couesi pennifer Bertelsen, Dana Rept. xxxix, 1951, pp. 143, 272, etc., figs. 93a, f, & g. and 95 l & m.

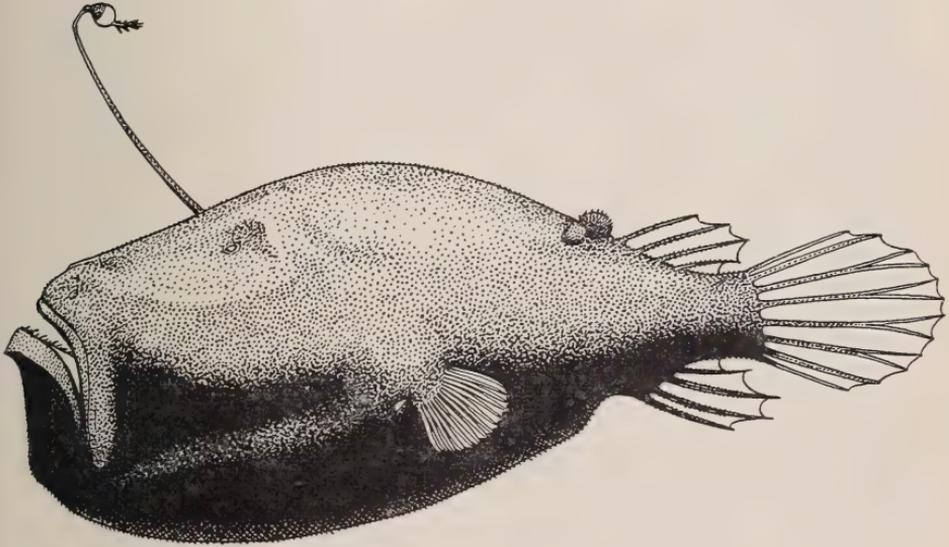


Figure 12.—Deepsea Angler Fish, *Cryptosaras pennifer*. Cotype. Tasman Sea.

A. Fraser-Brunner del.

The accompanying figure is of a cotype, kindly drawn for me some years ago by Mr. A. Fraser-Brunner. The only illustrations of the Australasian species hitherto published have been of the escae or of larval specimens.

Family ANTENNARIIDAE.

Genus ANTENNARIUS Daudin, 1816.

ANTENNARIUS COCCINEUS (Lesson, 1831).

D. $i/i/i/12$; A. 8 (9); P. 10; V. 6; C. 9.

Head (17 mm) 2.6, depth (27) 1.6, and width (20) 2.2 in standard length (44). Eye, 4 mm.; snout, 4.5; interorbital, 6; maxilla, 11; stalk of illicium, 4; depth of caudal peduncle, 6.5.

Maxillary very steep, not reaching below eye, its expansion covered by skin. Lower lip terminal. Small, backwardly-directed, movable, conic

teeth on jaws, in several rows anteriorly, fewer laterally. Sharp teeth on palatines. Tongue bulbous. Rounded preorbital lobe overlaps premaxillary each side. Interorbital broadly convex. Nostrils pore-like. No conspicuous dermal flaps on head, body, dorsal spines, or fins. Gill-openings pore-like, at pectoral elbow.

Body covered with prickles, forming a low pile. Skin little flexible. Lateral line developed around eyes, preoperculum, chin and mouth, less conspicuous on body.

Stalk of illicium smooth and slender, its base distant an eye-diameter from mouth-opening. Esca a small white bulb directed upwards and forwards. Second dorsal spine short (4 mm.), blunt and prickly, widened at its end, and with a membrane. No illicial trough. Third dorsal spine, curved, prickly, fused with back. Some of the posterior dorsal rays longest, about 7 mm., most of them simple but some posterior ones bifid. Last ventral and most of anal and caudal rays divided. Anal fin opposite posterior half of soft dorsal fin and, like it, separated from caudal fin by a very short peduncle. Anal fin lower than soft dorsal. Caudal rounded or irregularly rhomboid, its middle rays 13 mm. long. Pectorals moderately incised. Ventrals stumpy.

Colour in formalin: Pale yellow with sparse greyish brown markings. Eye blue. Second dorsal mostly dark grey. Illicium grey and white banded. Esca white. Ventral surface plain yellow except for four dark dots across throat.

Described from a specimen 61 mm. or about 2½ inches long. Austr. Mus. regd. No. 1B.3843.

Loc.—Noumea, New Caledonia, 1957. Dr. R. Catala's No. 16.

The small illicium and hidden third dorsal spine are useful diagnostic characters.

Near *A. drombus* Jordan and Evermann (Bull. U.S. Fish. Comm. xxii, 1902 (1903), p. 207 and xxiii, 1903 (1905), p. 521, pl. lxiv. Honolulu), but that species has P. 12, maxillary reaching below eye, top of head with rather large concave pit, and third dorsal spine depressible and with a membrane. Typical *Chironectes coccineus* Lesson (Voy. Coquille, Zool., ii, 1831, p. 143, pl. xvi, fig. 1. Mauritius), is fiery red in colour. *Chironectes nummifer* Cuvier (Mem. Mus. Hist. Nat. Paris, iii, Oct. 1817, p. 430, pl. xvii, fig. 4. No locality) has third dorsal spine erectile and with membrane and has a large round brown spot on the dorsal. *Chironectes reticulatus* Eydoux and Souleyet (Voy. Bonite, Zool. i, 1842, p. 186, pl. v, fig. 2. Hawaiian Islands) has dark reticulations over body and dark bars on tail.

ANTENNARIUS GLAUERTI Whitley.

Antennarius glauerti Whitley, W.A. Nat. v, 1957, p. 207, fig. Exmouth Gulf, W.A.

One specimen 60 mm. long from Hayman Island, submitted by Mr. K. de Witte in 1957, constitutes a new record for Queensland.

The anal fin is lower than that of the type and has 9 rays, and there are no long dermal filaments on head, body, and fins.

Family BALISTIDAE.

Genus PSEUDOBALISTES Bleeker, 1865.

Pseudobalistes Bleeker, Atlas Ichth. v, 1865, pls. 218 & 224; Ned. Tijdschr. Dierk, iii, 1866, p. 11. Orthotype, *Balistes flavimarginatus* Ruppell.

PSEUDOBALISTES FLAVIMARGINATUS Ruppell.

Balistes flavimarginatus Ruppell, Atlas zu Ruppell, Reise (Senckenb. Nat. Ges.), Fische (12), 1829, p. 33 and Neue Wirbelth. Abyssin. Fisch, 1837, p. 54, pl. xv, figs. 1-2. Djetta, Red Sea. *Id.* Macleay, Proc. Linn. Soc. N. S. Wales vii, 1883, p. 595 (New Guinea). *Id.* Kamohara, Fauna Nippon. xv, 2, 3, 1940, p. 45, fig. 21. And of authors.

Melichthys marginatus Swainson, Nat. Hist. Classif. Fish. Amphib. Rept. ii, 1839, p. 325. On Ruppell.

Balistes beeri Bleeker, Act. Soc. Indo-Neerl. viii, 1860, p. 53. Celebes.

Balistes (Pseudobalistes) flavimarginatus Bleeker, Atlas Ichth. v, 1869, p. 113, pl. 218, fig. 3 (young) and pl. 224, fig. 3 (adult); plates published 1865.

Balistes papuensis Macleay, Proc. Linn. Soc. N. S. Wales viii, 1883, p. 279. Hood Bay, Papua. New Synonym. *Id.* Fowler, Mem. Bish. Mus. xi, 1934, p. 448. *Id?* Seale, Proc. Calif. Acad. Sci. (4) xxi, 1935, p. 375. *Id.* Fraser-Brunner, Ann. Mag. Nat. Hist. (10) xv, 1935, p. 662 in genus *Rhinecanthus*.

Balistapus papuensis Jordan & Seale, Bull. U.S. Bur. Fisher. xxv, 1905 (1906), p. 363 (listed).

Pseudobalistes flavimarginatus Clark & Gohar, Publ. Mar. Biol. Stat. Al Ghardaqa viii, 1953, p. 30, figs. 6 a-b.

New synonym: A specimen (No. I.9110), 116 mm. in total length, in the Australian Museum was labelled "Co-type (Type?)" of *Balistes papuensis* from Hood Bay, Papua. This is evidently a young *Pseudobalistes flavimarginatus* (Ruppell).

Variations in the Secondary Operculum of the Australian Representative of the Polychaete Worm *Hydroides norvegica* Gunnerus

By BARBARA DEW.

(C.S.I.R.O. Division of Fisheries & Oceanography, Cronulla, N.S.W.)

(Figures 1-4.)

During studies on underwater fouling in Australian waters (Allen & Wood 1950), a great deal of material of the Serpulid *Hydroides norvegica* was examined. This species is very common in Sydney Harbour and was probably introduced by ships during last century (Allen 1953). It occurs in great profusion on the hulls of ships, buoys, landing stages, etc. and is sometimes very abundant on the walls of the water intake conduits of power-houses situated on Sydney Harbour, where it may grow to a length of 4-6 inches in a period of 8-12 months.

Rioja (1919) and Hartman (1952) have both recorded variations in this species, especially in the form and structure of the operculum, and it is interesting to note that the Australian representative shows similar variations to those from Spain and Texas.

In most cases the taxonomic features of specimens from Sydney Harbour do not differ significantly from those of other areas; the operculum which is carried on the end of a long smooth pedicle, protrudes above the branchial filaments and may arise from either of the branchial tufts, although the right is the more usual. The inferior cup of the operculum is symmetrical and has between 23 and 32 crenulations, depending on the size and age of the individual. The superior cup usually consists of 15 sharp spines bearing 2-4 lateral spines. On the inner surface of the main spines can usually be seen secondary thorn-like spines set at right angles, while in the centre of the cup there is usually a single low sharp spine.

However individuals with more than one operculum are frequently found; the degree of development of the secondary operculum varies considerably. Figure 1 shows a typical example in which both opercula are fully developed. The chief difference is usually in the length of the two pedicles, that of the secondary one being shorter than the functional primary operculum. The primary and secondary opercula differ in the number of crenulations on the inferior cup and the form and structure of the spines on the superior cup.

Usually the secondary operculum is a small outgrowth, shaped somewhat like an Indian club, but when this develops along with the primary operculum, the shape changes, as will be seen in figures 2 and 3.

Figure 2 shows an example of a secondary operculum (the primary being quite normal) in which the inferior cup is fully developed with 24 crenulations; the superior cup is not developed to the same degree and is just a knob in the centre of the inferior cup. Figure 3 shows an example in which almost the opposite has happened. The inferior cup shows no sign of development while the superior cup has 9 spines, although these spines lack lateral processes. This example is rather like figure 2 of Rioja, but his example appears to be much more developed.

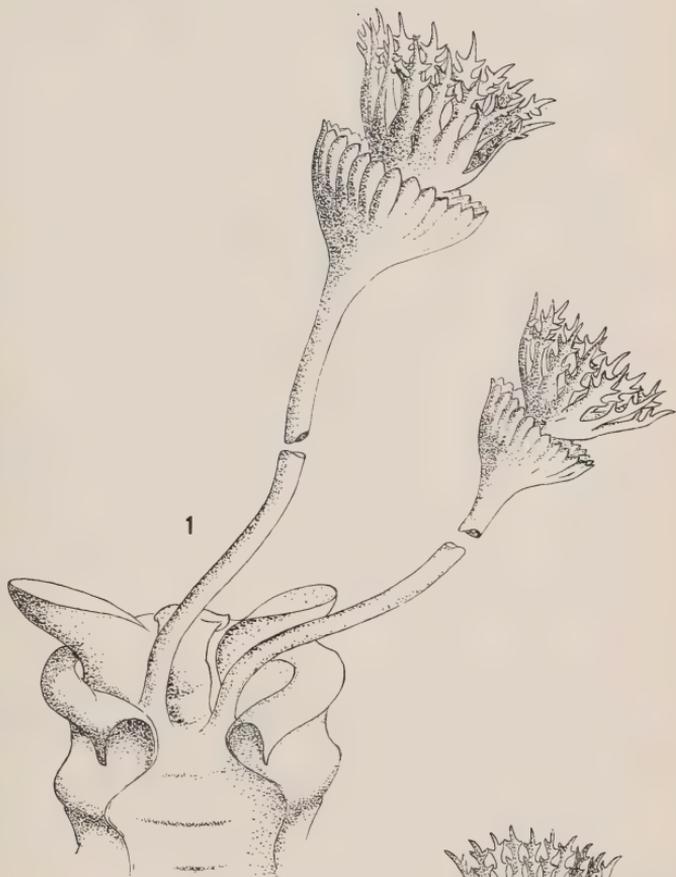
EXPLANATION OF FIGURES.

Variations of the operculum of *Hydroides norvegica*: 1, typical double opercula; 2 & 3, early variations of secondary opercula; and 4, freak "twin." All about X 50.

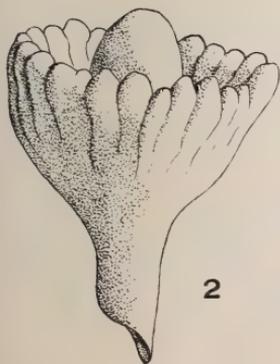
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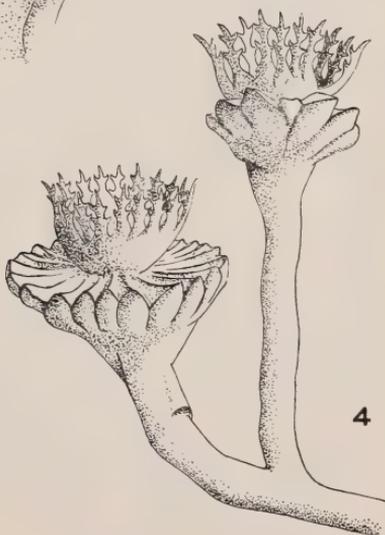
3



1



2



4

A most interesting and unusual freak is illustrated in figure 4 and is so far the only example seen. The "twin" opercula are carried for most of their length on a common pedicle, and it appears that the pedicle was injured, and a "secondary" pedicle and complete operculum developed and grew out at right angles to the main stem. This "secondary" operculum has 13 crenulations to the inferior cup and 10 spines on the superior cup, as opposed to 25 crenulations and 17 spines of the primary operculum.

It appears that the development of the secondary operculum does not follow any set pattern and there is no rule that the inferior cup always develops first. It is a well-known fact that the opercula of Serpulids vary considerably. Two opercula are uncommon, but not altogether unknown, and two opercula have also been observed in the following Serpulids: *Hydroides novae-pommerania* Augener, collected from a "fouling" test panel exposed at Townsville, Queensland, and *Josephella marenzelleri* Caullery and Mesnil, collected from the aquarium of the C.S.I.R.O. Laboratory at Cronulla. The question of two opercula is interesting as only one can function as an effective "stopper" when the worm retreats into its tube. The question arises as to how the dual development has taken place. Rioja (1919) puts forward one theory, based on the evolutionary trend. It appears that the Serpulids have evolved from a symmetrical ancestor, and in this case two opercula would be the expected arrangement, but as evolution continued, the operculum which was unable to function gradually ceased to develop and finally became absent, but occasionally an aberrant form developed which has reverted back to this ancestor. A more likely answer seems to be that at one stage the primary operculum was damaged but recovered and that in the meantime the secondary operculum had started to grow, thus giving rise to the dual opercula.

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Notes on a Polychaete Worm Recovered from the Aquarium at Taronga Zoological Park

By BARBARA DEW.

(C.S.I.R.O. Division of Fisheries & Oceanography, Cronulla, N.S.W.)

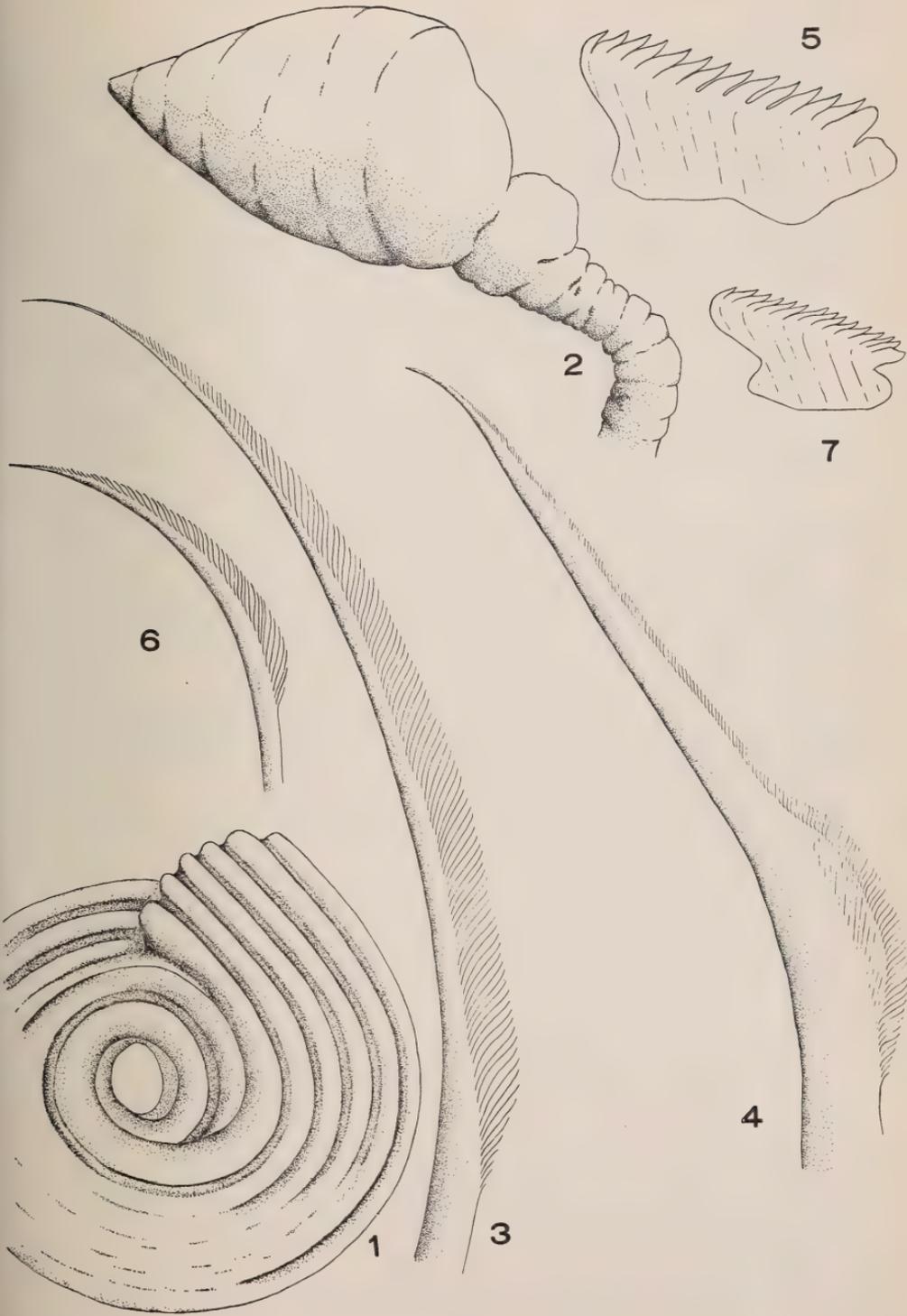
(Figures 1-7.)

In the aquarium of the Sydney Zoo, during January 1953 and subsequently at other visits, the last being in August 1957, attention was drawn to some Polychaete worms of the family Serpulidae. These worms were very different from any local form with which the writer was familiar, and

EXPLANATION OF FIGURES.

Vermiliopsis pygidialis: 1, operculum X 15; 2, tube X 6; 3, collar setae X 950; 4, thoracic setae X 950; 5 thoracic uncini X 950; 6, abdominal setae X 950; and 7, abdominal uncini X 950.

C. E. Purday del.



on examination proved to be *Vermiliopsis pygidialis* (Willey). This new record from Australia occurs under strange and unusual conditions. The writer is very grateful to the Taronga Zoological Park Trust for making specimens available and supplying information.

Vermiliopsis pygidialis is characterized by the following features. Body divided into thorax (usually 3-7 segments) bearing dorsal capillary setae and ventral uncigerous tori, and the abdomen bearing ventral capillary setae and dorsal uncigerous tori. First thoracic segment with a collar. Thoracic membrane usually present. Branchiae forming a funnel around the mouth and composed of two spiral lobes or semi-circles bearing a number of filaments with two rows of barbules. Operculum usually present. Tube calcareous and usually attached to the substratum.

Genus VERMILIOPSIS Saint Joseph, 1894.

Operculum horny, with a conical or cylindrical cap. Pedicle not winged. Collar setae simple. Thoracic setae of two types, (1) simple, (2) "Apomatus" type. Uncini with numerous teeth, the most anterior being larger and blunter. Abdominal setae geniculate.

VERMILIOPSIS PYGIDIALIS (Willey).

Vermilia pygidialis Willey, 1905, p. 318.

Vermiliopsis pygidialis Pixell, 1913, p. 86, Pl. 9, fig. 11.

In the Australian specimens the calcareous tubes are usually coiled back on themselves and covered with a thin coating of brown algal slime, except on the white growing edge. There are 5-6 parallel ridges along the upper surface. (Fig. 1.)

There are 12-15 pairs of branchiae, the terminal filament being long and naked with a swollen tip. In life the branchiae are a beautiful red, presenting a striking and characteristic appearance. The pedicle arises from the right, is very wrinkled and markedly swollen at base of operculum, and is also bright red in colour.

The operculum, frequently covered with calcareous marine growths, is of a horny nature, somewhat truncated, light brown in colour with five bands of dark brown. (Fig. 2.)

The three lobes of the well developed collar are wrinkled and deeply folded back on themselves. The short thoracic membrane overlaps narrowly along the mid line. The collar setae are simple, with faint striations. (Fig. 3.) The remaining thoracic setae are of two types, (1) simple setae, like those of the collar, and (2) setae of "Apomatus" type. (Fig. 4.) The uncini have 14-15 teeth, the most anterior of which is blunter and stouter. (Fig. 5.)

The abdominal setae are geniculate and are finely toothed (Fig. 6). The uncini are similar to those of the thorax but smaller (Fig. 7).

Distribution.—Ceylon, Suez, Maldivé Islands, Funafuti, and Zanzibar. The Australian localities are as yet confined to the aquarium at the Sydney Zoo.

Discussion.—This species has only been found in the heated tanks (75-77°F.) used to display tropical fish. No specimens have been found to date in tanks at room temperature or on the shore around the outfall pipes. It will be interesting to see if this tropical species will be able to establish itself in the harbour, as have so many other marine invertebrates (Allen 1953).

The question arises as to how this tropical species became established in the aquarium. One theory is that adults living on the hulls of ships

engaged in the Pacific Island trade have released larvae into the harbour waters, these being able to develop into mature adults only in the specially heated waters of the tropical display tanks. The chief argument against this is that all the water is heated to a temperature of about 90°F. and it is most unlikely that larvae could stand this sudden change in temperature, especially as one of the local introduced Serpulids, *Hydroides norvegica*, has larvae which are most susceptible to sudden changes in temperature.

A more likely theory is that at some time adults arrived on rock and coral from a tropical region where the worm is common, probably the area around the Solomon Islands, that being the area from which most of the material for the tropical displays originates.

The population is maintaining itself, and is in fact flourishing, especially in one of the tanks containing a number of lovely Butterfly Cod. It is difficult to explain how the worms get from one tank to another, especially as there is no direct exchange of water.

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A Home-made Book On Shells

By TOM IREDALE.

No: not by me. I refer to a small, very rare book entitled "Collections for a Monograph of Tasmanian Land Shells," by William Legrand, published at Elizabeth Street, Hobart Town, Tasmania, in 1871. Legrand, himself, was a small bookseller at the above address, who printed the work page by page on a small hand-press behind his shop. Apparently he was engrossed in shell collecting and had a very extensive collection, and made an attempt to catalogue the Land Shells of his adopted land. Very little seems to be on record about him personally, save that he was French, and died in 1902, aged 82. A vague rumour haunts me that he was an aristocrat and called himself Le Grand, later when he had become acclimatized he amended it to Legrand. It is noteworthy that Cox named a species Le Grandi, and that Legrand printed it in that form. The little work was first published in June 1871, with a second edition in September 1871. Both editions are great rarities, and also great curiosities. The size is a small octavo, the sheets uncut about $8\frac{3}{4}$ inches by $5\frac{1}{2}$ inches, the text varying from $6\frac{1}{2}$ inches to $3\frac{3}{4}$ inches, according to taste, printed on one side only, and emended by the addition of gummed printed slips obliterating the errors. When new matter was available the whole page was reset. Years ago I compared a few copies, working out the first edition, which was somewhat difficult, as new pages were commonly interspersed, before the second edition was issued. More recently, however, Mr. Mel Ward secured Legrand's own copy, with notes regarding the alterations, and has given it to me. The notes enable the present review to be accepted as authoritative. The first problem was that some sheets were dated June 1870, April 1871, and then others June 1870, additions to August 1871, and so on.

The first edition contains the Title page, Preface, Index i-ii (printed on both sides, then 10 sheets, the first with one species, numbered 1; the second with two, 2, 3; the third with two, 4, 5; the fourth with two, 6, 7; the fifth with one, 8; the sixth with three, 9, 10, 11 the seventh with one, 12; the eighth with two, 13, 14; the ninth with three, 15, 16, 17. None of these sheets is dated and a number have emendations stuck on. All the species have a generic and sub-generic name, all taken from Cox's Monograph of Australian Land Shells which had been published only three years earlier. The next six sheets have numbers 18 to 53, the first 5, the next four 6, and the last 7, the first species credited to Legrand, the next twenty-five to Cox, and the last ten to Brazier. These are all dated June 1870, and only a few words are given about each species, which cannot be regarded as descriptions. In some copies a slip is inserted here "From No. 18 to 53 will be reprinted, embodying the descriptions." After this lapse the sixteenth sheet has three species, 54 to 56, fully described, and is dated April, 1871, stuck over April 1870 apparently printed in error. The next three sheets are all dated May 1871, the first with three species, 57 to 59, the second with two, 60 and 61, the third with two, 62, 63. These are completely described and all refer to *Helix*, twenty sheets in all. Two sheets follow, each with one species of *Bulimus*, then one sheet with two species of *Vitina* and one with one *Succinea*. These last four sheets are undated, neither is any sheet numbered, only the species. Then follow nine sheets, the first headed "New Species of Tasmanian Land Shells described by J. C. Cox, M.D., of Sydney," the next headed Tasmanian Land Shells 2, the remainder similarly headed 3 to 9, the succeeding 10th having the same heading but below: "The next ten species are named and described by Mr. J. W. Brazier of Sydney" 10-13. Lastly a sheet of Additions and Errata dated June 1871. This completes the letterpress but two plates with two

COLLECTIONS

FOR A

MONOGRAPH

OF

TASMANIAN LAND SHELLS,

BY

W. LEGRAND.

ELIZABETH-STREET, HOBART TOWN, TASMANIA.

1871.

Figure 1.—Title page, original size, of Legrand's "home-made" book on shells.

pages of explanation constitute the construction of the first edition. These pages of descriptions by Cox and Brazier have the shells unnumbered but with reference after the name to the species number from 18 to 53 previously undescribed but not in that order. Now we may return to the Preface which states "I have to thank Dr. Cox for descriptions, and also for the plates, which were executed under his direction and at his expense. Mr. Brazier has supplied descriptions of ten new species." W.L. June 1871. Mr. G. P. Whitley has shown me a copy of the first edition in his library with the original paper cover in blue paper, the wording being the same as that of the title page but surrounded by an ornamental black border. This seems to be the only copy in existence with this paper cover.

The second edition has the latter descriptions incorporated in their numerical order, the sheets inscribed June 1870, additions to August 1871 as regards the Coxian species, but no dating in connection with Brazier's species. The sheet 54 to 56 is unaltered, the date April 1871 remaining, but the next sheet 57 to 59 has May 1871, additions to September, the next two May 1871 bringing up to 63. Nos. 64 to 72 new species by Brazier and Cox are dated August 1871, 73 to 77 dated September 1871. The sheets on *Bulimus* and *Vitrina* are unchanged but a new species of *Succinea* is added, August 1871. A sheet of additions dated September replaces the one in the first edition, those additions being incorporated in the text. The same two plates of shells and their explanations are included. There is a Second Preface and Additional Index dated Sept. 1871.

One of the interesting items in Mel Ward's copy is in connection with the remark in the first Preface "I have made some progress with the fluviatile species, and hope to publish the first part in the course of the present year." Nothing appeared but among the notes is a sheet lithographed of all the Freshwater species known at that time. The species seem to be correctly drawn, left and right, but curiously reversal of the script figures was overlooked.

The puzzle of "June 1870" seems to be solved by the original Preface being preserved. It begins much as the June 1871 one but there are only three paragraphs, the last one reading "A Supplement will shortly be issued, containing full descriptions and plates of the hitherto unfigured species, together with several new discoveries." It is suggested that a proof of this was sent to Cox who asked Legrand to hold it back and he would furnish the descriptions and plates. The Legrand copy has notes by Cox on the opposite blank sheet, in some cases negated by W. Legrand. Notes by other writers also appear on the sheets with many by Legrand whose spidery French handwriting is unmistakable. Also pasted upon paper in Legrand's copy are reviews from Tasmanian papers of his publication, with pencil notes of their probable writers. Unfortunately Legrand's scribbles are scarcely decipherable, the first one is from the "Mercury," 22 June 1871, another from the same paper is Nov. 23rd, with the probable writer Dr. Richards; another long review is from the "Australian Journal," looks like Dec 12, Ha-ford; fourth from C. Chr. 51 p. 9, 1871, Just, while the last is from the "Australian," Aug. 26, 1871.

Apparently Legrand used to print slips at later periods, one dated December 1874 being pasted in at the end, so it may be that he had the intention to print another edition, especially as some pages in Legrand's copy are noted "no alterations," and others have ticks against the species, although these may be simply proof-reading marks.

A notation after his death observes, "Of his family and early history no one knows aught definite. Legrand, in the far, vague heyday of his youth, had witnessed exploits and encountered notables. He knew Baedelaire in the 1840's, and recalled him with a shrug—'a miserable sort of devil with brains, and a tendency to religion.'" In the forties, indeed,

Legrand was much in Paris, and in some undiscovered capacity came into contact with many lights of his time—Janin, Gautier, Arsene, Houssaye, Merimee, Marger and numbers of others. Quaintly enough, he remembered them as bibliophiles and viveurs only. Legrand, it seems, had been a sad enough dog in his time. Additional proof that his golden time lay far back is given by the fact that he met Lady Blessington while that vivacious and various beauty was at the height of her charm. Charles Lamb he had also known. In short, Legrand was a remarkable man, a man good to know in the midst of this perverse and arid generation. During his Tasmanian decades, Legrand, immured among his mostly-rubbishy books, grew dingier and dingier. But there was a shrewd and kindly wayfarer beneath the grime, a strayed reveller from the wider world, a lover of light and a hater of the Philistines.”

On the Thirteenth Edition of Linne's Systema Naturae

By TOM IREDALE.

It is almost absurd to suggest that anything in connection with Linne's Systema Naturae should have escaped the attention of students for almost two hundred years. Most workers will recall that the Systema Naturae was built up year by year, the first attempt appearing in 1735 and the last, the twelfth edition, in 1766-68. This edition was commonly utilized as the basis of binominal nomenclature for more than a century, when it was suggested that the binominal system was completely displayed in the tenth edition, issued in 1758. The acceptance of the latter was urged, and after some time became universal. In the preface of the twelfth edition a list of Linne's works, prepared by himself, was included. An eleventh edition is mentioned as having been published at Leipzig (the other editions at Stockholm, Linne's home) in 1762, and dismissed as “furtim prodiit vitiosa. Nil additum.”

Later a very much revised edition was prepared by J. F. Gmelin and issued from 1788-1793, and this was styled the thirteenth edition, and until recent times was cited as such. Indeed, very commonly this edition was quoted as “Linne” alone, a practice accepted by Linne's successor and students. The citations can be recognised by the higher page numbers.

However, there was an earlier thirteenth edition, well known but commonly ignored. It was a piracy issued in Vienna, on the title page stating: “Editio decima tertia, ad editionem duodecimam reformatam Holmiensem” (1766-1768). The word “reformatam” has been overlooked, even by Sherborn in the Index Animalium. In his Bibliography, p. xxxv, 1902, he included (“ed. 13, ad. ed. 12. reform. Holmiensen”), 3 vols, 8 vo. Vindob. 1767 and 1770 (II and III). [Reprint of ed. 12.]

In “A Catalogue of the Works of Linnaeus in the British Museum” 2nd ed., Oct. 28, 1933), prepared by the Librarian of the Natural History Department (South Kensington) (Basil H. Soulsby), a little more was added: “A page-for-page reprint of the Twelfth Edition, except that the “Errata” on the last page of vol. 3 of the Stockholm edition do not appear in this. Tome 1, 1767; Tome 2, 1770; Tome 3, 1770.” It may be emphasized that the whole of Vol. I appeared in 1767, while the “Errata” slip in the official Twelfth Edition was not published until 1768.

The meticulous Sherborn overlooked that inquisitive note, and consequently allowed one of his almost unfindable errors.

Recently, when working on the Molluscan family of Strombs, I recalled one error I had noted many years ago, and as far as I have seen the error has not yet been publicised. In the Official Stockholm edition of the Twelfth Edition, Vol. I, pt. II, p. 1212, 1767, a letter had been dropped in the name of a species of *Strombus*, reading *uccinctus*. In the "Errata," abovementioned at the end of Vol. III, is noted "1212 *uccinctus* lege *succinctus*." This did not appear until 1768.

In the meanwhile the Vienna "Thirteenth Edition" had been published in 1767, and the pagination being exact, on p. 1212 the name had been corrected to *accinctus*. This was not recorded by Sherborn, and does not appear to have been noted since. Following Dillwyn the name *accinctus* has been credited to Born, who used it in his *Testae, Mus. Caes. Vindob., folio*, with plates, p. 283, 1780, and in his *Index Rerum Nat. Mus. Caes. Vindob., pt. 1, Testacea*, p. 280, 1778=1780, later than the preceding. Born mentioned the Stockholm edition in his list of Books, but apparently used the Vienna reprint, as he refers the name *accinctus* to Linn. Through this reference Sherborn did not record the name. It may be noted that Dodge (*Bull. Amer. Mus. Nat. Hist.*, III (3), p. 279, Oct. 29, 1956), dealing with the Strombidae of Linne, wrote: "In the twelfth edition of the 'Systema,' where the name first appeared, it is printed as '*ccinctus*,' the first two letters having been omitted through a printer's error. "Born used *accinctus*, etc." In original copies of the Twelfth Edition I have only met with "*uccinctus*," even as Linne corrected as above quoted.

The Foodplants of the Chequered Swallowtail, *Papilio demoleus sthenelus* Macleay, 1826 (*Lepidoptera: Papilionidae*)

By P. C. HELY

(N.S.W. Department of Agriculture.)

In the Proceedings of the Royal Zoological Society of New South Wales for the year 1954-5 (page 63) Mr. E. O. Edwards contributed an interesting article under the above heading. Mr. Edwards referred to his experience with this butterfly and to his inability to induce the larvae to feed on *Citrus* species or on the Wild Lime, *Atlantia glauca*, and asked if anyone has actually bred specimens on any of these hosts. The following brief observations may therefore be of some interest.

Being especially concerned with the subject of applied control of insects attacking citrus trees the writer has had considerable opportunity over many years of observing insects on these trees in many parts of New South Wales, and during a period of some twenty years in the Gosford district was in almost daily association with citrus orchards. However, it was not until March, 1943, that some unusual Papilionid larvae were noted in association with the commonly occurring orchard butterflies, *Papilio aegaeus* and *P. anactus*, on a block of mixed citrus varieties at Gosford Citrus Experiment Station, Narara. At this time these three species of larvae were so abundant that some young trees were almost defoliated. Many pupae of all three species were noted to be parasitized in the field but two unparasitized pupae overwintered and emerged as adult *Papilio demoleus sthenelus* in the following August.

On March 30th, 1950, an adult *P.d. sthenelus* was observed ovipositing on young citrus trees in the nursery row at Narara. The eggs hatched in 8-10 days and the first pupation from the resultant larvae, which fed on citrus foliage, occurred on 18th May after a larval feeding period of 40 days. An adult emerged from this pupa on 27th September. An adult butterfly was also seen in flight in a citrus orchard at Wyong in March of that year.

During March 1951 occasional adults were seen in the Gosford district but no larvae were observed although the caterpillars of *P. aegaeus* and *P. anactus* were plentiful and active on citrus trees at that time.

On 18th October 1953 an adult *P. demoleus sthenelus* was observed by Mr. Ian Mosse-Robinson to be ovipositing on the young shoots of a garden shrub, *Psoralea affinis*, at Gosford. The larvae hatched from these eggs and fed on the foliage of this South African plant and pupated on 10th December. The butterflies emerged on 31st December. Mr. Mosse-Robinson noted that the larvae on *Psoralea* were much browner in colour than similar stage larvae taken feeding on a young citrus tree at Narara on 30th November and which pupated on 2nd December and emerged on 18th December 1953. Several fresh-looking adults of *P. demoleus sthenelus* were also seen by Mr. Mosse-Robinson amongst citrus trees on 3rd November 1955 but no larvae were observed. It was of considerable interest to the writer to observe these butterflies flying amongst citrus trees at Barooga on the upper Murray and at Coomealla in the lower Murray district during early November 1955 but no larvae were seen.

From these scattered records it is evident that *Papilio demoleus sthenelus* can and does breed on citrus trees as well as on *Psoralea affinis* in the Gosford District but does not occur commonly enough to be regarded as a pest.

Mr. C. E. Chadwick informs me that he observed these butterflies visiting flowers of the introduced shrub *Duranta repens* at Alice Springs on 24th June 1957.

A Family of Flies New to Australia (Diptera, Rhinotoridae)

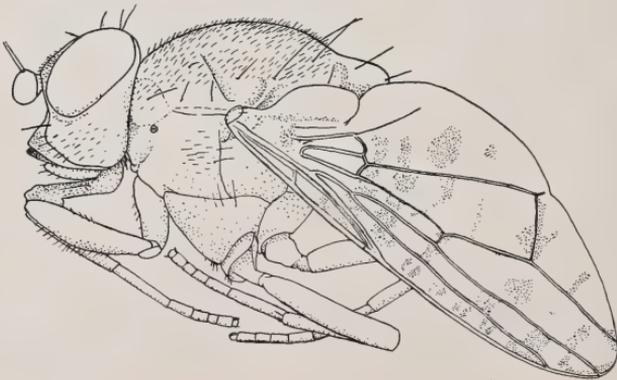
By D. K. McALPINE.

(Australian Museum, Sydney)

The Australian genus *Cairnsimyia* is transferred from the family Helomyzidae to the family Rhinotoridae. It is pointed out that the latter family is quite distinct from the Rhopalomeridae and is previously reliably reported only from the Neotropical Region.

In 1931 Malloch described and named a genus and species of fly from four specimens in the Deutsches Entomologisches Institut, Berlin. The specimens were from Cairns and Kuranda in Northern Queensland and the name given to them was *Cairnsimyia cavifrons*. The specific name refers to the deeply excavated dorsal region of the head. Malloch placed his new genus in the family Helomyzidae. He had recently studied the New Zealand species of this family and was impressed with the fact that these showed a much greater range of structural variation than the Northern Hemisphere representatives of the family. For this reason he included in the family forms which some would regard as belonging to a separate family, the Trixoscelidae. He recognized, however, that *Cairnsimyia* departed even more from the typical forms of Helomyzidae. Malloch stated that a paratype would be sent to the Australian Museum but there is no such specimen now in the collection.

Nothing more seems to have been published about *Cairnsimyia* up to the present. There is a specimen in the Australian Museum collection from Ulong, East Dorrigo, in northern New South Wales which agrees well with Malloch's description and figures, though there is a possibility of its being a distinct species. This specimen is also remarkably similar to representatives of three South American genera of the family Rhinotoridae in the museum



Cairnsimyia sp. from Ulong, New South Wales. Colour yellow-brown, the wings hyaline with brown markings. Length 5 mm.

collection. This fact has led to an investigation of the characters of both the Helomyzidae and the Rhinotoridae. The outstanding character of the Rhinotoridae is the sunken or excavated vertex of the head. This character is shared only with the related family Rhopalomeridae among the Acalyptrata. These two families usually have the femora much thickened and armed with ventral spines, a character not present in *Cairnsimyia*. One of the South American rhinotorids, *Rhinotoroides bifurcata* Lopes (1934), is also without this character whilst in the Entomology Department of the University of Queensland there is a series of specimens from Southern Queensland which closely resemble *Cairnsimyia* except that the femora are thickened and spinose. It is thus possible to state that *Cairnsimyia* and a related Australian form exhibit no important external character which does not also occur in South American species of Rhinotoridae and that the two Australian forms undoubtedly belong to this family. There are, however, minor differences in chaetotaxy which separate *Cairnsimyia* from all South American genera.

Although as long ago as 1916 Hendel recognized the Rhinotoridae as a distinct family, most authors have only allowed it subfamily distinction from the Rhopalomeridae. Steyskal (1957) pointed out differences in the male terminalia of the two families but only examined one species of each family. There are several other structural differences. One of the most significant, the presence of vibrissae in the Rhinotoridae and their absence in the Rhopalomeridae, has been generally overlooked.

The distribution of the two families is of interest as they have generally been supposed to be confined to South and Central America, the Rhopalomeridae extending to the United States. Brues, Melander and Carpenter (1954) give the distribution of Rhinotoridae as Neotropical and Ethiopian. The only Ethiopian record which I can find is that of *Rhinotora leucopsis* Bigot (1891) from West Africa, but Hendel (1931) has pointed out that this species is not a rhinotorid but a chloropid of the genus *Elaphaspis* Bezzi. It seems probable that no reliable record of Rhinotoridae from Africa exists. The east coast of Australia from Cairns in Queensland to the Dorrigo Plateau in New South Wales would thus seem to be the only area, outside the Neotropical Region, from which the Rhinotoridae have been recorded.

It is intended at a later date to make a detailed study of the Australian species of Rhinotoridae together with a comparison of Australian and Neotropical forms.

The author is indebted to Mr. F. A. Perkins for the opportunity of examining specimens in the Entomology Department, University of Queensland. He also wishes to thank Dr. J. W. Evans and Mr. A. Musgrave of the Australian Museum who checked the manuscript and gave helpful advice.

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Building a Home

Construction of Shelter by Larvae of the Butterfly *Mesodina halyzia halyzia* (Lepidoptera Hesperidae).

By E. O. EDWARDS.

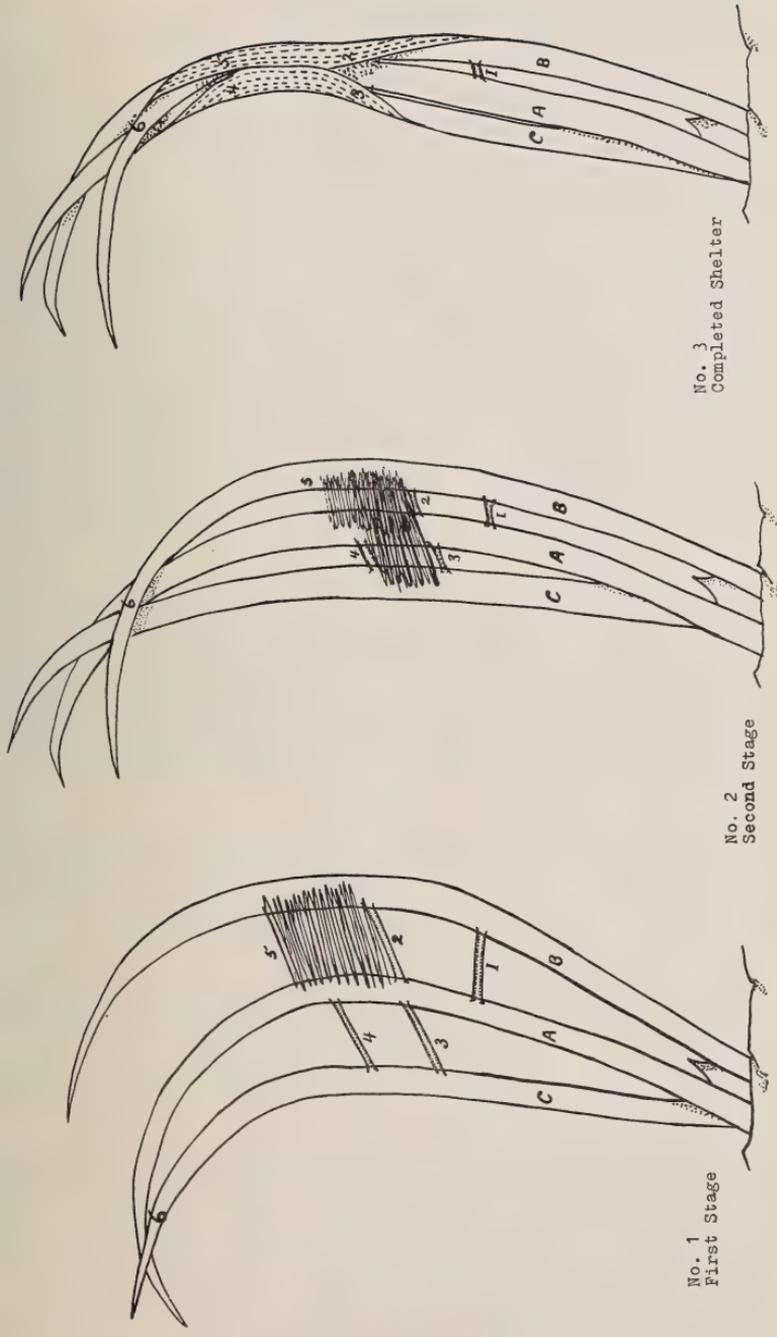
In modern days one envies the ability of a small caterpillar to build its own home, but have we ever stopped to watch and admire the skill with which this apparently quite untrained architect carries out the task? It was with this envy that I enjoyed watching the larva of *Mesodina halyzia halyzia* Hewitson, 1868 (The Halyzia Skipper) build its shelter. We called the larva "Snowy" because of the white powdery substance covering its pale green and pink body and black head.

"Snowy" was collected on a plant of *Patersonia glabrata* or Wild Iris at Woodford in New South Wales on July 29, 1957. We brought it home because we had already cultivated the plant. It is necessary to grow the food plants of most of the Hesperidae because of their home-building characteristics.

Next morning at 9.10 o'clock "Snowy" was introduced to its new clump of foodplant beneath a budding Coastal Myall Wattle in the wildflower garden. It wasted no time in making a careful inspection of the plant. The care that is taken cannot be fully appreciated until the home is built.

Patersonia glabrata belongs to the Iris family (Iridaceae), with purple flowers and rigid grass-like leaves growing directly from the base of the plant and varying in length from 6 to 12 inches, but drooping over at the extremities. These leaves were carefully surveyed by "Snowy" for two hours and 40 minutes by travelling up and down them. Unlike most Hesperidae, the Halyzia Skipper larva always rests in its shelter head downwards so that the top of the shelter will be the closed end. The growth of the foodplant may have some bearing on this as the point where the leaves bend over serves as a top to the shelter.

At 11.50 a.m. "Snowy" had selected its site, and, from a central leaf (A) midway between the base of the plant and the point where they commence to bend over, it stretched almost its full length of half an inch to clutch the leaf on the right (B). From this leaf it spun silk threads backwards and forwards to the central leaf (A) at the rate of 60 threads per minute for 6 minutes, forming a rope (1) of 360 silk strands. "Snowy" then moved on to the leaf on the right (B); travelled up this leaf for $\frac{2}{3}$ of an inch, and returned to the central leaf (A). At 12.5 p.m. from leaf (A) about $\frac{2}{3}$ of an inch above the rope (1), but at an angle of about 45 deg. down from the right leaf (B) to the centre leaf (A) another silken "rope" (2) was started. At this point the leaves were closer together than the point where rope (1) was made, and the rate of threads spun from leaf to leaf was greater, equalling 36 per minute for 4 minutes or a total of 144 threads. By this time the threads of rope (1) were drying, and the drying of the threads drew the right-hand leaf (B) gradually towards the central leaf (A). "Snowy" then crawled farther up the central leaf (A), transferring to the right-hand leaf (B) and back to leaf (A), where rope (2) joined central leaf (A). At 12.14 p.m. silk threads were run from central leaf (A) to a third leaf on the left-hand side of the central leaf (A), which we called left-hand leaf (C). The rope (3) thus formed was in a straight line and at the same angle with



No. 3
Completed Shelter

No. 2
Second Stage

No. 1
First Stage

A caterpillar builds a home. (See text for details.)

rope (2). The rate of thread-spinning was 30 per minute for 3 minutes, making a rope of 90 threads. The drawing closer of right-hand leaf (B) to central leaf (A) was now becoming still more noticeable.

There was a change in procedure as "Snowy" worked its way upwards from rope (2), spinning threads from central leaf (A) to right-hand leaf (B) in the form of a web (5) and not as a rope. This was continued for 11 minutes 32 seconds, and extended about 1 inch above rope (2). A period of inspection followed, then "Snowy" returned to add additional threads for 5 minutes.

At 12.40 p.m. the edges of the central leaf (A) and the right-hand leaf (B) had met. At 12.48 p.m. "Snowy" started a new rope (4) between the left-hand leaf (C) and the central leaf (A) about $\frac{1}{2}$ an inch above rope (3) and parallel to this rope. This continued for 3 minutes, then "Snowy" moved up the central leaf (A) to where it naturally touched the left-hand leaf (C) at (6) and attached these two leaves together there with silk threads. With the three leaves now connected, which, as the threads dried, were gradually being drawn together, "Snowy" commenced running threads across the three leaves, forming a platform above ropes (2) and (3). This was followed by the strengthening of the threads between left-hand leaf (C) and central leaf (A) in the form of a web between ropes (3) and (4), and continued until 1.30 p.m., when the two leaves (C) and (A) met.

Then commenced by far the most extensive job of all—that of bringing the right-hand side of the right-hand leaf (B) over so that it would be held at right angles to the central leaf (A). To do this "Snowy" ran threads from the outer or right-hand edge of the right-hand leaf (B) to the left-hand side (nearest leaf (C)) of the central leaf (A). This had the desired effect, and leaf (B) began to curl over. At 1.55 p.m. "Snowy" had five minutes' rest, the first rest it had taken. The same procedure was continued with "Snowy" working from the top (5) down to rope (2), but never going below rope (2) and concentrating on the top area around (5).

By 2.50 p.m. the right-hand leaf (B) was showing signs of curling over. "Snowy" now reinforced the threads at the junction of the right-hand leaf (B) and the central leaf (A), which were by now well joined. At 3.50 p.m. work ceased for the day and "Snowy" sheltered for the night on the central leaf (A) against the now curling right-hand leaf (B).

Next day was cloudy, but "Snowy" spent all day in drawing the right-hand leaf (B) over by running silk threads between the junction of the right-hand leaf (B) and the central leaf (A). By evening the right-hand leaf (B) was at right angles to the central leaf (A). "Snowy" rested that night in the same place as on the previous night, but did not eat at any time during the construction.

On the following day, which was sunny but cold, "Snowy" commenced the final stages. Up to this time the left-hand leaf (C) had received little attention beyond being drawn over to join the central leaf (A). Silk threads were now run from the outside of the right-hand leaf (B) to the outside of the left-hand leaf (C). This had the effect of gradually curling over the left-hand side of the left-hand leaf (C) to meet the right-hand side of the right-hand leaf (B), thus forming a cylinder. The left-hand leaf (C) had not joined up with the right-hand leaf by night but was very close, and the section between rope (4) and the top of the shelter (6) was pulled together.

On the fourth day the leaves (B) and (C) were joined, and the inside of the cylinder thus formed was heavily lined with silk. The three leaves were joined just about $\frac{1}{2}$ an inch above rope 4 and formed the top of the shelter. Next day "Snowy" had its first feed, starting from near the point of the central leaf (A).

POINTS OF INTEREST IN SUMMING UP

1. The rope (1) which was constructed first was not further used in the construction of the shelter itself, although it was the strongest rope. When finished, the bottom of the shelter was $\frac{3}{4}$ of an inch above this rope (1). Apparently the purpose of rope (1) was to ensure keeping the leaves close enough together to allow uninterrupted work if it should happen to be windy, and to some extent to assist in pulling the leaves together.

2. By far the most extensive work was the curling over of the two outer leaves, but no attempt was made to curl over the left-hand leaf (C) until the right-hand leaf (B) was in the desired position.

3. The larva did not feed during the four days' construction. In this respect one may be justified in thinking that in warmer weather the drying of the threads would be quicker and construction thus speeded up. Still, the amount of energy expended and the quantity of silk thread used in comparison with the size of the larva are very great.

FEEDING

It has been generally regarded that many larvae of Hesperidae feed only at night. In the case of this larva it fed only during the day, and on two occasions I found it feeding between 12 noon and 1 p.m. I have found that other larvae of Hesperidae, regarded as night or dusk feeders, do feed during the day, but confine their feeding to parts of the leaves near the entrance to the shelter, thus making it unnecessary to bring more than their heads out of the shelter.

A New Species of *Argiolestes* from New South Wales (Order Odonata)

By LT.-COL. F. C. FRASER, I.M.S., Retd.

ARGIOLESTES CALCARIS, n. sp.

Male. Abdomen 27.5 mm. (with appendages), Hindwing 23 mm.

Head: labrum dark blue metallic; epistome glossy black, yellow at its lower border; bases of mandibles and genae bright chrome yellow; rest of head matt black, including antennae; occiput projecting markedly as an angle just medial to border of eyes. Prothorax dull black with a large rounded spot on each side of the middle lobe, a smaller on each side of the posterior lobe, and the whole of the anterior lobe chrome yellow. Thorax black on dorsum rather heavily pruinosed, marked with a bright chrome yellow humeral stripe, the lower part anterior to the suture but crossing it at its middle to be continued along its posterior border but not quite attaining to its upper limit. Laterally black varied with chrome yellow—a broadly interrupted stripe on the mesepisternum extending on to coxae below and interrupted at the upper level of spiracle; a second irregular stripe on lower half of metepimeron which expands anteriorly and turns back along the lower border of the posterolateral suture, forming a hasp-shaped marking. Yellow beneath thorax but its centre black. Legs black, coxae and trochanters marked with yellow. Wings hyaline, pterostigma very dark ochreous framed in black, covering 2 cells, narrowly lozenge-shaped, acute at both ends; 13 to 15 post-nodals in forewings, 12 to 13 in the hindwings; petiolation of wings begins at level of base of discoidal cell but the anal vein distinctly confluent with the posterior border of wing to as far as *Ac*, which vein lies much nearer the level of the distal antenodal; *Riii* begins at the 5th postnodal in forewings, at the 4th in the hind. Abdomen black with the apical border of segment I chrome yellow and paired basal spots, broadly interrupted on the dorsum from segment 3 to 7. Anal appendages black; superiors nearly half as long again as segment 10, broad at base, slightly constricted at middle, directed straight back but apical fourth curled abruptly inwards; the inner border rather deeply excavate so that the basal portion forms a distinct angulation on the inner side; shortly before apex a strong thorn-like spine, similar to that found in *icteromelas* is directed ventrally and obliquely posteriorly. Inferior appendages rudimentary, not visible in profile.

Female. Abdomen 26-27 mm., Hindwing 26 mm.

Resembles the male generally in colour and markings; differs as follows: The anteclypeus more definitely carneous or reddish purple, a small oval yellow spot on each side of vertex between the ocelli and orbit, pterostigma larger and of a pale ochreous at its centre with the surround more or less enfumed, the nodal index a little higher, 16-17 postnodals in forewings and 14-16 in the hind (compared with 20-22 in the female of *icteromelas*); lastly the abdomen of the same length as the wings and of extraordinary robustness, much thicker than the larger species of the genus, this feature alone serving to separate the species from all others.

The black markings on the sides of thorax appear to be made up of three oblique stripes, the anterior and middle ones confluent at a point at level of spiracle, the middle and posterior ones broadly confluent at their upper halves.

Habitat: *New South Wales*: Mt. Kosciusko, 5,000 ft., 18. i. 54; 4 males and 3 females collected by Mr. Roderick Dobson. The general appearance of this new species resembles *Argiolestes griseus* Selys, and it is possible that it has actually been mistaken for this species, which, however, has no ventral spur near the apical end of the superior anal appendages. It differs from *A. icteromelas* Selys by its much smaller size (Abd. 27 mm. compared with 34-38 mm. in *icteromelas*), by the lower nodal index (13-15 compared with 18-20 in the males and 16-17 compared with 20-22 in the females), by the greater extent of the black markings on sides of thorax, by superior anal appendages relatively longer and less curved, by the marked pruinosity of the dorsum of thorax (quite absent or limited to the humeral stripes in *icteromelas*), and lastly by the great robustness of the female abdomen. The pterostigma of the female appears to retain its pale yellow colouring even in the adult stage, but this is lost in the female of *icteromelas*.

Antipodogomphus neophytus, a New Species of Dragonfly from Northwestern Australia

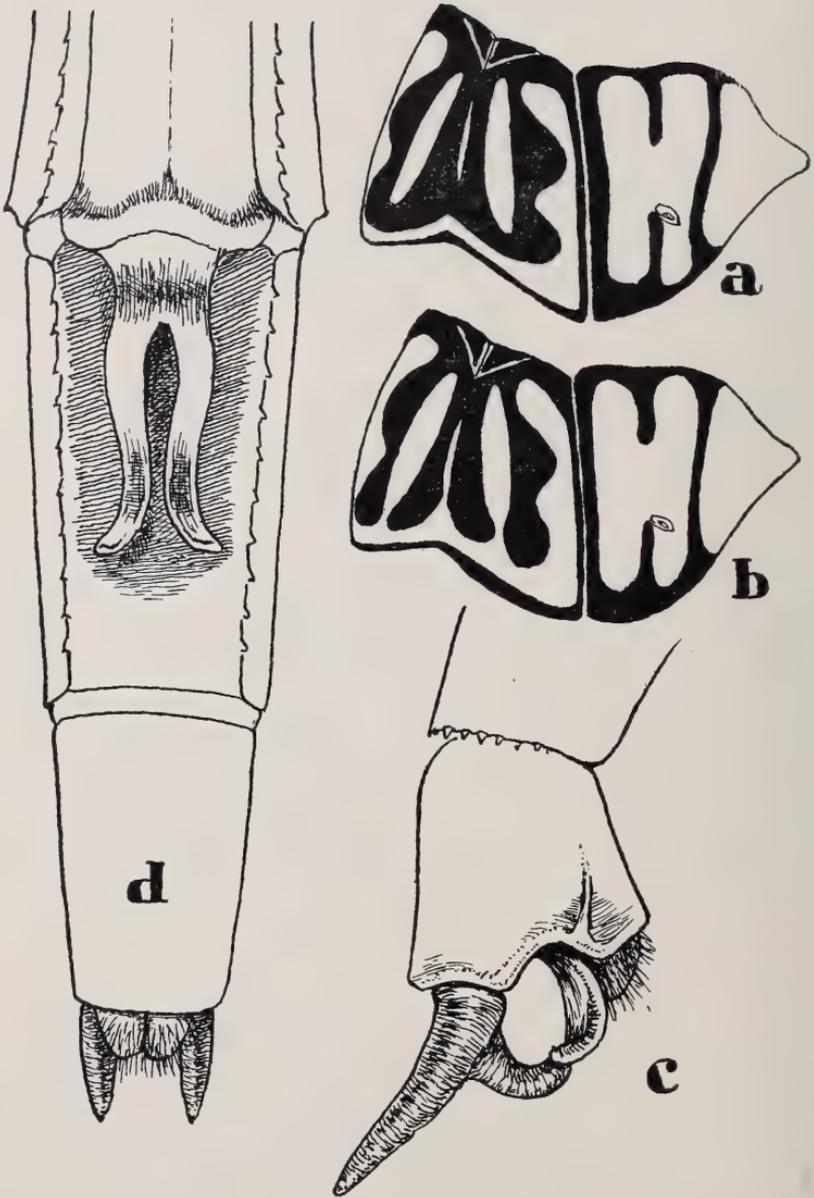
By LT.-COL. F. C. FRASER, I.M.S., Retd.

In a small collection of Odonata made by Dr. E. P. Hodgkin, of the University of Western Australia, I have found a new Gomphus belonging to the genus *Antipodogomphus* Fraser, bringing the number of species of the genus to three. In addition to this was a single female of *Orthetrum pruinosum migratum* Lieftinck, a rare species of which this sex was hitherto unknown. This species was first discovered by Dr. R. J. Tillyard, who sent a single male to Dr. F. Ris for his opinion; Dr. Ris remarked on its peculiarity as compared with *O. pruinosum pruinosum* (Burmeister), but said that he dared not name it in view of there being only a single example. Some forty years later M. A. Lieftinck redescribed the male and named it as a new subspecies from two males from North Australia. He pointed out quite a number of characters in which *migratum* differed from *pruinosum*, and these are so manifest that I personally would not confuse the two; therefore I prefer to regard it as a full species belonging to the group *pruinosum*. The description of the two insects follows:—

ANTIPODOGOMPHUS NEOPHYTUS, n.sp.

Male. Abdomen 40 mm. Hindwing 30 mm. Pterostigma 3.5 mm.

Head: whole of lips, face, frons, and occiput pale yellow; vertex black but centred with yellow. Prothorax yellow with the dorsum of middle lobe and a spot on each side black. Synthorax black on dorsum marked with citron yellow, yellow on sides with sparse black markings as follows—middorsal carina finely yellow, antehumeral stripes elongated fusiform in shape which do not extend quite to the slightly interrupted mesothoracic collar, humeral stripes complete, markedly expanded at the upper, middle, and lower parts and obviously made up by the confluence of the three spots found in the related species *acolytus* and *proselytus*; laterally a very narrow widely interrupted black stripe on the first lateral suture, broken at level of spiracle, and a similar linear stripe on the whole of the second lateral suture. Legs sandy yellow, the femora striped in their length with black, the hind with a stripe on the extensor surface and one on each side, the other two pairs with a short linear black spot on the outer side



a, Thoracic markings of *Antipodogomphus neophytus* n. sp., male. *b*, The same of the female. *c*, Anal appendages of the same species viewed from the right side. *d*, End segments of female of *A. neophytus* to show genitalia.

of the distal ends; tibiae and tarsi black. Wings: costa bright yellow throughout its length and strongly contrasted against the black pterostigma; many other veins also yellow but the Radius conspicuously black; the whole wing tinted with yellow. Venational details: 14 to 15 antenodals and 10 postnodals in forewings; 10 antenodals and 8 to 9 postnodals in the hindwing; anal field of forewing one cell deep, that of hindwing 4 cells deep; an incomplete basal antenodal in all wings. Abdomen black with yellow markings—segment I with base narrowly black; 2 with a middorsal trilobate yellow stripe enclosed on each side by a broad black one, below which the oreillets and rest of sides are yellow, segments 3 to 6 with prejugal and apical black rings, the jugal one becoming progressively narrower from segment 3 to 6 and finely linear on 6; the apical rings, on the contrary, becoming progressively broader; segment 7 with its basal two-thirds yellow, 8 entirely yellow save for a small preapical dorsal black spot; segments 9 and 10 ferruginous. Anal appendages; superiors yellow, the ventral curved hooks dark ferruginous, as also is the inferior appendage; the superiors shaped almost exactly the same as in *proselytus*, the inferiors deeply forked. Genitalia: lamina ferruginous; posterior hamules very elongated and narrow, bright yellow with black apices; lobe of penis black.

Female. Abdomen 42 mm. Hindwing 32 mm. Pterostigma 4.0 mm.

Resembles the male closely in colour and markings, but the yellow ground-colour more extensive. The black of vertex encroaching on base of frons; the antehumeral stripes confluent with the mesothoracic collar and the latter extending outwards to become confluent with the humeral stripes; the black rings on segments 3 to 6 extend laterally to become confluent and enclose long oval yellow dorsal spots; on segments 5 and 6 the middorsal carina is finely black, thus dividing the dorsal spots into two; segment 7 has small apicolateral yellow spots in the apical black annule; segment 8 is largely black on dorsum, this extending nearly to base. Segments 8 to 10 greatly lengthened as in the two other species. Anal appendages about half as long as segment 10, conical, yellow.

Habitat: N.W. AUSTRALIA, Wyndham, Kimberley Research Station, a single pair taken in February, 1954.

This new species is distinguished from *acolytus* (Selys) by the antehumeral stripes not confluent with the mesothoracic collar, at least in the male; by the complete yellow humeral stripe (an upper triangular spot and a short linear one in *acolytus*); by the greatly reduced black on the sides (confluent in *acolytus* to enclose two or three yellow spots); no black line traversing the lower part of frons anteriorly; segments 8 to 10 ferruginous; hamules tipped with black. The ovipositor is very similar to that of *acolytus* but the base is more constricted and the two lobes into which it is cleft are narrower, closer together, and with the apices divaricate. The occiput is again somewhat similar to that of the female of *acolytus*, but the two spines are very minute and set even further apart. From *proselytus* (Selys) the armature of the female occiput and the shape of the ovipositor are entirely different; the thoracic markings differ (in *proselytus* the humeral yellow stripe is broken up into three or four spots and the black on the sides is very much more extensive, enclosing spots or a broken yellow stripe).

ORTHETRUM MIGRATUM Lieftinck.

Orthetrum pruinosum migratum Lieftinck.

Female. Abdomen 25 mm. Hindwing 32 mm.

The specimen is not quite fully adult and is of an olivaceous yellow with the abdomen inclining to ferruginous and all its sutures mapped out finely in black. The face is paler but slightly darkened on the frons; thorax without markings; legs sandy yellow. Wings hyaline with the extreme base of forewing and a large triangular area at base of hindwing rich amber in colour, extending in the hindwing to the first antenodal, just invading the base of the anal-loop and overlapping the *Cu*₁ and base of membrane, which latter is cinereous or pale brown. The venational details are closely similar to those of the male, but the three specimens (two males accompanying the female) show slight variations—13 to 15 antenodals in forewing and 10 to 11 in the hind; 8 to 9 postnodals in all wings; the pterostigma is paler yellow (dark ochreous between black veins in the males), 3 mm. in length. Segment 8 has but slight lateral dilatations. Ovipositor very small, inconspicuous.

Habitat: N.W. AUSTRALIA, Millstream, one pair, vi. 54, one male, Wittenden, 2.iii.54.

The types of the new *Antipodogomphus neophytus* and the allo-type female of *O. migratum* have been returned to Dr. Hodgkin, and are presumably lodged in the University of W. Australia Museum.

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The Dates of Publication of Certain Insect Plates in
L. I. Duperrey, *Voyage Autour du Monde* . . .
La Coquille . . . 1822-1825, Atlas

By A. MUSGRAVE.

(By permission of the Trustees, Australian Museum.)

The dates of publication of the text and atlas of the *Voyage de la Coquille* have been dealt with by various authors, notably Sherborn and Woodward, *Ann. Mag. Nat. Hist.*, (7) xvii, 1906, 335, but in this last-named contribution no mention is made of the actual plates published in each livraison.

It is well known that the Atlas containing the coloured plates, with the scientific names of the insects inscribed thereon, had appeared during 1830-1832, but the *Texte* of the *Insectes* by Guérin-Méneville did not appear until 1838, the *avant-propos* being dated November 15, 1838. Guérin-Méneville in a footnote to the *Texte* of the *Zoology* part, p. 271, gives the dates of the appearance of the *Livraisons* containing the plates, but cites two plate 17's (one of which should be plate 19). In my *Bibliography of Australian Entomology, 1775-1930*, p. 133 (1932), I cited verbatim from Guérin-Méneville, being thus obliged to repeat the error for lack of information.

References made by Sherborn and Woodward to the *Bibliographie de la France*, suggested that therein might lie the solution to this problem. As this work is not represented in the Public Library, Sydney, an appeal was made to the Bibliothèque National, Paris, and now, thanks to the courtesy of Mons. P. Jossierand, Conservateur des Imprimés, the position has been clarified. Mons. Jossierand writes:

En réponse a votre lettre du 19 septembre dernier, nous ne pouvons vous donner en ce qui concerne les dates exactes de publication des planches 17 et 19 relatives aux insectes de l'Atlas du *Voyage de la Coquille* que les indications mentionnées dans la *Bibliographie de la France*.

Il y a évidemment une faute d'impression dans la note no 2 de la p. 271 du *texte* de Guérin-Méneville relatif aux insectes. Si la première phrase: "La livraison 19, contenant les planches 2 et 17 des insectes, a paru le 25 novembre 1830" est exacte, la phrase suivante doit être modifiée ainsi: "La livraison 20, contenant les planches 3, 6 et 19 (*au lieu de* 3, 6, et 17) des insectes, a paru le mars 1831."

Ces indications correspondent à celles données par la *Bibliographie de la France*, il est en effet normal que celle-ci annonce avec quelques jours de retard la publication des planches en question.

Bibliographie de la France.

Numéro du 11 decembre 1830, p. 803. On lit au no. 6498: "Voyage autour du monde par L. I. Duperrey. 1ère division. Zoologie. 19e livraison, In-folio d'une feuille servant de couverture, plus 4 planches."

Numéro du 18 decembre 1830. On lit, après d'autres indications, au no. 6609: "La 19e livraison de Zoologie, annoncée sous le no. 6498, contient 6 (et non 4) planches."

Numéro du 30 avril 1831. On lit au no. 2023: "Voyage . . .
lère division. Zoologie. 20e livraison. In-folio d'une feuille servant
de couverture, plus 6 planches coloriées."

L'excédent de planches par rapport a la note de Guérin-Méneville
s'explique par le fait que ces planches concernaient aussi d'autres animaux
que les insectes.

The Insectes Pl. 17 [25 Nov. 1830], Atlas, Voy. de la Coquille, are
named by Guérin-Méneville as follows and all are Lepidoptera-
Rhopalocera:

- | | | |
|---------------------------------|---|--|
| 1. <i>Morpho bioculatus</i> | = | <i>Tenaris bioculatus</i> (Guér.).
Waigeu I. |
| 2. <i>Satyrus klugii</i> | = | <i>Geitoneura klugii</i> (Guér.).
Port Jackson. |
| 3. <i>Satyrus Duponchelii</i> | = | <i>Mycalesis duponchelii</i> (Guér.).
New Guinea. |
| 4, 5. <i>Satyrus chiliensis</i> | = | <i>Cosmosatyrus chilensis</i> (Guér.).
Chile. |

The eight insects (Lepidoptera-Heterocera) figured on Pl. 19 [March
1831] are all named by Guérin-Méneville as follows (see list on left), but
some are now regarded as synonyms of earlier described species. Only two
of these are recorded from Australia, viz. nos. 2 and 7.

- | | | |
|------------------------------------|---|--|
| 1. <i>Agarista Aemorrhoidalis</i> | = | <i>Ophthalmis haemorrhoidalis</i> (Guér.).
New Ireland. |
| 2. <i>Noctua scapularis</i> | = | <i>Leucanitis frontinus</i> (Donovan).
Port Jackson. |
| 3. <i>Deileptena Poeyi</i> | = | <i>Dysphania Poeyi</i> (Guér.).
Waigeu I. |
| 4. <i>Phaloe cruenta</i> | = | <i>Phaloe cruenta</i> (Guér.).
Buenos Ayres. |
| 5. <i>Lithosia Arthus Bertrand</i> | = | <i>Rhodogastris arthus-bertrand</i> (Guér.). |
| 6. <i>Noctua propitia</i> | = | <i>Hamodes propitia</i> (Guér.).
New Ireland. |
| 7. <i>Noctua picta</i> | = | <i>Calogramma festiva</i> (Donovan). |
| 8. <i>Glaucopsis strigiventris</i> | = | <i>Eurota strigiventris</i> (Guér.).
S. Brazil. |

Observations on Some Australian Forest Insects

2. A Biting Midge (Diptera: Ceratopogonidae), and Mortalities Among Larvae of Lepidoptera (Limacodidae)

By K. M. MOORE.

The Limacodidae (cup-moths) is a small family of moths containing some twenty-five Australian species (McKeown 1945). Many species of *Eucalyptus*, or ornamental trees such as *Tristania conferta* R. Brown (brush-box) are at times defoliated by them.

Larvae of *Doratifera casta* Scott were defoliating *Eucalyptus saligna* Smith (Sydney blue-gum), *E. acmenioides* Schauer (white mahogany) and *Angophora intermedia* A. P. deCandolle (rough-barked apple) at Lisarow, N.S.W., from 1954 to 1956. Numerous mortalities among larvae of most instars of *D. casta* were then observed in that area, and from the appearance of the dead or dying larvae it was suspected that a virus disease was responsible. Groups of young larvae, or single specimens of the more dispersed and larger larvae did not alter their positions on the leaves for some days, during which time they became flaccid and the body contents liquefied, until eventually only the shrivelled remains were observed on the leaves.

During April, 1956, several female specimens of a biting midge were collected during late afternoon on apparently healthy penultimate and last instar larvae of *D. casta*, which were feeding on *E. saligna* leaves. Some midges were collected with the proboscis inserted, and others as they alighted on larvae. Specimens were identified as *Forcipomyia fuliginosa* (Meigen) (Diptera: Ceratopogonidae) by Dr. W. W. Wirth, of the U.S. National Museum, Washington.

This is the second specific host-record for *F. fuliginosa* in Australia known to the writer; the earlier record concerns a specimen identified by W. W. Wirth, and now in the School of Public Health and Tropical Medicine. This specimen was collected at Nedlands, Western Australia, by K. R. Norris, March 20, 1940, with its mouthparts deeply embedded in the intersegmental membrane of the larva of the common West Australian moth *Antimima sryptica* (Notodontidae). *F. fuliginosa* is common in many localities in Australia, and, although attracted readily to light-traps, is never taken in large numbers. (Personal communication, D. J. Lee, School of Public Health and Tropical Medicine, University of Sydney, 1957.)

Some species of the Ceratopogonidae are parasitic on insects of various orders, and feed on the blood of larvae or attach themselves to the wing or the thorax of adult insects. A list of hosts given by Wirth (1956) includes the following:—

Larvae: Lepidoptera and Hymenoptera.

Adults: Odonata; Orthoptera, Phasmidae; Neuroptera; Coleoptera, Meloidae; Diptera, Tipulidae, and Culicidae; and Lepidoptera. Spiders and frogs are also attacked. Distribution is given by Wirth, but no specific host-records from Australia are recorded.

F. fuliginosa has many synonyms, is world-wide in distribution, and is a parasite of many species of lepidopterous larvae. It appears that its

habit of sucking the body-fluids of certain larvae is a means by which disease is spread among the hosts. Wirth is reported in Circular 52, page 6 (April 1957), of The Society of Entomologists (Sydney), as saying that in the U.S.A. a midge, *Forcipomyia* sp., was in the habit of sucking the blood of caterpillars and sawfly larvae and was believed to transmit a polyhedral virus disease.

With the probability of virus transmission among larvae of insects by midges, *F. fuliginosa* may be a factor in the rapid reduction of large populations of *D. casta* larvae by the spread of the disease observed at Lisarow.

A list of genera (and habits where known), together with Australian and overseas literature concerning Ceratopogonidae recorded from the Australian region may be found in an unpublished report (Lee 1956).

ACKNOWLEDGEMENTS

I wish to express my thanks to Mr. D. J. Lee for the data concerning the first specific host-record and to Mr. K. R. Norris for permission to include the record in this paper.

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Evolution of Royal Jelly

By TARLTON RAYMENT, F.R.Z.S.

The eating of “royal jelly” is not the royal prerogative of the hive-queen, and even less so of the worker-bees. The truth is—the “super-food” of bees constitutes an integral portion of the ancient inheritance of the race: of every bee, from the humblest fossil deep in her cave, up to the most regal mother reigning high over her waxen palace. When that fact is firmly established the student may then begin his investigations with some hope of success into the evolution of the royal jelly of the bees.

The secretion of the glands in the head may be seen in excelsis in worker-bees. The pharyngeal glands are situated inside the cheeks at each side, and resemble a miniature cluster of grapes. The organ consists of a number of cream-coloured nodule-like masses; each node is connected with a short extension to the main duct, whence the secretion flows along the glossa.

This passage of the secretion may be observed in the female in micro-sections of the bees, *Exoneura*, and also by critical study of the functioning of the glossa. The "tongue" is not directed towards the point, but bent backwards, so that the inner surface becomes the outer one, and the aperture of the duct of the Salivarium is now exposed to receive the secretion.

When the genera of the bees are arranged in a series according to the evolution of the mouth-parts it can be seen that the pharyngeal glands form a beautiful demonstration of creative evolution.

By the year 1957 it had become the fashion of writers to ascribe certain miracles to the use of royal jelly. Journalists revelled in these sensational tales of the cures of the halt, the sick, and the maimed. However, a few of the naturalists realised that the question of food is not entirely one of quantity but rather one of quality.

It is quite illogical to expect in nature any sudden ebullition of a "super food," or anything else, because the wheels of Nature grind very slowly, albeit very finely; consequently, once the first elements of secretion have been laid down, then the subtle laws of evolution will tend to the gradual growth qualitatively and quantitatively.

If one were to assume that morphology and function were dependent upon the supply of food to the animal, then logically the scientist should be able to demonstrate the truth of this hypothesis. Fortunately, he has been able to do just that, for he has a shining example for demonstration.

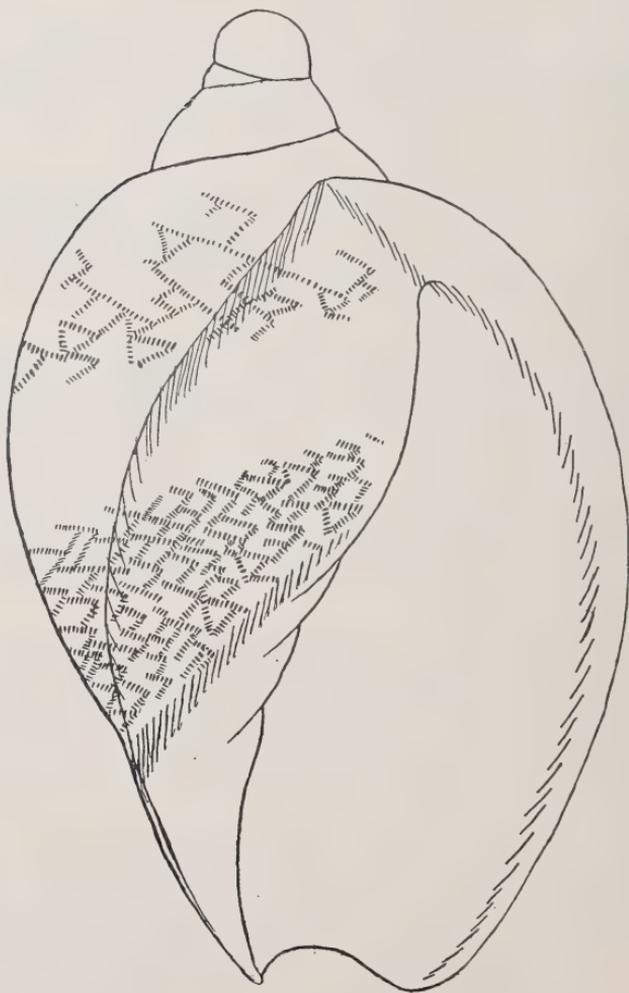
The "queen," mother of the hive-bee, owes her spectacular development to the evolution of the pharyngeal glands and the secretion of the "royal jelly," with its subsequent changes in the morphology of the body of the insect. These are well-known phenomena to naturalists, but what is not so well known are the functions of the organs and the psychic life of the insects.

A German anthropologist, Professor Fischer, extracted the tentative vitamin "T" and injected the product into various animals, such as beetle larvae, dogs and apes, to increase their "unmistakable happiness and playfulness." Whether there is anything in this, it is a fact that the fast disappearing primitive tribes of Australia, as elsewhere, are about to receive special scientific attention, long overdue. "Age," p. 10, August 29, 1957, Dr. Pennyquick.

D. S. Coleman, an apicultural officer of the Agr. Dept., W.A., writing on July 15, 1957, claims that there is "no doubt about the presence of royal jelly in honey," but the present author would stress the fact that the percentage must be exceedingly small, and largely adventitious. Coleman quotes another authority, referring to the question of vitamins in honey, states that pantothenic acid is the only source of the royal jelly; furthermore, that during the extraction some of the royal jelly must go into the honey. Indeed, it would be remarkable if it were not so, owing to the close association of bees and honey, but the percentage of royal jelly in the honey must be infinitesimal indeed.

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[This issue of the "Marine Zoologist" is dedicated to the memory of one of its founders and prime movers. Through the kind permission of the Malacological Society of Australia, Melbourne, we reproduce here an obituary notice by Miss Joyce Allan of our late friend which appeared in the *Journal* of that Society.]

Lee Woolcott

Malacologists here and abroad will be grieved to hear of the sudden death of well-known member, Mrs. Leone (Lee) Woolcott, wife of Ray, who died on Sunday, 4th August 1957. Lee was one of the foremost amateur malacologists in Australia, with a remarkable knowledge of the eastern Australian marine forms in particular, gained by being an excellent field worker and collector, who loved to pack her haversack and tramp with husband Ray, a keen fisherman, to many out-of-the-way beaches and rocky reefs. Later she changed more to car trips, and had all arrangements made for an early visit to Bustard Head, Queensland. She always planned trips well ahead down to the finest detail, and had a much wider expedition to Darwin and down the north-west coast of Australia which she and her husband intended to do. Lee always kept field notes assiduously to accompany any collecting she did, and her collection at her home in Mosman was efficiently kept and recorded, example of her clear mind and methodical approach. She had reached the stage where she could do serious research on it, and several names have appeared in recent years in publications of the Royal Zoological Society of New South Wales, and a very interesting account of one of her many trips to the Barrier Reef, in *Walkabout*, a few years ago.

Lee was for many years Chairman of the Marine Section of the R.Z.S.N.S.W., during which time she inspired members with her enthusiasm and love of shells, and undoubtedly her term did much towards building the section to its present standard. A quite new and most noteworthy achievement was the innovation of a Juniors' and Beginners' Class, which she and her daughter, Mrs. L. Harford, formed jointly to teach the elements of Malacology, using specimens from her own collection as training aids. This was held one hour before the usual monthly shell night.

Lee was an Honorary Correspondent of the Australian Museum and attended there regularly about once a week to assist in the shell department, where she was working on a revision of the bivalve collection with the writer until the latter was forced to retire owing to a severe illness; she then carried on her excellent assistance with Dr. McMichael. Everyone will greatly miss her charming, warm and helpful nature and her clear brain, which combined so vividly to give her the great love of life and living for which she was noted.

JOYCE ALLAN.

A Bibliography of Lee Woolacott with an Index to Her New Scientific Names

By TOM IREDALE and GILBERT WHITLEY.

1. The Establishment of *Salinator fragilis* Lamarck and *Salinator solida* von Martens as Two Distinct Species in Australia.
Proc. Roy. Zool. Soc. N. S. Wales 1944-45 (publ. Aug. 31, 1945), pp. 35-38, pl. iii.
 2. Outlines [of the "Marine Zoologist"].
Proc. Roy. Zool. Soc. N. S. Wales 1951-52, Nov. 5, 1952; *Marine Zoologist* i, 1, p. 37.
 3. New Shells for New South Wales.
Proc. Roy. Zool. Soc. N. S. Wales 1952-53, May 24, 1954; *Mar. Zool.* i, 2, pp. 37-39, pl. iii.
 4. Junior Members' Study Group Marine Section R.Z.S.
Proc. Roy. Zool. Soc. N. S. Wales 1953-54, March 4, 1955, p. 14.
 5. Coral Dwellers.
Proc. Roy. Zool. Soc. N. S. Wales 1953-54, March 4, 1955; *Mar. Zool.* i, 3, pp. 79-81, pl. ii.
 - 5a. Holiday on North-West Island, Capricorn Group, Queensland, *Walk-about*, June 1, 1955, pp. 32-36.
 6. Notes on Australian Shells. No. 1.
Proc. Roy. Zool. Soc. N. S. Wales 1954-55, April 10, 1956; *Mar. Zool.* i, 4, pp. 72-75, and plate.
 7. Notes on Australian Shells. No. 2.
Proc. Roy. Zool. Soc. N. S. Wales 1955-56, May 8, 1957; *Mar. Zool.* i, 5, pp. 112-117, pl. iii.
- | | |
|--|---------------------------------|
| arbutum, Rhombothais: 3, p. 38. | Minnimurex: 7, p. 115. |
| gemmulatum, Ataxocerithium: 7, p. 115. | opulens, Pyrene: 7, p. 113. |
| imperator, Virroconus: 6, p. 72. | phantom, Minnimurex: 7, p. 115. |
| lavendula, Naticarius: 6, p. 73. | Rhombothais: 3, p. 37. |
| leone, Solecortus: 3, p. 39. | vapida, Bedeva: 7, p. 114. |

All the new genera and species were illustrated, as well as other shells.

Lee Woolacott (fourth from the right) at a Marine Zoological excursion to Bottle and Glass Rocks, Sydney, in 1948.

Photo—F. McCamley.





LEE

To Memorize

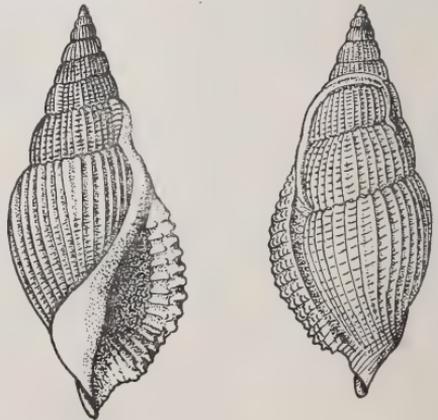
Lee

By

TOM IREDALE

A beautiful little shell that has not been yet included in the Marine Fauna of Queensland may be called *Varicospira lee* as a slight memorial to our lost colleague, the late Mrs. Lee Woolacott. Her first name was Leone but she endeared herself to all the shell-collecting

communion under the pleasing abbreviation of Lee. I have been arranging the Strombs and Lee was most interested as she had been studying this puzzling group for some time. She showed me some of her treasures for advice and allowed me to examine her collection. In it I found a series of this shell which was in the Australian Museum from Torres Straits and Darwin without official record. I had already had a figure drawn by Mr. C. F. Laseron from an Australian shell but Mrs. Woolacott's series confirmed the locality as they had come from southern New Guinea just across the water. I had selected Lee's name for this shell, when I was very shocked to hear of the very sudden death of this grand lady. For years she had been a constant attendant at the Australian Museum, investigating problems surrounding her own specimens and assisting in the arrangement and determination of shells sent in. She was always so alive, so enthusiastic, and so untiring, full of news, enquiries and hopes, that it will be a long time before we become accustomed to her absence. It is still very disturbing to miss her happy face on Mondays, her usual day for appearance. Her energy as a collector was super-normal, she was always thinking of new places to visit, and new shells to criticize. She was very painstaking in her studies, probing every record, and verifying every item to the utmost detail. The formation of the "Marine Zoologist" as a means of communication for the work of the members of the Marine Section of the Royal Zoological Society of New South Wales, which had been such a success, was primarily due to her persistence, and this supplement to our Proceedings will be always a memorial to her enthusiasm; that this is recognized by the members will be seen in the fact that this number is dedicated to her memory.



Varicospira lee Iredale.

Charles Laseron del.

Family STROMBIDAE.

Genus VARICOSPIRA Eames, 1951.

Varicospira lee, sp. nov.

Shell small, elegantly pointed oval, spire about equal to the aperture, whorls seven adult plus two nepionic, slightly convex, apex acute, spire conical, tri-varicose, aperture small pointed oval, very strongly variced externally with heavily reinforced columella anteriorly, canaliculate at each end. Dead shell dirty brownish-white; living (Mrs. Woolacott's specimen) a beautiful honey brown, the last whorl showing three darker bands, more noticeable on the outer varix. The apex consists of two glassy whorls, the succeeding whorls being sculptured by narrow elevated longitudinal ribs with the broadish intervals crossed by close incised lines which do not cut the longitudinals, but produce a superficial cancellation. On the face of the body-whorl thirteen ribs may be counted while the linear incisions vary about twenty. The varices are normally three, but these are not all pronounced, sometimes only one or two being marked, on each whorl. Two extraordinary features characterize the shell, both concerning the aperture and the figures will show these better than any description: first, the columella which is heavily reinforced and reflected, more boldly towards the anterior canal, where it forms a large pad and is produced and reverted so that it is not clearly visible in the figures. Anteriorly it is laid on thickly on the preceding whorls travelling upwards two whorls, then abruptly crossing the suture halfway and as abruptly descending more than a whorl. As the outer lip has followed this procedure, an open channel appears all the way. The outer lip is most complexly varicose, very broad, showing strong ridges—almost twofold inside the aperture, while internally the ridges are even stronger and cut by deep incisions, practically following the body-whorl sculpture but separated from it by a deep gutter. There is a situation in the form of the outer lip towards the anterior canal separated by a slight projection, the canal itself long and narrow. Altogether it is a very remarkable little shell. Length, 34 mm., breadth 12 mm., interior of aperture about 10 mm. by 4 mm. Type locality, Torres Straits, North Queensland. Also Darwin, North Australia, and New Guinea (Mrs. Woolacott's Collection). The name *Varicospira* was proposed by Eames (Phil. Trans. Roy. Soc. Lond. 236 B, 2, 70, 1951) for the fossil *Strombus cancellatus* Lamarck.

A New Gudgeon from the New Hebrides

(Pisces Gobiomoridae).

By GILBERT P. WHITLEY, F.R.Z.S.

(Contribution from the Australian Museum.)

Lee Woolacott, one of the founders of this "Marine Zoologist," loved beautiful things: shells; corals, small fishes and other marine life gave her endless pleasure both in the field and in collections.

It seems fitting therefore for a very beautiful little marine gudgeon to be named in her memory. It has been in the Australian Museum collection for more than forty years unidentified and unique, no other specimen having come to hand.

It belongs to the genus *Eviota* Jenkins, 1903, of which some authors consider *Trimma* Jordan and Seale, 1906, to be a synonym or a subgenus.

The new gudgeon differs from the nominal species and subspecies of *Eviota* and *Trimma* (listed below) in fin- and scale-counts and coloration, in lacking predorsal scales, and in having a conic rather than a snub head. The superficial facies of the new species is rather like a blenny of the *Tripterygium* group.

In alphabetical order the named species and subspecies of *Eviota* and *Trimma* are: *Eviota abax* Jordan & Snyder, *afelei* Jordan & Seale, *Trimma caesiura* J. & S., *Eviota distigma* J. & S., *epiphanes* Jenkins, *Trimma eviotops* Schultz, *Eviota grammistes* Tomiyama, *gymnocephalus* Weber, *herrei* J. & S., *inutilis* Whitley, *lachdeberiei* Giltay, *macrophthalmus* Tomiyama, *miniata* (Seale), *Trimma naudei* Smith, *Eviota nigriventris* Giltay, *okinawae* Aoyagi, *prasina* (Klunzinger), *prasites* J. & S., *pruinosa* J. & S., *queenslandica* Whitley, *saipanensis* Fowler, *sealei* Herre, *sebreei* and *smaragdus* J. & S., *viridis* (Waite), *woolacottae* sp. nov., and *zonura* J. & S.

Genus *EVIOTA* Jenkins, 1903.

Eviota Jenkins, Bull. U.S. Fish. Comm. xxii, 1902 (July 23, 1903), p. 501.
Haplotype, *E. epiphanes* Jenkins.

Allogobius Waite, Rec. Austr. Mus. v, March 11, 1904, p. 176.
Haplotype, *A. viridis* Waite.

? *Trimma* Jordan and Seale, Bull. U.S. Bur. Fish. xxv, Dec. 15, 1906, p. 391.
Orthotype, *T. caesiura* Jordan and Seale.

EVIOTA WOOLACOTTAE, sp. nov.

(Figure 1.)

D. vi/i, 7; A. i, 7; P. 18; V. i, 5; C. 14 main rays. Sc. 22 from head to hypural joint. Tr. 8 on body to 6 on caudal peduncle. No predorsal scales.

Head (13 mm.) 3.2, depth (10) 4.2 in standard length (42). Eye (5) 2.6, length of pectoral (13) 1, height of spinous dorsal (7) 1.8 in head. Base of second dorsal fin, 7 mm., equal to that of anal. Length of caudal, 12.

Head rather conic, naked. Rows of papillae around chin and preoperculum, across cheek and down front of operculum; mucous canals around eyes and preoperculum. Eyes large, interorbital very narrow. Preoperculum spineless. Maxilla reaches below front of eye. Teeth fine, acute, in bands; outer row of lower jaw enlarged and hooked. Tongue truncately rounded. Gill-opening extending below not as far forward as level of preoperculum.



Figure 1.—Gudgeon, *Eviota woolacottae* Whitley. Holotype. New Hebrides.
Photo.—A. A. Racek.

Body with large ctenoid scales extending over pectoral base and breast. Genital papilla long and finger-like, not bifid. Predorsal length (15 mm.) less than distance from first dorsal origin to posterior dorsal axil. Dorsal fins separate; first, and second spines longest. Anal lobe pointed, nearly reaching caudal. Pectorals pointed, without modified rays. Ventrals separate, fringed, fifth ray longest, not reaching anal origin. Caudal rounded.

Colour, after more than forty years preservation in alcohol, yellowish-brown, the fins lighter. Head, body and fins (except anal) with spaced, conspicuous, rusty brown spots in about six longitudinal rows. A large brown spot on middle of side near root of tail and less conspicuous ones along middle of sides of body; two others on proximal parts of pectoral rays. A black blotch between first two dorsal spines. On top of snout a mark like a tuning-fork or letter Y with the prongs facing backwards. Eye blue.

Described from the unique holotype, a specimen 55 mm. or 2.2 inches in total length. Australian Museum regd. No. I.14128.

Loc.—New Hebrides. Collected by Dr. A. D. C. Cummins and Staff Paymaster P. B. Stevens, R.N., of H.M.S. "Pegasus" probably about 1916.

Named after the late Mrs. Leone Hermione Woolacott, who died August 4, 1957. An obituary notice by Miss Joyce Allan appeared in the Journal of the Malacological Society of Australia, i, 1957, p. 48.

Memories

A highlight of one of our collecting holidays on North Keppel Island (Queensland) in August 1954, was to have the pleasure and benefit of Mrs. Lee Woolacott's company.

She worked hard at teaching us to identify shells, and her ability to recognise and name most specimens found there, was amazing.

It is a sad thought that she is lost to us, though we are left with happy memories. One of those memories is of a lovely sunshiny afternoon when she and I went over the hill and through the scrub on our way towards Considine Beach. All the way we were followed by a friendly little pig grunting chummily. He was really a nice little pig but my friend did not appreciate his company and was glad to lose him when we climbed down onto the shore.

We worked our way round the rocks back to the huts. Mrs. Woolacott was delighted when we found two or three live *Thais ambustulata*. There had been some doubt about its being so far north, she said.

We, and her other friends at Yeppoon will remember her with gratitude.

MOLLIE BOWMAN.

Observations

This year's notes are all concerned with molluscs of the Sydney district but the Publishing Committee will welcome observations from readers living anywhere along the Australian coast. Mating seasons, egg-laying habits and the appearance of rare species will all be welcome items for next year's issue.

Charonia rubicunda—January, 1957. Plentiful at North Harbour but only old, crass shells were seen. Olive Wills.

Monoplex australasiae—February, 1957. Many specimens were seen at Gunnamatta Bay including two laying eggs. Other species found included *Tapes turgida*, *Notovola fumata*, *Subitopinna menkei* and *Circe sugillata*. Lee Woolcott.

Umbraculum botanicum—May, 1957. Two pairs mating at low tide level on Collaroy rocks. Phillip Colman.

Charonia rubicunda—April to July, 1957. Observed mating at Collaroy rocks. Phillip Colman.

Carswellena exquisita—Four specimens were found on Collaroy Beach this year. Phillip Colman.

A Rare Shell from Botany Bay

By PHILLIP COLMAN.

On the 12th May, 1957, Mr. G. Whitley, Curator of Fishes at the Australian Museum, brought in to the Museum four specimens of a shell which he had found at Botany during the week-end. Mrs. L. Woolcott,

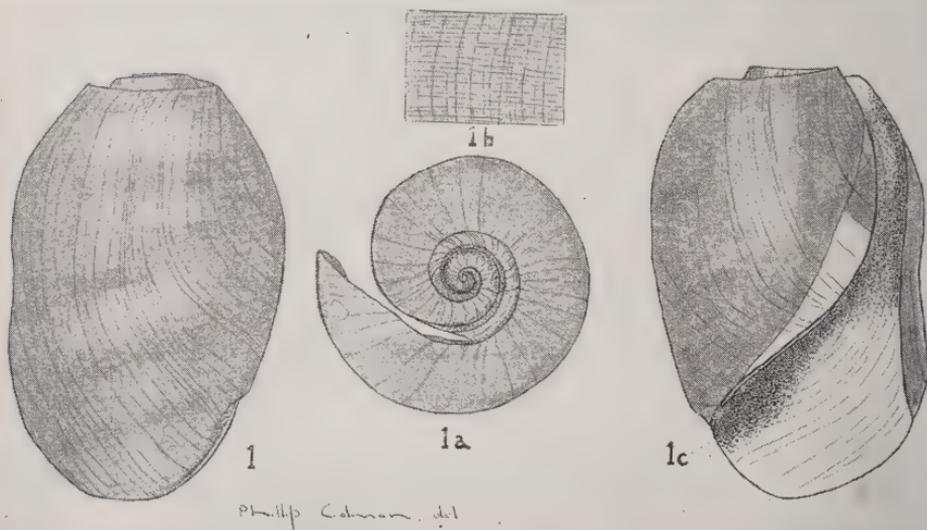


Figure 1.—Bubble Shell, *Akeria soluta*. Specimen from Botany, New South Wales. No. 1, dorsal view; 1a, posterior view; 1b, sculpture enlarged; and 1c, ventral view.

Phillip Colman del.

who was at the Museum with me at the time, recognised them as a very rare shell, *Akera soluta* Gmelin, and when Mr. Whitley said that there were more of them at Botany I immediately went over there to get them. Imagine my surprise and pleasure when I found the beach literally covered in places with them, both alive and dead. I succeeded in collecting over three hundred specimens, and had to leave at least three times as many on the beach, as I was not able to carry any more with me. Of the ones I collected I was able to get 192 perfect specimens, many much larger than previously found from New South Wales, up to 1½ inches in length.

Following is a brief description of the shell which, with the accompanying drawings, will allow the shell to be recognised by those lucky enough to find it:

Shell large, fragile, cylindrical, covered with a thin, pale brown epidermis. Shoulder of whorls acutely keeled. Body whorl forming most of the shell, densely, spirally, but very finely striated throughout. Outer lip fragile, arching forward in the middle, columella very concave, with a narrowly reflexed, cord-like ridge.

This shell, although rare, has a very wide range. It has been collected from Zanzibar (type locality), Mauritius, Ceylon, Philippines, Torres Straits and New South Wales to South Australia.

Notes from Yeppoon

By MOLLIE BOWMAN.

After unseasonal rough weather in August 1957, some good shells washed in on the Yeppoon beach, Queensland. There was a noticeable lack of the usual great number of *Strombus campbelli* and *Circe rivularis* along the tide line, but number of *Scala scalaris* were picked up alive, whereas previously we had found only three live ones over a period of eleven years. Also washed in alive were two species of Primovulas. We had never seen the pretty animal before. They were very active and the mantles were a pale fawn-pink, spotted white in a honeycomb effect. In the centre of each conspicuous white spot was a whiter pustule. The globose-shaped shells were pink with white underneath and the larger more oval ones were pink and orange with a white band.

A *Lamellaria* with animal completely covering its thin shell was a species new to us.

I noticed too that *Cypraea xanthodon* is becoming plentiful and a few *Cypraea macula* are appearing again on the Yeppoon cowry-grounds. These and *Cypraea magerrones* had been plentiful until the 1954 floods killed all. It is interesting to note the continued absence of *Cypraea magerrones*.

The Shell With the Built-in Energy Pill

By PHILLIP COLMAN.

Anyone who has opened a live pipi shell (*Plebidonax deltoides*) has probably noticed in it a long, thin, hard, gelatinous thread up to an inch long, tapering from thick to thin. But how many know what it is?

It is a formation called a crystalline style, and consists solely of enzymes, which are roughly speaking vitamins with particular properties. With this "built-in-energy-pill" the pipi is prepared for any unusual activity, such as the shock of being dug up and popped into a collector's bag. *Plebidonax* can make it at will, and has an ingenious device for using it again. In his body he has a hard, muscular plate, against which the thick end of the "energy pill" rests. If he suffers a shock he sets up machinery

which starts the style spinning. The muscular plate acts as an abrasive and cuts into the style, liberating enzymes for his immediate use. The shellfish can use up the whole style in about ten minutes, and can make it again in no time.

No pill-bottles and tubes for *Plebidonax*.

Shell Collecting in the New Guinea Area

By FRANCIS McCAMLEY.

North of Australia, in the Coral Sea and situated on the shores of the Gulf of Papua, lies the township of Port Moresby. Small villages line the bay on either side. To the west, Konedobu and Hanuobada and to the east, Ely Beach, Paga Hill and Koki.

It has been said that "Shells take you all over the world" and this is true, be it by ship or 'plane, exchange or imagination. Here then was I, visiting these tiny villages and foraging for shells, like a dog digging for a bone. First to the native village of Koki, where, under the swaying palms on shore, the natives conducted their markets. The fast-ebbing tide was leaving bare the mud flats and marine life was ready for study. Only a few moments and I was surrounded by the native population very anxious to assist "Master" in finding No. 1 shells. Three hours spent in this spot with one very good "boy," resulted in some very fine collecting. I was amazed at the marine life and astounded to find that the common beche-de-mer was regarded by the natives as a snake and they were afraid to touch it. Whether my explanation that it was harmless was understood, I do not know.

In this area were all the common *Cypraea* and small shells occupied by small hermit crabs and in quantity was *Cypraea sophiae*. There were also large specimens of *Conus magus*, and three different species of *Conus* as yet unknown to me. Vast quantities of bivalves called for further study, but as the ship was bound for other ports of call, I could search no longer.

Journeying northwards and just off Samarai, I was able to barter for some very nice specimens of *Strombus laciniatus*, *Cypraea mauritiana*, *Conus ochroleucus* and *Pterocera rugosa*. While, further along our route, I caused much amusement in the native market at Madang, by buying a quantity of shell food or "Kai" in native language, consisting of *Anadara cuneata* and a large black bivalve, the name of which is unknown to me.

Rabaul may have been of conchological interest, but unfortunately the eruption of the volcano "Matupi" in 1937 has destroyed most of the shell life in the vicinity. From here, we made a trip to the Duke of York Islands, where I am convinced there would be good collecting, only to find that the tide was unsuitable and I had to be content with a few of the smaller varieties of shells, nonetheless beautiful to see.

The return of the ship, homeward bound, to Port Moresby, gave me the opportunity of exploring the west side of the bay and just near Konedobu, I found a "picnic spot." The native population had apparently gathered hundreds of *Strombus canarium*, *Strombus isabella* and a similar number of bivalves, all eaten and clean and ready just to be collected. Wandering on the tropic reefs, I have always been very impressed with the way in which nature provides, for over the centuries the native populations of the various islands must have gathered and eaten colossal quantities of shell fish, and there still remains food for the present and the future.

I was greatly impressed with the collecting in these areas, but as my time was limited I was unable to search long and diligently. However, I really believe that when our conchologists do get around to investigating these areas, they may be surprised at the results and will add many a new specimen to our old world of collecting. One never knows—there may even be a *Conus gloria maris*.

Collecting Trip to Stradbroke Island, Moreton Bay, Queensland

By PHILLIP COLMAN.

During May 1957 I had the good fortune to spend a week at Dunwich, on Stradbroke Island, a locality rich in shell life. It is immensely interesting from the marine scientist's view, as it seems to be the boundary between the colder New South Wales and the tropical Queensland fauna. In one spot one can find the typical fauna of Gunnamatta Bay, Sydney (i.e. *Pinna menkei*, *Pinctada perviridis*, etc.) and twenty yards away can be found live tropical corals with typical Queensland fauna.

Below is a list of shells I found there. It is not complete, but will be, I hope, a handy guide to future collectors there. All shells were found alive except the two marked. Unfortunately, as I was so busy, I did not have time to register the colours of any cowry animals collected.

COWRIES:

Paulonaria macula, Angas.
Erosaria erosa, Linne.
Mystaponda vitellus, Linne.
Purperosa limacina, Lamarck.
Staphylea staphylea, Linne.
Solvadusta subviridis, Reeve.
Ovatipsa caurica longior, Iredale.
Ornamentaria annulus, Linne.
Gratiadusta xanthodon, Sowerby.
Gratiadusta walkeri, probably *continens*, Iredale, but immature.
Ravitrona labrolineata nashi, Iredale.
Palmadusta clandestina, Linne.
Ravitrona caputserpentis, Linne.

OTHER SHELLS:

Melo umbilicata, Sowerby.
Melina isognomon, Linne.
Melina cumingii, Reeve.
Fragum unedo, Linne.
Cardium flavum, Linne (Dead).
Mitra variabilis, Reeve.
Mitra cookii, Sowerby.
Mitra crassa, Swainson.
Benthominea wallisii, Gray.
Turritella vittata, Hedley (Dead).
Nassarius coronatus, Bruguiere.
Dolabella scapula, Martyn.
Pretostrea bresia, Iredale.
Saxostrea commercialis, Iredale & Roughley.
Pinna menkei, Reeve.
Pinctada perviridis, Reeve.
Pinctada panasesae, Jameson.
Pinctada sugillata, Iredale.
Pinctada epitheca, Iredale.
(And other *Pinctadas* which I cannot name so far.)
Pyrazus ebeninus, Bruguiere.

Another Octopus Bite

By DONALD F. MCMICHAEL.
(The Australian Museum, Sydney.)

Following the report of a bite by *Octopus maculosus* Hoyle published in last year's Proceedings, Mr. F. S. Colliver of the Geology Department, University of Queensland, sent me the following record. Although this incident took place many years ago, it is felt that all such events are worth recording; in this case the details were provided recently by the person involved who is now a resident of Melbourne.

He was fishing at the northern end of Admiralty Bay, opening onto Cook's Strait, New Zealand in 1904, when bitten by an octopus. No description of the animal was given which would allow identification. He was holding the animal when it bit him between the thumb and first finger. The bite itself was agonising and immediately the arm began to swell; within an hour his hand (the left) was "the size of a boxing glove" and his left side was slightly affected.

Although no doctor was available, the application of poultices seemed to have some effect, for the swelling was reduced and the wound healed within three days. The victim stated that there was little pain after the actual bite, but a feeling of numbness followed. These symptoms are in accord with those recorded by American workers in the majority of cases of *Octopus* bite.

The Care of Small Shells in the Collection

By C. F. LASERON.

When, some twenty years ago, the author became interested in the study of small shells, he was content, as others before him, to keep them in small glass tubes, plugged with cotton wool, and with narrow labels inside. Inconveniences which had been felt by many previous collectors and conchologists soon became apparent. The labels of necessity were so small that they could not contain sufficient information; they had to be taken from the tube to be read; the specimens were difficult to see through the striations on the glass, and the curvature of the tubes distorted their appearance. To find a particular specimen often meant long search and much waste of time. Moreover there seems to be a chemical reaction between some types of glass and the substance of the shell, so that after some years the specimens effloresced and fell to pieces. Many valuable types have been lost in this way. An alternate method has been to mount the specimens with gum on black card, but this has proved even more unsatisfactory. The late John Brazier mounted thousands of specimens in this way, but though his work was wonderfully neat and painstaking, most of the specimens have either sunk into the gum or have become broken, and his extensive collections have largely become valueless for study.

It is no doubt this difficulty in the display and labelling of small shells that has led to their general neglect, not only by collectors, but by most of the more serious conchologists. Yet no study of the mollusca of any area can be complete in any way without consideration of the small species, and by small is meant about one quarter of an inch or less in length, that is from 6 to 7 mm. downwards. It is impossible to give exact figures, but species of this size probably outnumber the larger species by three to one, and must constitute a very important element in the molluscan fauna.

This then was the problem to be faced—how to find a container which would allow ready examination of the specimens, ensure their permanent security, and leave room for their adequate labelling. It was only after many experiments and by a process of evolution that the author now feels that something like the ideal container has been produced. That they are practicable is proved by the fact that several thousands of them have been made, and the time taken in their making has been saved over and over again by their use. That others might benefit by this experience drawings of the containers are here shown, and details given of how they can best be made.

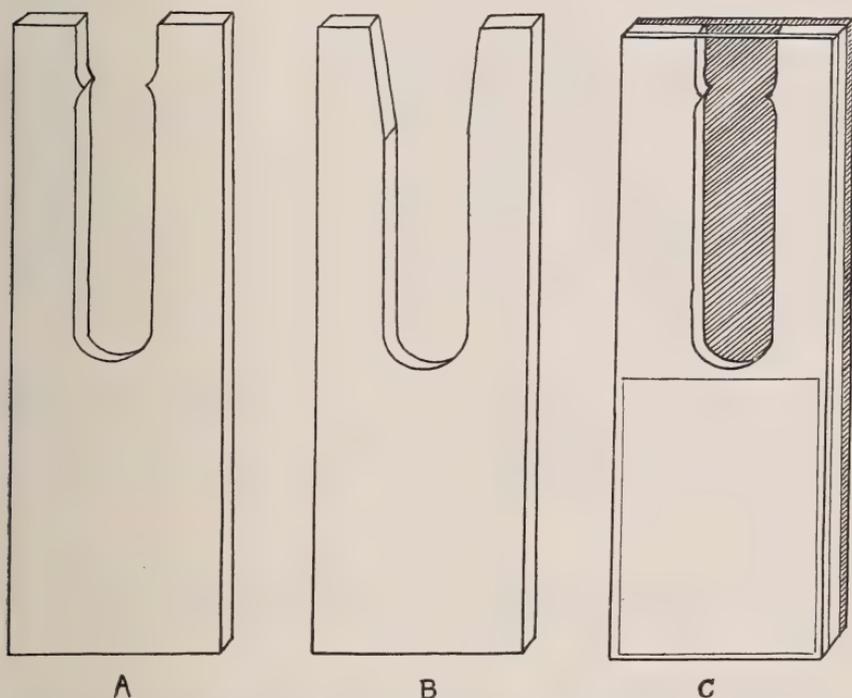


Figure 1.—Container for small shells. A and B.—Two different shapes for the stamped pieces. C.—The finished container.

The containers have an overall size of 3 by 1 inches, and each contains three parts, the main portion stamped out by a die from hard cardboard or millboard one eighth of an inch in thickness. This is backed by a thinner coloured card, and covered with a microslide or other thin glass. Thus a narrow opening is left at the top through which the specimens can be dropped to the central cavity where they are enclosed by a plug of cotton wool. There is ample space on the lower half of the container for a label $1\frac{1}{2}$ inches by 1 inch, on which the full particulars of name, locality, etc., can be printed. The specimens themselves are clearly visible through the glass, and except for drawing and the most detailed examination, can be studied with a hand lens or microscope without removal.

The greatest practical difficulty experienced was in having the recess for the specimens cut from the thick cardboard or millboard. Two shapes are shown in the text figure. For that at B the author had a special die

made, and was able to make arrangements to have the pieces stamped out in a power press. For A, a manufacturer friend had an oval die, and the pieces were put through the press twice, the overlap leaving the slight projections near the top. These projections were left deliberately, as they serve the purpose, as do the sloping shoulders in B, of packing the cotton-wool plug and preventing its being pushed right within the container.

For the back a thin card was used. A light blue was found the most useful general colour, as providing a contrasting background for white, yellow, brown, or black specimens. Or if desired white card can be used for dark specimens and black for those which are white or light in colour. For the glass covers ordinary microslides were found the best, as they can be bought in the right size and have a good surface, so that there is no distortion. For putting the parts together any very strong paste will do, but if one of the old fashioned letter presses is available, a casein cold water glue is better. This has the advantage of sticking slowly and only under pressure, so if the cardboard backing be cut in suitable strips a number of containers can be made at a time, and glass and all fixed with the one pressure. Each is then cut out and trimmed with scissors as required. A refinement contemplated but not pursued on the grounds of initial expense was to have an injection mould made, and the containers fashioned in one piece from one of the clear transparent plastics now on the market. The initial cost would be considerable, but if a very large quantity were needed, the ultimate price should be small. It might even pay a manufacturer to do this, as once their use was appreciated, there should be a considerable sale to museums and similar institutions.

Though the containers are large compared with the specimens they contain, they actually take up very little space. They can be spread out for display, or can be stacked as microslides are, and are readily sorted or regrouped as classification demands. They are also easily and securely packed for postage. Their use need not be limited to shells, but they should also be suitable for the collection of many other minute objects such as foraminifera, seeds, etc.

Brazier's "Cowries in Australasia"

By TOM IREDALE.

Brazier began an essay on cowries which was never authoritatively published. It would not require discussion save for the fact that it has been mentioned in literature without correct data having been given.

Shaw⁽¹⁾ wrote a "Note on an unpublished reprint of a paper by J. W. Brazier published in the *Sydney Mail*, 2nd December, 1871." He said that there was a reference to such a paper in Hidalgo's "Monografia," but could not track it down so had written to Hedley. Hedley gave the details but did not verify the facts. Hence, coming across the pamphlet in question, I proceeded to check the data and here give the results. There is no doubt that publication was intended as Hedley suggested. The least thought would have indicated that "pp. 1-44" could not have appeared in a newspaper on one day. The title is as quoted, "Distribution and Geographical Range of Cowries in Australasia. By John William Brazier, C.M.Z.S." Issued in the "Sydney Mail" newspaper beginning on July 1, 1871, and finishing on Dec. 2, 1871, the first part included the introduction and two species, and, as the pages of the "Sydney Mail" were consecutively numbered, this appeared on p. 555. Brazier there stated "Of the *Cypraea*, Cowries, about two hundred and twenty species are now known to science, and nearly half of that number are found in the Australasian seas. The

publication in the "Sydney Mail" appeared as follows: July 15, 1871, p. 633, sp. 3-10; Aug. 19, 1871, p. 791, sp. 11-22; Sept. 9, 1871, p. 871, sp. 23-28; Sept. 16, 1871, p. 905, sp. 29-31; Sept. 30, 1871, p. 967, sp. 32-(36); Dec. 2, 1871, p. 1256, sp. 37-40. Then the articles were discontinued.

Hedley wrote, "The type was rearranged and reprinted in book form for Dr. Cox." Dr. Cox may have financed the printing, but the pamphlet, that has caused this essay, is a continuation of Brazier's articles.

Firstly, the pamphlet is not paginated "pp. 1-44": it is (5)-44, the first four apparently blank for the title-page and preface. Secondly, the "Sydney Mail" articles cover species 1-40 (remember Brazier wrote "nearly half of two hundred and twenty") and the pamphlet finishes with sp. 69 on page 44, indicating that the book was a little more than half done.

In the reprint there is no date to consider, but on p. 40, *C. coxi* is included with its date of publication, Nov. 3, 1872; this is followed by *C. coxeni* Cox published in 1874, and then *C. sophiae* published in 1875. So that the unfinished reprint was not paginated until 1875.

It is a pity that the essay was not completed and issued as it is a valuable piece of work, the species being roughly described and localities given which "will, I trust, be the means of assisting them (other shell collectors) to fix exact localities to the specimens in their cabinets." Failure to apply this usage has been the source of much confusion as even today old collections contain shells, superficially showing valid localities, which can now be proved to be untrue.

Book Review . . .

Cowries ! Cowries !! Cowries !!!

By TOM IREDALE.

A series of books for the edification of the young has been popularized by repeated emphasis of the subject as above. The book under review on the contrary is for the education of adults although it would be worthy of study by all, old and young. The title of the book is not the one given above, but reads "*Cowry Shells of World Seas*" by Joyce Allan and was issued in May 1956 by Georgian House, Melbourne. It is a very valuable acquisition to the library of every conchological student and must have a place in every natural history museum as no similar book exists and this is complete from every aspect. It reviews the history of these interesting shells which have long held pride of place in the estimation of collectors from their delightful form and lovely coloration which is unspoilt by wear and tear as the shell is covered by the animal when alive.

The work deals with the breeding habits of the animals, which unfortunately could not be fully discussed, followed by the quaint growth of the shell, the immature and juvenile shells being unlike those of the adults. The animals themselves are large, covering the shell as above noted, and are brilliantly coloured. Numbers of coloured plates would be necessary to show up the animals, and as the costs of such are prohibitive today, the book is compelled to deal with shells alone. Cowry shells have been used as ornaments from time immemorial, and have been used as barter almost throughout the known world, although the shells mainly live in tropical waters.

¹ Shaw, Proc. Malac. Soc. Lond. xiii, Aug. 1918, p. 78.

An account of the rare shells is given, and "how to collect and clean" hints are carefully detailed. The classification is then given and descriptions and figures are appended of all the known species so that it will serve as a monumental work of reference for many years. The word "monumental" is used advisedly as the whole of the work is by the author-artist alone. There are some 170 pages of letterpress and fifteen full-page plates, six of which are in colour, the figures exceeding five hundred, two hundred odd being in colour. The descriptions given number many more as named forms of minor value than species are fully noted. As a very useful item a list of the forms occurring in Australian waters is coyly appended, and there is another list of the references necessary to students; an Index of inestimable value completes the work. This may seem a brief review of such a work but to point out all the valuable points for both students and collectors would occupy much more space than can be here allotted.

The best advice to all is to secure a copy and find out how little you have known on the subject before you had studied it. Nothing but praise can be given to the artist-author for the publication of such an excellent work, which must have been indeed a labour of love, as no mere worker could have completed the work in such a satisfactory manner.

Forbes and Australia

By TOM IREDALE.

A recent article, entitled "A Double Centenary—Two Notable Naturalists, Robert Jameson and Edward Forbes" by James Ritchie, has been published in the Proc. Roy. Soc. Edinb. (Sect. B, Vol. lxvi, 1955-56, pt. I, pp. 29-58, 5 text figs., pls. 1-4, 1956).

It attracted attention as both names came into Australian annals though neither of them ever reached this country.

Edward Forbes was one of the notables of British naturalists, through his original approach, but is better known as the co-author of an account of British molluscs, which has remained unrivalled as the standard work for over a century. It is not this great work which calls for Australian attention, however, but his ecological zonation. To the thirteenth meeting of the British Association for the Advancement of Science held in 1843, Forbes furnished a "Report on the Mollusca and Radiata of the Aegean Sea, and on their distribution, considered as bearing on Geology." This appeared in 1844 occupying pp. 130-193. Forbes separated eight sections, the first only being given a name, the "Littoral Zone," diagnosed as from highwater to two fathoms; second, 2-10 fathoms; third, 10-20 fathoms; fourth, 20-35 fathoms; fifth 35-55 fathoms; sixth, 55-79 fathoms; seventh, 80-105 fathoms; eighth 105 fathoms downward.

These sections were supported by details of much collecting and many dredgings. This zonation has been amended in later years and the details of the sections altered, and names have been given, the best known being the Laminarian, which succeeds the Littoral and extends into the fourth section, while beyond 105 fathoms more have been separated with names, Benthic, Abyssal, etc., down to thousands of fathoms.

John Macgillivray, whom I have mentioned before, was probably one of the most meticulous (this is a good word in this connection) collectors ever known. His notebook, preserved in the British Museum (Natural History), is a model for accuracy and detail. When he returned from the Voyage of the *Rattlesnake* he was allowed to publish an account of the voyage, and he handed his notebooks to the enthusiastic Forbes.

Forbes prepared an essay "On the Bathymetrical Distribution of Marine Testacea on the Eastern Coast of Australia" beginning "As in every instance the exact locality, depth and character of habitat of each species of Mollusk taken (by Mr. Macgillivray) were carefully noted at the time of capture, much more valuable information elucidating the distribution of shell-fish in the Australian seas has been collected during this expedition than was ever before obtained," . . . "It may here be remarked that the Molluscan fauna of the seas of North Australia and of the north-east coast from Cape York southwards to Sandy Cape, belongs to the great Indo-Pacific province, a zoological region extending from the east coast of Africa (from Port Natal or a little above, northwards to Suez) to Easter Island in the Pacific. But south of Sandy Cape and onwards to Van Diemen's Land (and apparently including New Zealand), we have a distinct (East) Australian province, marked by a peculiar fauna in many respects, representative of the Senegal, and perhaps also Lusitanian regions of the North Atlantic."

"Proceeding in descending order we may first remark on the SHELLS OF SALT MARSHES. As in the northern hemisphere, *Melampus* or *Conovulus* is the genus represented in such localities. This *Auricula Australis* prevails in salt marches at Brisbane water, and an allied species in similar places in New Zealand. In both instances we find this form accompanied by members of a curious genus characteristic of the Australian province,—*Ampullacera*, the *Ampullacera Quoyana* being the Brisbane Water species and *A. avellana*, that of New Zealand." "SHELLS INHABITING MUD, ETC., AMONG MANGROVES. These belong to the Indo-Pacific province. Some are found on the mangroves themselves. (*Littorina scabra*, *Phasianella*, *Auricula angulata* and *rugulata* on the trunks and branches, a *Littorina* on the leaves, *Monodonta viridis*, etc., on the roots, *Cytherea* and *Cyrena* in the mud.) LITTORAL ZONE. Of the many living Gasteropoda taken in this region, very few are new species. (Species named, and here the forms found at Fort Dalrymple, Tasmania, are contrasted with those from the north. In the same manner the Acephala are dealt with. The notes regarding the habitats of the various species are very good, such as *Corbis fimbriatus* in sand among coral reefs; *Cypricardia vellicata* occupies the fissures of rocks.) REGION OF WEEDS equivalent to the LAMINARIAN REGION of the European Seas. Some seventeen or eighteen localities in this Bathymetrical province were explored by means of the dredge, varying in depth from one to seventeen fathoms. Port Jackson, 5 to 6 fathoms, and Port Phillip, 3 to 5 fathoms, are mentioned, *Calyptraea connata* from the former and *Marginella fornicata* from the latter, the first named unknown, the second *formicula*. In the North-east Australian province, a different set of shells was dredged in similar depths, Cape York, Cape Upstart, Cape Capricorn, and off the Percy Isles being mentioned "The bivalves of this region were but few. In the South Australian province this is the region of the peculiar genus *Myadora*, of which five species were dredged on sand in 6 fathoms at Port Jackson. In the North-east Australian province we have species nearly all new, from the shallower localities, and 8-11 fathoms, off Cumberland Islands, also 15-17 fathoms off Cape Capricorn in a sandy and shelly bottom."

"CORALLINE ZONE. Some dredgings in both North and South-eastern provinces, in depths between twenty-seven and forty-five fathoms give a slight idea of the fauna of this important region." (A short list of species dredged for contrast is given, mostly unnamed specifically.)

Forbes concluded, "It is evident from the comparative paucity of undescribed species procured in the Littoral zone and the large proportion of new or doubtful forms among those taken by the dredge, that a rich harvest has yet to be reaped in the deeper regions of the southern seas. In the lower zones, however, just as much as in the upper, the distinctions

of province are maintained. The explanation of this complete separation of the South-eastern marine fauna of Australia from that of the North-eastern or Indo-Pacific portion, may be explained by reference to the distribution of currents along the Australian shores. In both, as in the Bathymetrical regions of the South Atlantic, the Testacea of the depths are generally smaller and less brightly coloured than those inhabiting the shallows. During this voyage notes of the habitats of considerably more than a thousand species of Mollusca and Echinodermata were carefully registered."

"The Narrative of the Voyage of H.M.S. *Rattlesnake* during the years 1846-1850" was issued in December 1851, though dated 1852. Forbes was born in 1815 and died in 1854 at the early age of 39, a disastrous loss to science at the time, as will be seen from the short account above.

In the same year died James Robert Jameson, born in 1774, who had preceded Forbes as Professor of Natural History in Edinburgh University. His name also appears in the annals of Australian Natural History as he received birds collected by P. Lindsay, who was with Sturt on his famous voyage down the Murray in 1829-1830. Jameson named *Meliagris lindesayii* but did not describe it, and it appears a synonym of the Brush Turkey, *Alectura lathami*, but he was more fortunate in describing the Straw-necked Ibis (*Ibis spinicollis*), the specific name still being used. Wilson, another Edinburgh man, named the Silver Gull, *Larus jamesonii*, and that name was used for some time until an earlier name was discovered.

Descriptions of the Animals of Papuan Cowries

By ROLAND V. OLDHAM.

In the following short list, it will be noted that I have on occasion given two descriptions of the same cowry as I have found from prolonged observation that the environment in which the animal lives has quite a marked influence on the coloration, not only of the animal but of the shell also. It has also been found that those shells living on the outer reefs, where they are subjected to the action of the tides and weather, differ to a more or less degree from those found living in the sheltered waters of harbours or bays where they become subjected to the effects of the influx of silt and fresh water during the rainy seasons.

Another interesting fact is that during the south-east monsoons (dry) season, quite large numbers of species could be collected close inshore, but as the season advanced towards the commencement of the north-west or wet season, one had to search further into deeper water in order to secure any specimens when collecting in harbours or sheltered bays.

On the outer reefs conditions also have a marked effect on the colour and size of both animal and shell: where life is prolific and living conditions well suited to the animal it is found the coloration will be rich and the shells well formed and robust, whereas those living on decayed and dying reefs have poor colour and the shell is often malformed, the animal also suffering from the effects of the living conditions imposed upon it.

An excellent example is *Cypraea tigris* Linne, 1758. I have collected specimens in which the shells show little or no coloration, others with sparse and poor colour, some showing rusty patches and others with badly-formed shells. These types have been collected on poor ground of decaying reefs, whilst those taken from the outer, living reefs have been the richly coloured, large, robust shells so much prized by collectors.

DESCRIPTIONS OF ANIMALS.

Cypraea tigris Linne, 1758.

Mantle pale brown mottled with very fine black lines, the lining becoming heavier in the darker patches. Papillae greyish, tipped with ochre. Tentacles grey. Eyes approximately one-third from base of tentacles. Foot dark grey, mottled with black. This is the inshore form from Port Moresby.

The form found on the reef has an animal similar to the above but with the mantle very finely lined, ochreish and with mottling much heavier. Head dark yellow-green and the papillae on mantle yellowish tipped white. The base of each papilla white.

Calpurnus verrucosus Linne, 1758.

Mantle pale cream covered with small black dots. Foot cream, covered on the outer margin with black dots twice the size of those on the mantle. Tentacles white with a black band approximately two-thirds up from the base. Eyes black. The dots on the foot are not nearly so crowded as those on the mantle and the space between the dots is devoid of any marking. From Port Moresby Harbour. Twelve specimens examined.

It is interesting to note that these shells were only collected on the undersides of the folds of soft coral.

Amphiperas ovum Linne, 1758.

Mantle deep velvety black, over which is spread a fine net-like formation of tiny white papillae, simple and short. The inner side of the mantle is of an ochreish colour. Tentacles very long, thin, black and tipped with white. Siphon broad and short without fringe. Head black. A striking animal to be found in such a snow-white shell.

This species is only found among soft corals.

Arabica arabica Linne, 1758.

Mantle deep brown, almost black and covered with small, simple white papillae. Tentacles long and slender, also very deep brown. Siphon deep brown. The under surface of the foot is of a yellowish colour and the upper surface a darker brown than that of the mantle.

Basilitronea isabella Linne, 1758.

Mantle jet black with minute jet black papillae. Foot jet black as also are the tentacles and siphon. Found among broken coral on outer reef.

Erosaria erosa Linne, 1758.

Mantle pale greenish mottled with brown. Papillae very numerous, some simple, others branched and all of a chalky-white. Tentacles pink. Head rose colour. Foot grey, heavily mottled with minute dark dots. Siphon grey. Harbour form.

Reef form is similar to above but mantle dark brownish-green. Papillae white, tipped dark grey. Siphon grey, finely dotted white. Foot whitish, heavily mottled with grey.

[*Erosaria poraria* Linne, 1758.]

Body of animal red, mantle shading off to greenish-grey with small, numerous papillae. Tentacles mottled greyish-white and green. Siphon fringed. Upper surface of foot mottled with greyish-green. Specimen collected in New Caledonia.]

Evenaria asellus Linne, 1758.

Mantle jet black with the edges close to the head, brilliant red. Papillae on mantle very small, simple and black. Foot black. Tentacles red and black.

Evenaria kieneri Hidalgo, 1906.

Mantle transparent white through which may be seen the markings on the shell. The mantle is covered with small white papillae. Foot white slightly tinged with yellow sprinkled with minute black dots. Tentacles black at base but yellow through the rest of their length.

These shells were found among dead coral rubbish.

Erronea chrysostoma Brazier, 1881.

Mantle grey, blotched with black and fairly thickly covered with white papillae about $\frac{1}{16}$ in. long, some simple but others branched. The whole of the mantle is dusted with minute white dots. Foot grey and covered with black dots and dark mottling. Tentacles pink from eyes to the end. The space between the tentacles at the top of the head rose coloured. Siphon pale bluish-grey and fringed. The edge of the mantle is lined with tiny jet black dots. In some specimens the papillae were of an ochreish colour.

Erronea nimiserrans Iredale, 1935.

Mantle creamy-white sparingly mottled with black and fairly thickly covered with cream coloured papillae, most of which are branched with the exception of those close to the head which are mostly simple. The whole is peppered with pale cream dots. Foot similar in colour to mantle. Siphon grey and heavily fringed. Tentacles rose-pink.

Erronea caurica Linne, 1758.

Mantle cream, lightly mottled with greyish-brown and covered with small many-branched papillae of a chalky-white colour. Foot cream, lightly patterned with greyish-brown. Head and tentacles salmon-pink. Eyes black. Siphon very large, salmon-pink and without fringe.

Lyncina vanelli Linne, 1758.

Mantle transparent creamy-white, so thin that the coloration of the shell is plainly seen. It is sparingly dotted with papillae, those close to the head being small and simple, while those over the greater part of the mantle are large, coarse and fringed. The branches on the papillae are chalky-white. Siphon creamy-white with a heavy white fringe. Tentacles grey. Foot creamy-white, the upper part being a brownish-grey.

Mystaopoda vitellus Linne, 1758.

Mantle creamy-white covered with a heavy mottling of black sprinkled with minute white dots. The whole is covered with numerous papillae which are branched and about $\frac{1}{8}$ in. long. Tentacles black. Siphon creamy-white with a fine yellow fringe.

Specimens found under coral boulders on outer reef, shore reef and also inside harbour.

Monetaria moneta Linne, 1758.

Mantle cream, lined vertically with fine black lines and blotched with black close to the edge of the mantle. The mantle is covered with numerous cream coloured papillae, most of which are branched. Foot cream with black mottling. Tentacles creamy-white. Siphon grey and finely fringed. Shells mostly found on the lee side of islands and close inshore. Very rarely found on exposed parts of the outer reef.

Monetaria annulus Linne, 1758.

Mantle greyish, sparingly mottled with black. The edge of the mantle lined with fine minute black dots. The whole is covered with numerous papillae a few of which are much larger than the rest and all are of a chalky-white colour. At the base of all the large papillae is a fairly large

patch of chalky-white. In some specimens the patches are tinged with yellow. Siphon grey. Tentacles grey with a slightly pinkish tinge.

Ponda carneola Linne, 1758.

Mantle greyish and thin enough to show the pink colour of the shell. It is mottled with much darker grey. Papillae short and white. Foot pale greenish-grey, slightly mottled with pale brown. Head capped with dark bluish-grey. Outer reef form.

Inshore and harbour forms are similar but much paler in colour and the mottling on the mantle is much more scattered. The mottling is also speckled with tiny white dots.

Palmadusta clandestina Linne, 1767.

Mantle black sparingly dotted with whitish papillae which are slightly golden close to the mantle. Foot black with white irregular spots. Siphon thick, long and with a tapering fringe.

Staphylaea staphylaea Linne, 1758.

Mantle of a deep blackish-brown, sparingly dotted with white. The whole is covered with a dense growth of spear-pointed papillae, which are very crowded close to the base of the mantle. Tentacles long and slender of a brownish-black colour. Siphon deep brownish-black. Foot brownish-black minutely sprinkled with white dots.

Trivirostra scabriuscula Grey, 1827.

Mantle dark greyish-black dotted with yellow-green papillae, the edge of the mantle being light grey. Foot dark grey. Siphon dark greyish-black, sprinkled with minute pale yellow dots and encircled with a yellowish fringe. Tentacles grey with pinkish tinge.

Some Interesting Limpets of South Africa

By KAY RUTLAND.

For the first six months of the year 1957, I was fortunate enough to be in South Africa, staying at Cape Town and several other well-known seaside resorts along the South Coast, which are well known by shell collectors and conchologists the world over. The Patellidae of South Africa are of course well known and I collected many species. The most interesting to my mind was the pyriform *Patella cochlear* which live just below low tide level. I received many a ducking when trying to collect them as they were very tenacious, and it was really a most exhausting task. They were most difficult to locate as mostly they were covered with coralline growth, the same colour as the rocks they lived on. They live one on top of the other and it is amazing just how many can fit on one limpet. The foot of the animal was pale yellow and the mantle white. The inside of the shell varied in colour from pale mauve to dark grey with a very dark muscle scar. In many specimens the edge was white and scalloped and, with the white, almost transparent mantle, it looked very beautiful, almost like white lace. The largest specimen I collected was two and a half inches in length, but this was exceptional.

Another fascinating species was *Patella longicosta*. These star-shaped limpets are particularly interesting because of the variations in different localities. In the southern part of Cape Peninsula the ribs are usually sharply keeled, while those in the eastern localities were much flatter and the outline more regular, although in this species there are no two exactly the same. The interior is white with yellow inside the muscle scar.

Two other interesting species were *Patella oculus* and *Patella granatina*. In localities where both these species lived I could seldom tell which was which until I took them off the rocks and lifted the mantle to see the colour of the shell. Both shells are broadly ovate with prominent lateral projections, but in *Patella oculus* the whole interior of the shell is dark brown with the area inside the white muscle scar a light brown, while in *Patella granatina* the area inside the muscle scar is dark shiny brown, while the rest of the shell varies from mottled grey, brown, even yellow and pale blue. I have collected these up to three inches in length but mostly they were two inches to two and a half inches.

The largest limpet of South Africa is *Patella patriacha (tabularis)*. This lives in water well below the spring tide low level, so it is difficult to obtain alive. The largest I have is four inches in length, but they have been known to attain a length of five and three quarter inches. The interior of the shell is like white porcelain with a white muscle scar, the edge mostly pink but not always.

Patella argenvillei is a heavily built elevated shell, ovate, with fine close radial ribbing, white and brown interior, with brown inside the muscle scar.

Patella barbara I found varied immensely, sometimes being finely ribbed and other times with the ribs strongly projecting. The shell was always white, inside and out, the largest specimen being three inches in length and living at low tide level. The young of this species can be very fascinating, having strong reflected ribs.

Patella miniata has a flat shell with close radial ribbing. It is usually streaked with white, with white inside the muscle scar, but brownish varieties also occur. I have found them up to three and a half inches in length. When beach-worn they are reddish, mottled or striped.

Another interesting species is *Patella compressa*, which, as its name implies, is compressed from side to side. This lives on the stalks of the bamboo which accounts for its peculiar saddle-shaped base. It is finely ribbed and I have collected specimens up to three inches in length. The colour of the interior varies from light brown to dark grey.

Patella granularis is a very distinctive species, brownish and having blunt spines or knobs on the ribs. The interior is pale, often white with a dark brown edge and dark brown within the muscle-scar. I found this species very common near Cape Town living on the vertical sides of rocks and reaching almost two inches in length, but at Jeffrey's Bay where they were living on mussels they were without spines and only up to one inch.

One of the small species was *Patella variabilis* approximately one inch in length and very variable indeed. This is a thin-shelled fine-ribbed species, and can vary in colour from yellow with black stripes or spots to black with fine white stripes or a reddish brown, and lives in the waters of Natal at high tide level.

Cellana capensis is also yellow with black spots, approximately one inch in length, very finely ribbed, but is easily distinguished by the satiny opalescent sheen on the inner surface of the shell.

Cybernetics and Ichthyology

(From Ichthyological Research & Development Corporation, 4217 Ponce de Leon Boulevard, Coral Gables, Florida.)

The Ichthyological Research and Development Corporation of Coral Gables, Florida, has contracted with the Long Island Tabulating Corporation of Hempstead, New York, for the application of the science of

cybernetics to the scientific study of fishes in the Caribbean Sea and the Atlantic Ocean.

It is believed that this is the first time ichthyological research will be conducted through the use of electronic punch-card equipment.

It is estimated that it will take two years to accumulate the available information of some 5,000 species occurring in these waters. The research is to cover basic and applied ichthyology.

After the scientific information has been accumulated and studied, the research project will be continued, to obtain more information on the potentials of fish for the fields of human and animal food, chemicals, pharmaceuticals and synthetics.

From the initial studies that have been made, it is believed that a great source of information will be made available to the fields of commercial and sports fishing, which in itself is a great industry in the Caribbean Sea and the Atlantic Ocean.

Book Review

"Sea Anglers' Fishes of New Zealand." By Arthur W. Parrott. Hodder & Stoughton, London, 1957, pp. 1-176, coloured frontispiece, pls. i-xii, text-figs. 1-56 & diagrams. Price 18/- in New Zealand, plus 6d. postage.

A handy, beautifully produced and popular guide to the most important fishes of New Zealand, many of which are the same as or closely related to Australian species. A great deal of field knowledge and natural history data are condensed into a concise account of 56 different kinds and there are abundant illustrations. Flatfishes, Eels and Game Fishes are not included: these are to be the subjects of a proposed companion volume. Mr. Parrott's book is written for the man and woman by the sea rather than the professional ichthyologist, but there is information of value to all of them in its pages. He is to be congratulated on his modern nomenclature (but *Aldrichetta* should have been used instead of *Agonostomus* for the yellow-eyed mullet). There are very few errors and those of a minor nature. Some of the acknowledgments for the illustrations do not refer to the original authors of the figures and the Red Gurnard has smaller, not larger, scales than the other gurnards.

G.P.W.

Some Molluscan Name Changes

By TOM IREDALE.

Three new names are here proposed for preoccupied ones, and two others are introduced to replace misapplied ones.

Allentula, nom. nov., for *Allenella* Iredale, Austr. Zool., 10 (3), 311. May 10, 1944. Orthotype, *A. formalis* Iredale, loc. cit., pl. 19, fig. 9. Not *Allenella* Aurivillius 1927.

Parvisheba, nom. nov., for *Sheba* Iredale, Austr. Zool., 10 (1), 89. Dec. 19, 1941. Orthotype, *Helix hombroni* Pfeiffer, 1856. When I proposed

Sheba there was no prior use recorded in any of the Nomenclators, but I have since found in "The Museum of Natural History, Mollusca, by W. Baird (of the British Museum) on plate 7, ante 1862, an entirely different form of shell figured as *Sheba albella*. On plate 3 of the same work a shell is named *Tegulapellis serpentis*, instead of *Tegula pellisserpentis*.

Vacerrena, nom. nov., for *Vacerra* Iredale, Proc. Linn. Soc., New South Wales, 49, 221, Oct. 24, 1924. Orthotype *Puncturella demissa* Hedley. Not *Vacerra* Godman, Biol. Centr. Amer. Zool., Lep. Rhopal., 2, 52, 1900.

The misapplied names refer to two Tapetoid bivalves, the series of which will be fully discussed later.

TAPES WATLINGI, sp. nov.

The common Sydney shell, known as *Tapes turgida*, has no right to that name, as was pointed out over one hundred years ago. *Venus dorsata* and *V. turgida* were introduced for Western Australian molluscs at the same time, and *dorsata* has precedence, and both names refer to the same shell. The range of the eastern shell is separated from that of the western on both the north and south, and the shell is less turgid than the western form. Under the incorrect name, figures of the local shell appeared in the *Australian Museum Magazine*, Vol. II (8), p. 287, 1925, and in Allan's *Australian Shells*, p. 333, pl. 37 fig. 5, 1950.

The overall name for the shells so long known as *Tapes* has now become *Paphia*, but the group is divisible, and our shell belongs to the restricted *Tapes*.

PAPHIA WELLSI, sp. nov.

The second correction is referable to the division of *Paphia* restricted. Under a section named *Paratapes* a common species was called *textile*, but is now known as *undulata*. It is rather variable in coloration, but fairly constant in form, and a very distinct species became involved in a variety. It is apparently a rare North Australian form, and was regarded as a colour-variation only, and on account of its marked coloration was selected by Miss Allan to represent the "Weaver Tapes, *Paratapes textile*," on p. 334, an excellent coloured figure being given on pl. 39, fig. 8, of her *Australian Shells*, 1950. Miss Allan is not to blame, because the odd specimens in the Museum had been so named by Hedley and myself. The species is now named *Paphia wellsii*, sp. nov. Holotype in the Australian Museum, Sydney. Registered No. C.14855.

A large number was sent by the Rev. E. A. Wells, Superintendent of the Methodist Overseas Mission, Milingimbi, Northern Territory, to Mr. Kellner, who handed them over, and asked for them to be named for the forwarder.

Upon close examination the shell was found to be more allied to the *subrugata* series than to the "*textile*," the form and sculpture nearer the form but the colour pattern very different. It may be noted that the curious angulate markings are formed throughout the *Paphia* group, more or less expressed or suppressed. Refer to coloured illustrations in Miss Allan's *Australian Shells*, 1950, plate 39, where fig. 11 represents *subrugata*, and fig. 10 shows *Tapes laterata*. These species will be discussed fully in a later publication.

John (William) Brazier

By TOM IREDALE.

When Angas drew up his List of Shells of New South Wales, he had left Australia, where he had been Secretary to the Australian Museum, and he provided a basis for his successors. Angas had been a very assiduous collector though he had published nothing while in the colony. His publication, based on British Museum nomination, immediately produced extraordinary results. A young collector, John William Brazier, sent to Angas many of his treasures, or Angas' omissions, and continued yearly so that Angas was kept busy with Brazier's collecting. Angas had to publish paper after paper, then to add a supplementary List, increasing his original total by nearly half as much again. Brazier soon dropped the William, and was known as John Brazier. He had been a shell-collector from childhood. His father was a Ship's Captain, and young John accompanied him before he was in his "teens." Locally he must have been well known as a shell collector as in 1861 he presented specimens to the Australian Museum and in 1865 he was selected to accompany J. Brenchley on a trip through the Pacific Islands on the *Curacoa*. Apparently he sailed elsewhere as he was in New Caledonia in 1866, then he was elected to go with the Australian Eclipse Expedition in 1871; was with the H.M.S. *Blanche* in the Pacific in 1872, and then with Macleay's *Chevert* Expedition along the Queensland Coast to southern New Guinea in 1874. He proved to be a very energetic collector, and was particularly interested in small shells, sorting the most minute kinds out of shellsand or dredgings. Unfortunately he gummed these small shells on cards and the gum has hardened so that the many thousands he mounted became useless. When R. C. Rossiter, the rescuer of Eyre, arrived at Sydney, Brazier met him, and his son G. T. Rossiter collected shells with young Brazier. The father, R.C., was a great shell-collector, and later settled in New Caledonia, and apparently his daughter Sophia also took a keen interest. Brazier later married Sophia, and dedicated many shells to her. When she died in 1883 Brazier wrote "I therefore name the species after my late wife, who was a devoted student of conchology for twenty-three years." After Brazier's return from the *Chevert* Expedition, he was allotted the task of reporting upon the mollusca. Macleay initiated a Society, the Linnean Society of New South Wales, and the first publication of the Society's Proceedings gave Brazier's first paper on shells first place. Previously Brazier had sent his essays to London or Paris, and as he was uncertain whether either would publish his offering he sent them to both. To later confusion the same paper was printed simultaneously in the Proceedings of the Zoological Society of London, and in the *Journal de Conchyliologie* in Paris. Another tricky feature of collating the species Brazier described, is the presence of manuscript names. Brazier commonly sent away specimens with a new name he had allotted to them, and then from unknown causes these names were not published by him, often being published by the recipient. It is impossible to trace all such names, and in the Index that accompanies this, only the names published by Brazier himself appear. There was no outlet for Brazier's writings in the early days of Sydney, so that the weekly and daily newspapers reported the Proceedings of the Zoological Society of London, including Brazier's papers. Then they printed original papers on zoological matters as there was no local scientific journal. When the Linnean Society was established the press reported the proceedings immediately after the meeting, but only if the matter were "newsy."

Brazier took a large part in the development of the study of conchology in Sydney, leading parties to the shell collecting spots regularly, and giving talks continually. A quotation from the Daily Telegraph of Feb. 25, 1890.

may be cited: "The Natural History Association visited Bradley's Head under the leadership of Mr. J. Brazier. . . . Mr. Brazier, who is a walking dictionary of Latin names and a living encyclopedia on matters conchological, took great pains to explain the shells gathered by members."

It should be noted that Brazier was born in Sydney Sept. 23, 1842, and died there Aug. 20, 1930, nearly 88 years of age.

Brazier was appointed to the staff of the Australian Museum as Conchologist in about 1880, and began a "Catalogue of the Marine Shells of Australia and Tasmania," and three small parts had been issued in 1892-1893, when due to the great financial crisis in the latter year, he and most of his colleagues were retrenched. He continued his active interest in conchology for a few years, and then faded away. His last note appeared in 1905, but he lived for twenty-five years afterwards. In 1923, when he had turned eighty. Hedley got in touch with him, and he lunched in Sydney with Hedley, Pilsbry and myself. As all old men can, he contributed to the meeting many anecdotes of the past, of his conchological trips in the islands in the sixties and seventies of the nineteenth century, and of the peoples he had met.

It must be laid to his credit that he assisted Hedley when the latter branched out into Marine study, as previously Hedley had been purely a student of Land Shells. In the following list of his published papers will be included many more notes of items of interest. The very many mentioned have been culled, and the few listed have special interest: thus a strange land-shell was brought into the Museum in the 1930's, and was tracked down to *Helix vermiculata* Muller. It will be noted in the last (148) that Brazier had reported it in 1897, from the same locality, an item of great value. A short obituary was published in the Australian Museum Magazine Vol. 4, pp. 142-3 with photo at the time of his death, and it also appeared in the (American) Nautilus 44, pp. 95-96, Jan. 1931, and in the (British) Journal of Conchology 19, p. 110, March 1931.

CHRONOLOGICAL LIST OF PAPERS.

1869.

1. Observations on the Distribution of *Bulimus miltocheilus* in the Solomon's Archipelago. *Proc. Zool. Soc. (Lond.)*, 1869, 162-163, June 21.

1870.

2. Note sur l'habitat exact de deux especes de *Coquilles terrestres* et de trois especes de *Volutes*. *Journ. de Conchyl.*, 18: 84-86. Jan. 1.
especes de *Volutes*. *Journ. de Conchyl.*, 18: 84-86. Jan. 1.
3. Exhibition with notes of an egg of a species of *Megapodius* from Banks's Island. *Proc. Zool. Soc. (Lond.)*, 1869, 528. Apl. 7, 1870. (Note: Sclater named the species (on the egg) *Megapodius brazieri*.)
4. Notes on the Localities of two Species of Land-Shells and three species of *Volutes*. *Proc. Zool. Soc. (Lond.)*, 1869, 560-1. Apl. 7, 1870.
5. List of Species of Cones found in Port Jackson, New South Wales, with Notes on their Habitats and Distribution. *Proc. Zool. Soc. (Lond.)*, 1869, 561-563. Apl. 7, 1870.
6. Descriptions of Three new Species of Marine Shells from the Australian Coast. *Proc. Zool. Soc. (Lond.)*, 1870, 108-110. June 2.
7. Description d'especes nouvelles de Coquilles marines des cotes d'Australie. *Journ. de Conchyl.*, 18: 300-301, July 1.
8. Notes on *Gracula kreffti*. *Proc. Zool. Soc. (Lond.)*, 1870, 551. Nov. 11.

1871

9. Description d'une espece nouvelle de *Voluta*. *Journ. de Conchyl.*, 19: 78-80, pl. 5, f. 1. Jan. 1.
10. Descriptions of Ten New Species of Land-shells, collected by Mr. W. F. Petterd, of Hobart Town, Tasmania. *Proc. Zool. Soc. (Lond.)*, 1870, 659-662. Apl. 1, 1871. Antedates same species in Legrand's Coll. Mon. Tas Shells, June 1871.
11. Notes on two Australian Land-shells. *Proc. Zool. Soc. (Lond.)*, 1870, 662. Apl. 1, 1871.
12. Descriptions of two new Species of Land-Shells from the Bellengen River, New South Wales. *Proc. Zool. Soc. (Lond.)*, 1871, 321. Aug. 16.
13. Notes on recently described Shells. *Proc. Zool. Soc. (Lond.)*, 1871, 321-322. Aug. 16.
14. Notes on the Localities of *Dolium melanostoma* and other shells found in Australia and the adjacent Islands and in the Australian Seas. *Proc. Zool. Soc. (Lond.)*, 1871, 585-587.

1872.

15. Descriptions of eight new Australian Land-Shells. *Proc. Zool. Soc. (Lond.)*, 1871, 639-642. May 2, 1872.
16. Descriptions of seven new Species of the genus *Helix*, and of two Fluviate Shells from Tasmania. *Proc. Zool. Soc. (Lond.)*, 1871, 696-699. May 2, 1872. These are antedated by publication in Legrand's Coll. Mon. Tasm. Shells, 2nd edition, Sept. 1871.
17. Remarks on previously described species of Land-Shells. *Proc. Zool. Soc. (Lond.)*, 1871, 699. May 2, 1872.
18. Descriptions of seven new Species of Land and Marine Shells from the Solomon Islands, Western Polynesia, and Australia. *Proc. Zool. Soc. (Lond.)*, 1872, 20-23, pl. 4, pp. 6-10. June.
- 18A. Additional Habitats of certain species of Volutidae. *Proc. Zool. Soc. (Lond.)*, 1872, 23. June.
19. A List of the Cypraeidae found on the Coast of New South Wales. *Proc. Zool. Soc. (Lond.)*, 1872, 81-86. June.
20. Descriptions of three new Species of Marine Shells from Australia. *Proc. Zool. Soc. (Lond.)*, 1872, 616-617, pl. 44. Nov. 3.
21. Descriptions of six new Species of Land-Shells from Australia, and Lord Howe's Island. *Proc. Zool. Soc. (Lond.)*, 1872, 617-619. Nov. 3.

1873

22. Synonymy of and Remarks upon Australian and Western Polynesian Land-Shells. *Proc. Zool. Soc. (Lond.)*, 1872, 805-806. May 2, 1873.
23. Synonymy of *Helix milligani* Brazier. *Proc. Zool. Soc. (Lond.)*, 1872, 807. May 2, 1873. Published earlier in Legrand's Coll. Mon. Tasm. Shells, Sept. 1872.
24. A List of the Species of Cassididae found on the Coast of New South Wales, together with Remarks on their Habitats and Distribution. *Proc. Zool. Soc. (Lond.)*, 1872, 837-838. May 2, 1873.

1875.

25. Descriptions of Eleven new Species of Terrestrial and Marine Shells, from North-east Australia. *Trans. Roy Soc. New South Wales*, 1874, 29-33. 1875?. (Issued separately, dated 1874.)
26. Exhibition and notes on a series of eggs of Megapodes. *Proc. Zool. Soc. (Lond.)*, 1874, 606-607. Apl. 1, 1875.

27. Descriptions of eleven new Species of Terrestrial and Marine Shells from North-east Australia. *Proc. Zool Soc. (Lond.)*, 1874, 668-672, pl. 83. Apl. 1, 1875. (Note: This is the same paper as No. 25 above, but the shells are here figured, and *Chondrella multilirata* appears as *Georissa multilirata*.)
28. Description of fourteen new species of Shells from Australia and the Solomon Islands. *Proc. Linn. Soc. New South Wales*, 1: 1-9. Apl. 27, 1875.
29. Descriptions of eight species of Australian and Tasmanian Land and Fresh Water Shells. *Proc. Linn. Soc. New South Wales*, 1: 17-20. Apl. 27, 1875. Also in *N.S.W. Medical Gazette* 5, 176-178. April (? May), *vide* G. P. Whitley.
30. Descriptions of ten new Species of Shells from the Collection of Mr. Charles Coxen, of Brisbane, Queensland. *Proc. Zool. Soc. (Lond.)*, 1875, 31-34, pl. 4. June 1.

1876.

31. Description of two new species of Australian Land Shells. *Proc. Linn. Soc. New South Wales*, 1: 97. July.
32. Descriptions of Thirty-five new species of Land Shells from New Guinea, Australia, and Islands in Torres Straits, collected during the Chevert Expedition. *Proc. Linn. Soc. New South Wales*, 1: 98-113. July.
33. List of Land Shells collected during the Chevert Expedition. *Proc. Linn. Soc. New South Wales*, 1: 117-133. July.
34. Description of a new *Pupina* collected during the Chevert Expedition. *Proc. Linn. Soc. New South Wales*, 1: 136-137. July.
35. A List of the Pleurotomidae collected during the Chevert Expedition, with the description of the new species. *Proc. Linn. Soc. New South Wales*, 1: 151-162. July.

1877.

36. List of Marine Shells, with Descriptions of the new species collected during the Chevert Expedition. *Proc. Linn. Soc. New South Wales*, 1: 169-181. Feb.
37. Shells collected during the Chevert Expedition. *Proc. Linn. Soc. New South Wales*, 1: 199-215. Feb.
38. Shells collected during the Chevert Expedition. *Proc. Linn. Soc. New South Wales*, 1: 224-240. Feb.
39. Shells collected during the Chevert Expedition, with Descriptions of the New Species. *Proc. Linn. Soc. New South Wales*, 1: 249-261. Feb.
40. Synonymy of and Remarks upon Tasmanian and other Shells, with their Geographical Distribution. *Proc. Roy. Soc. Tasm.*, 1876, 168-172. Feb. 27, 1877.
- 40A. Exhibition of a number of eggs of a *Porphyrio* from the Loyalty Islands. *Proc. Linn. Soc. New South Wales*, 1: 283. Mch.
41. Continuation of the Mollusca of the Chevert Expedition, with new species. *Proc. Linn. Soc. New South Wales* 1: 283-301 Mch.
42. Notes on *Laevicardium beechi*. *Proc. Linn. Soc. New South Wales*, 1: 306-307. Mch.
43. Shells collected during the Chevert Expedition. *Proc. Linn. Soc. New South Wales*, 1: 311-321. Mch.
44. Continuation of the Mollusca of the Chevert Expedition. *Proc. Linn. Soc. New South Wales*, 1: 362-368. Mch.
45. Continuation of the Mollusca of the Chevert Expedition. *Proc. Linn. Soc. New South Wales*, 2: 1-6. July.
46. Description of a New *Murex*, collected at Port Darwin, by Mr. W. Bednall. *Proc. Linn. Soc. New South Wales*, 2: 6-7. July.

47. Continuation of the Mollusca collected during the Chevert Expedition. *Proc. Linn. Soc. New South Wales*, 2: 20-25. July.
48. Description of Three New Species of Shells, from Australia and New Guinea. *Proc. Linn. Soc. New South Wales*, 2: 25-27. July.
49. Continuation of the Mollusca Collected during the Chevert Expedition. *Proc. Linn. Soc. New South Wales*, 2: 41-46. July.
50. Continuation of the Mollusca, Collected during the "Chevert" Expedition. *Proc. Linn. Soc. New South Wales*, 2: 46-53. July.
51. Continuation of the Mollusca Collected during the Chevert Expedition. *Proc. Linn. Soc. New South Wales*, 2: 55-60. July.
52. Continuation of the Mollusca collected during the "Chevert" Expedition. *Proc. Linn. Soc. New South Wales*, 2: 74-89. July.
53. Description of two new species of *Helix*, from New Guinea and the Louisiade Islands. *Proc. Linn. Soc. New South Wales*, 2: 120-122. July.
54. List of Land Shells collected on Fitzroy Island: with notes on their geographical range. *Journ. Conch. (Leeds)*, 1: 268-275. Nov.

1878.

55. Continuation of the Mollusca collected during the Chevert Expedition. *Proc. Linn. Soc. New South Wales*, 2: 128-135. Jan.
56. Exhibition of specimens of *Haliotis canaliculata*, a species not previously found in Port Jackson, and of *Tellina perna* from the same locality. *Proc. Linn. Soc. New South Wales*, 2: 142. Jan.
57. Mollusca of the Chevert Expedition. *Proc. Linn. Soc. New South Wales*, 2: 143-145. Jan.
58. Continuation of the Mollusca of the Chevert Expedition. *Proc. Linn. Soc. New South Wales*, 2: 368-369. June.
- 58A. Exhibition of a complete specimen of *Panopaea australis* and other species. *Proc. Linn. Soc. New South Wales*, 2: 369. June.
59. Notes and remarks on Mollusca recently found in Port Jackson and New Caledonia. *Proc. Linn. Soc. New South Wales*, 2: 369-371. June.
60. Descriptions of seven new species of Terrestrial and Marine Shells from Australia. *Proc. Linn. Soc. New South Wales*, 3: 77-81, pl. 8. Dec.
61. Mollusca of the "Chevert" Expedition. *Proc. Linn. Soc. New South Wales*, 3: 155. Dec. (Note: This concludes the report on the "Chevert" Mollusca, leaving the Bivalves undiscussed, and seemingly they were dissipated or misplaced, as recent attempts to trace them have been unsuccessful. As the Gasteropoda in the preceding accounts were unfigured Hedley examined and figured some of the novelties in the *Rec. Aust. Mus.*, 4, 121-130, pls. 16-17, 1901.)
62. Exhibition of rare specimens of shells from California. *Proc. Linn. Soc. New South Wales*, 3: 160. Dec.

1879.

63. Description of a new species of *Vivipara*. *Proc. Linn. Soc. New South Wales*, 3: 221-2. Jan.
64. Exhibition of a new species of *Conus* and a new species of *Mitra* (from Tanna, New Hebrides. Syd. Morn. Herald rept. of meeting). *Proc. Linn. Soc. New South Wales*, 3: 406. May.
65. List of Marine Shells collected on Fitzroy Island, North Coast of Australia with Notes on their Geographical Range [Note: Fitzroy Island is on North-East Coast]. *Journ. Conch. (Leeds)*, 2: 186-192 (June); 193-199 (July).
66. *Helix pulchella* and *H. cellaria* of Muller, found in Australia: with Notes on their Distribution. *Journ. Conch. (Leeds)*, 2: 281-2. Sept.
67. List of *Cypraea* found in Moreton Bay, Queensland. *Journ. Conch. (Leeds)*, 2: 317-332. Oct.

68. Exhibition of *Neaera latesulcata* (Woods) obtained at the Heads (Sydney Harbour); also young and spawn of *Limnaea* (p. 292); *Centrostephanus rodgersii* (312); and fossil *Bulimus senilis* (sinistral var.) from Isle of Pines etc., p. 356. *Proc. Linn. Soc. New South Wales*, iv. Dec. 1.

1880.

69. Synonymy of, and remarks upon Port Jackson, New Caledonian and other Shells, with their distribution. *Proc. Linn. Soc. New South Wales*, 4: 388-392. May.
70. List of Land-Shells found on Thursday Island, with descriptions of the new species. *Proc. Linn. Soc. New South Wales*, 4: 392-396. May.
- 70A. Exhibition of *Cardium fornicatum* from New Caledonia etc. *Proc. Linn. Soc. New South Wales*, 4: 398. May.
71. List of Brachiopoda or Lamp Shells found in Port Jackson and the Coast of New South Wales. *Proc. Linn. Soc. New South Wales*, 4: 399-403. May.
- 71A. Exhibition of *Magasella cumingi*. *Proc. Linn. Soc. New South Wales*, 4: 409. May.
72. Tropical Mollusca recently dredged at Port Jackson Heads. *Proc. Linn. Soc. New South Wales*, 4: 428-431. May.
73. Note on *Oniscia ponderosa*, with its Locality. *Proc. Linn. Soc. New South Wales*, 4: 431. May.
74. Exhibition of R. C. Rossiter's *Onixia* (sic) *ponderosa* from New Caledonia (459); typical *Voluta angasi* "Lam." (463); and *Chione calophylla* with a small pearl found therein (471). *Proc. Linn. Soc. New South Wales*, 4. May.
75. Exhibition of five proof sheets of Brachiopoda from the new species obtained by H.M.S. Challenger. *Proc. Linn. Soc. New South Wales*, 5: 49. Aug.
76. Localites des iles Australiennes, des iles Salomon et d'autres iles de la mer du Sud. *Journ. de Conchyl.*, 28: 300-320. Oct. 1.
77. Notes on a new variety of *Bulimus Caledonicus*. *Proc. Linn. Soc. New South Wales*, 5: 190-191 (var. *edentula* exhibited, 192). Nov. 22.

1881.

- 77A. Exhibition of *Helix pomatia* and *Voluta (Lyria) deliciosa* with operculum. *Proc. Linn. Soc. New South Wales*, 5: 300. Feb.
78. Notes on Shells from the Solomon Islands and Australia. *Proc. Linn. Soc. New South Wales*, 5: 444-447. Feb.
79. Notes on a new variety of *Helix palmensis*. *Proc. Linn. Soc. New South Wales*, 5: 458. Feb.
80. Notes on recent Mollusca found in Port Jackson and on the Coast of New South Wales and other localities with their synonyms. *Proc. Linn. Soc. New South Wales*, 5: 481-488. May 20.
81. List of species of *Porcellana* or *Cypraea* found in Moreton Bay, Queensland. *Proc. Linn. Soc. New South Wales*, 5: 496-503. May 20.
82. Remarks on some recently described Australian Shells. *Proc. Linn. Soc. New South Wales*, 5: 630-631. May 20.
- 82A. Exhibited three species of Australian Sea Birds, viz. *Nectris carneipes*, *Prion turtur* and *Pelagodroma fregata*. The beach at Bondi and other beaches along the coast both north and south of Sydney were strewn with these and other seabirds. *Proc. Linn. Soc. New South Wales*, 5, 637. May 20.
83. Remarks on *Megapodius Brazieri*. *Proc. Linn. Soc. New South Wales*, 6: 150-154. July.
84. Exhibited *Ancylus cunninghami* and a supposed new species of *Gundalucnia*, collected by Lieut. C. E. Beddome in Tasmania. *Proc. Linn. Soc. New South Wales*, 6: 170. July.

85. Note on a specimen of malformed *Cypraea*. *Proc. Linn. Soc. New South Wales*, 6: 202. Sept. 12.
- 85A. Exhibited *Voluta mamilla* (196), a rare *Helix* from Travertine in Kent's Group (197), and a Tortoise with two heads, etc. *Proc. Linn. Soc. New South Wales*, 6: Sept. 12.
86. Synonymy of and remarks upon two Australian species of *Melania*. *Proc. Linn. Soc. New South Wales*, 6: 551-2. Dec.
87. Check List of the Fresh-water Shells of Australia (By Ralph Tate & J.B.). *Proc. Linn. Soc. New South Wales*, 6: 552-569. Dec.
88. Description of a New *Bulimus* from New Caledonia. *Proc. Linn. Soc. New South Wales*, 6: 586-587. Dec.

1882.

89. Note on *Limopsis Loringi* found on the Coast of New South Wales. *Proc. Linn. Soc. New South Wales*, 6: 789. Mch. 20.
90. Exhibited specimens of *Culaxis* (sic) *Layardi* and *Helix Caffra*, a man eating *Helix* from South Africa (790), and a fine collection of *Cypraea*, fourteen species all distorted or malformed (836). *Proc. Linn. Soc. New South Wales*, 6: March 20.
91. Remarks on some Fluvial Shells of New South Wales. *Proc. Linn. Soc. New South Wales*, 7: 83-86. May 23.
92. Exhibited a reversed specimen of *Triton quoyi* Reeve etc. *Proc. Linn. Soc. New South Wales*, 7: 91. May 23.
93. A List of Cypræidae found on the Victorian Coast, collected by Mr. J. F. Bailey. *Proc. Linn. Soc. New South Wales*, 7: 117-121. May 23.
94. Notes on *Bulimus gunni*. *Proc. Linn. Soc. New South Wales*, 7: 121-2. May 23.
95. Habitat of *Cypraea citrina* of Gray. *Proc. Linn. Soc. New South Wales*, 7: 322-323. Oct. 28.
- 95A. List of Mollusca dredged off Point Piper and other localities in Port Jackson. *Rept. Trustees Austr. Mus.* 1881 (1882), pp. 16-17.
- 95B. List of Shells dredged in Port Stephens, N.S.W., *Rept. Trustees Austr. Mus.* 1881, appendix XII, pp. 19-22, 1882. [Sole mention of this important dredging; 33 new species, not named.]

1883.

96. Exhibited two specimens of a new genus of Shell from New Guinea, for which he proposed the name of *Brazieria typica*. He intimated that a full description would be given at the next meeting. *Proc. Linn. Soc. New South Wales*, 8: 35. June 19.
97. Synonymy of Australian and Polynesian Land and Marine Mollusca. *Proc. Linn. Soc. New South Wales*, 8: 224-234. July 17.
98. Localities of some species of recent Polynesian Mollusca. *Proc. Linn. Soc. New South Wales*, 8: 294-296. July 17.

1884.

- 98A. Exhibited specimens of *Voluta maculata* nearly all white (442), and *Cypraea contusa* McCoy (465). *Proc. Linn. Soc. New South Wales*, 8: Feb. 21.
99. Critical List of Mollusca from North-West Coast of Australia. *Proc. Linn. Soc. New South Wales*, 9: 793-803. Nov. 29.
100. Synonymy of some Land Mollusca from Papua or New Guinea. *Proc. Linn. Soc. New South Wales*, 9: 804-806. Nov. 29.
101. Exhibited *Bulimus aurisvulpina* from St. Helena (509) and species of Helicidae (866). *Proc. Linn. Soc. New South Wales*, 9: Nov. 29.

1885.

102. List of some Recent Shells found in Layers of Clay on the Maclay-Coast, New Guinea. *Proc. Linn. Soc. New South Wales*, 9: 988-992. March 4.
- 102A. Exhibited *Trigonia lamarckii* Gray, from Port Jackson, containing a beautiful flesh-tinged Pearl. *Proc. Linn. Soc. New South Wales*, 9: 1016. Mch. 4.
103. Synonymy of and remarks upon the specific names and authorities of four species of Australian Marine Shells, originally described by Dr. John Edward Gray in 1825 and 1827. *Proc. Linn. Soc. New South Wales*, 10: 85-84. June 4.
104. Exhibited *Sepia plangon* Gray, from Port Jackson and *S. capensis* from Bondi etc. (341), *Paryphanta hochstetteri* (449). *Proc. Linn. Soc. New South Wales*, 10. Dec. 21.
105. *Onchidium chameleon* Sp. nov., and the structure of the dorsal skin of this and other *Onchidia* (R. von Lendenfeld and J.B.). *Abstract Proc. Linn. Soc. New South Wales* for Nov. 25, 1885; 4 & 5.

1886.

106. Description of a New Species of *Onchidium*. *Proc. Linn. Soc. New South Wales*, 10: 729. Apl. 3.
107. New Species of Land and Fresh Water Mollusca from Maclay-Coast and Triton Bay, New Guinea, collected by Baron Maclay. *Proc. Linn. Soc. New South Wales*, 10: 841-844. Apl. 3.
108. Exhibited two new species of *Helix* (163) photographs of four species of *Partula* (477) and specimens of *Pecten tegula* Wds. etc. from 30 ft. to 40 ft. below bed of Parramatta River (577). *Proc. Linn. Soc. New South Wales*, Ser. 2, 1. May 25 (163), Aug. 23 (477 & 577).
109. Notes on the Distribution of *Ceratella fusca* Gray. *Proc. Linn. Soc. New South Wales*, Ser. 2, 1: 575-576. Aug. 22.
110. Exhibited shells of the genus *Triton*. *Proc. Linn. Soc. New South Wales*, Ser. 2, 1: 853. Dec. 21.

1887.

111. Trochidae and other Genera of South Australia, with their Synonyms. Part I. *Trans. Proc. Roy. Soc. South Austr.* 1885-6. 9: 116-125. Mch.
112. The Trochidae and other Genera of Mollusca, from Tasmania, with their synonyms. *Papers Proc. Roy. Soc. Tasm.*, 1886: 193-207. 1887.
113. Exhibited *Ceratella fusca* Gray from Coozee Bay, N.S.W. *Proc. Linn. Soc. New South Wales*, Ser. 2, 2: 198. Aug. 31.

1888.

114. Report on a small Zoological Collection from Norfolk Island. Part III. Mollusca. *Proc. Linn. Soc. New South Wales*, Ser. 2, 2: 993-1001. Mch. 21.
115. Exhibited *Physa gibbosa* Gould. *Proc. Linn. Soc. New South Wales*, Ser. 2, 3: 894. Sept. 10.
116. Exhibited stone from crop of Goura pigeon, and tube of *Segmentina australiensis* Smith. *Proc. Linn. Soc. New South Wales*, Ser. 2, 3. 1096. Dec. 7.

1889.

- 116A. *Lord Howe Island, Its Zoology, Geology and Physical Characters*. E. P. Ramsay. Gen. Editor, R. Ethridge Jr. Mr. John Brazier has named the whole of the Mollusca. 8vo. Sydney. May 1.
117. Exhibited eggs of the "Mallow Hen" (*Megapodius layardi*) from Malicolo, New Hebrides. *Proc. Linn. Soc. New South Wales*, Ser. 2, 4: 131. May.

118. Notes and Critical Remarks on a Donation of Shells sent to the Museum of the Conchological Society of Great Britain and Ireland. *Journ. Conch. (Leeds)*, 6: 66-84. May 4.
119. Note on the Linnean *Murex corneus* found living on the coast of New Caledonia, South Pacific Ocean. *Proc. Linn. Soc. New South Wales*, Ser. 2, 4: 117-8. May 29.

1890.

120. Mollusca trawled off Merimbula, New South Wales. *Proc. Linn. Soc. New South Wales*, Ser. 2, 4: 747-750. Feb. 3.

1891.

121. Description of *Conus worcesteri*. *Abstr. Proc. Linn. Soc. New South Wales* for June 24: 3. June 26.
122. Description of a New Cone from Mauritius, *Conus (Chelyconus) worcesteri*. *Proc. Lin. Soc. New South Wales*, Ser. 2, 4: 276, pl. 19, f. 4. Dec. 22.

1892.

123. On the Synonymy of *Helix (Hadra) gulosa*, Gould. *Proc. Linn. Soc. New South Wales*, Ser. 2, 6: 321-328. May 23.
124. List of the Cephalopoda in the Collection of the Australian Museum. Pages 1-3. Printed but not issued: sheets not uncommon.
125. Exhibited Gualtier's Index; *Cassisi nana* from New South Wales etc. *Abstract Proc. Linn. Soc. New South Wales* for Sept. 9, 1892: 8.
126. Catalogue of the Marine Shells of Australia and Tasmania. *Aust. Mus. Cat.*, No. 15.
Part I, *Cephalopoda*; 1-19. Rec'd Brit. Mus., 27 Aug| 1892.
Part II, *Pteropoda*; 25-42.

1893.

Part III, *Gastropoda-Murex*; 45-74. Preface June. Rec'd Brit. Mus., 28 Aug. 1893.

Note: In the *Cephalopoda* pp. 17-19 were reprinted, and the corrections substituted.

127. Note on *Cassisi wyvillei*, Watson, from the Solomon Islands. *Proc. Linn. Soc. New South Wales*, Ser. 2, 8: 43. July 28. (Specimen in Australian Museum.)
128. Synonymy of and Remarks on Old-Described Australian Mollusca, with Notes on their Distribution. *Proc. Linn. Soc. New South Wales*, Ser. 2, 8: 107-120. July 28.
129. Exhibited specimens of *Marginella pulchella* Kiener from Norfolk Island. *Abstract Proc. Linn. Soc. New South Wales*, Sept. 8: iv. Sept. 10.

1894.

130. On a new *Murex* from South Australia. *Proc. Linn. Soc. New South Wales*, Ser. 2, 8: 179-180. Mch. 12.
131. Note on the additional localities of *Astele subcarinata* Sw. *Proc. Linn. Soc. New South Wales*, Ser. 2, 8: 303-305. Mch. 12.
132. Distribution of Little-Known Mollusca from Polynesia and Australia, with their Synonyms. *Proc. Linn. Soc. New South Wales*, Ser. 2, 8: 430-435. Apl. 13.
133. A New Cone, *Conus pulcherrimus* Brazier, described from Tanna, New Hebrides. *Proc. Linn. Soc. New South Wales*, Ser. 2, 9: 187. Sept. 4.
134. Exhibited a double white pearl from *Tapes turgida* Lam.; a small black pearl from *Ostrea cucullata* Sowb.; three from *O. subtrigona* Sowb.; sinistral *Helix similis* Fer. from Paddington (Sydney), and sinistral *Nolumbella (Atilia) filosa* Angas, from Sow & Pigs reef, 4 f. (Sydney Harbour). *Abstr. Proc. Linn. Soc. New South Wales* of Sept. meeting.

135. List of Mollusca found at Green Point, Watson's Bay, Sydney, by Arnold U. Henn. With a few Remarks upon some of the most interesting Species and Descriptions of the new Species, by John Brazier. *Proc. Linn. Soc. New South Wales*, Ser. 2, 9: 165-182, pl. 14. Sept. 4.
136. On a *Patella* said to have been found at the Kermadec Islands. *Proc. Linn. Soc. New South Wales*, Ser. 2, 9: 183-184. Sept. 4. New name in Abstract IV. Apl. 26.
137. On the correct Habitat of *Patella kermadecensis* Pilsbry. *Abst. Proc. Linn. Soc. New South Wales*, mtg. Nov. 28, 2 Nov. 30. *Proc. Linn. Soc. New South Wales*, Ser. 2, 9: 566. Mch. 26, 1895.
138. A British Bivalve Mollusc (*Cryptodon flexuosus*, Mont.) found in Australia and Tasmania, with its Distribution. *Abstract II*, Nov. 30. *Proc. Linn. Soc. New South Wales*, Ser. 2, 9: 725-727. Mch. 26, 1895.
139. *Rossiteria*, new name for *Solanderia* Fischer 1880. *Abst. Proc. Linn. Soc. New South Wales*, II. Nov. 30. *Proc. Linn. Soc. New South Wales*, Ser. 2, 9: 728. Mch. 26, 1895.

1895.

140. *Trochus adamsi* new name for *T. comptus* A. Ad. *Abstr. Proc. Linn. Soc. New South Wales*, I. Sept. 28, 1894.
141. *Trochus adamsi* from Port Jackson, and new varieties of *Bulimus miltocheilus* from the Solomon Islands. *Proc. Linn. Soc. New South Wales*, Ser. 2, 9: 567-570. Mch. 26, 1895.
142. On some Australian and Tasmanian Mollusca, with their Synonyms. *Proc. Linn. Soc. New South Wales*, Ser. 2, 9: 691-700. Mch. 28, 1895. The new names appeared in the *Abstract* for Oct. 31, 1894 Mtg., p. II. Nov. 9, 1894.

1896.

143. New Species of Cone from the Solomon Islands. *Proc. Linn. Soc. New South Wales*, Ser. 2, 10: 471. Jan. 31.
144. Exhibited specimens of *Cypraea* and examples of *Trivia australis* with a distinct dorsal sulcus, a character not in conformity with the generic (?) definition. *Abstr. Proc. Linn. Soc. New South Wales*, Mtg. Mch. 25, 1896.
145. On the New Genus *Petterdiana*. *Papers Proc. Roy. Soc. Tasm.* 1894-5, 105. Aug. 1896.
146. A new Genus and three new Species of Mollusca from New South Wales, New Hebrides and Western Australia. *Proc. Linn. Soc. New South Wales*, 21: 345-347. Dec. 22.

1897.

147. Note on the Shells found in Kitchen Middens at Bondi Bay (Sydney). *Proc. Linn. Soc. New South Wales*, 21: 817-818. May 31.
148. Exhibited specimens of *Helix vermiculata* Muller, from Waverley (Sydney). *Abstr. Proc. Linn. Soc. New South Wales*, Mtg. 25 Aug. 1897. *Proc.* 22: 441. Feb. 11, 1898.
149. New Marine Shells from the Solomon Islands and Australia. *Proc. Linn. Soc. New South Wales*, 22: 779-782. June 4.
150. Four new Species of Mollusca from Victoria. *Proc. Linn. Soc. New South Wales*, 23: 271-272. Aug. 30.
151. New Marine and Land Mollusca from Fiji, Ceylon and Queensland. *Proc. Linn. Soc. New South Wales*, 23: 379. Dec. 9. Title only.

151A. Description of six new Species of Mollusca. The species named are, *Conus Brenchleyi*, the type specimen of which was found inside a living *Tapes radiata* at Kandavu, Fiji; *Cypraea rossiteri*, from the collection of the late Mr. George Thomas Rossiter; and four species of *Hadra* from Queensland. *Abstract Proc. Linn. Soc. New South Wales*, Mtg. Aug. 31; II, issued Sept. 2 or 3. (The type specimen of *Cypraea rossiteri* is in the Kenyon Collection in the South Australian Museum, marked Ceylon.) (None of these species was described.)

1905.

152. Exhibited objects from New Caledonia including a sinistral variety of *Placostylus fibratus* and other shells . . . *Pedicularia elegantissima* Desh., a new record. *Proc. Linn. Soc. New South Wales*, 29; Apl. 10.

INDEX TO BRAZIER'S NEW NAMES FOR MOLLUSCS.

- abbreviatum, *Cerithium*, 43: 316.
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Charles Hedley's Papers Indexed

By TOM IREDALE.

Following the lamented death of my friend and predecessor, Charles Hedley, I prepared a notice accompanied by a list of his published scientific papers giving the names of the new species he had described. Ten years later an account embodying mine was issued, and an abridged list of his papers was attached. As two of my colleagues have done me the great honour, which I appreciate very much, of issuing a list of my papers with

a complete index of the novel names, I have felt I must prepare similar accounts of the work done by my great predecessors, Brazier and Hedley, who so memorably paved the way for my own easier work. In the account (Memorial Series, No. 5, of the Linnean Society of New South Wales, Proceedings, 61 pp. 209-220, photo, 1936) abovementioned the great ability of Hedley is recognized, so only the conchological excellence alone will be reconsidered. Hedley began his career as a student of Land Shells, which he dissected and he made accurate drawings of the dissections. He was essentially an out-of-doors worker with the added gift of concentration on the dreary indoor study. He was a Yorkshireman who came out to the colonies for health reasons, first settling in New Zealand, but finding it did not suit him, came to Queensland. Meeting with an accident that incapacitated him, manually, for his work, he moved to Brisbane and worked at the Museum on the Queensland Land Snails. He seized an opportunity to collect in New Guinea with Macgregor, and when he returned with his gatherings he found that the required literature was not available in Brisbane, so came down to Sydney which became his home for the rest of his life. He became employed at the Australian Museum in a junior position, but soon became Conchologist, a post he brilliantly occupied for thirty-three years, retiring in 1924, but unfortunately only lived two more years.

In his work his energy was tremendous, his application remarkable, while his originality of thought and deed established him as the master mind of Australian conchology. Angas began the work, Brazier added to the structure, while Hedley consolidated the position with years of field work and study of literature. Whenever a book was not available he ordered it from abroad at his own expense and then donated it to the Museum. As one result the Conchological Library of the Australian Museum is one of, if not the best of, such libraries. He was the only professional conchologist in Australia and consequently problems from every State were submitted to him and he never shirked any task however difficult it might be. To this end he compiled a Card-Catalogue of all the literature concerning Australian conchology, and was thus able to prepare Lists of the Marine Mollusca of New South Wales, of Queensland, of Western Australia and assisted May in that of Tasmania and Verco in that of South Australia. He trained himself to draw his new species, and also older species which had been unfigured and later when his hands were full of other work he employed at his own expense good artists to continue the work. It is not easy for anyone following his well-made track to realise how hard it must have been to overcome all the many and difficult obstacles. Perhaps his first conversion to the delights of Marine Molluscan study was his trip to the Atoll of Funafuti. To report upon his collection he had to investigate the many standard works on Marine Mollusca and found a great deal to query and question. But the study converted him and he began his "Studies on Australian Mollusca," of which fourteen essays appeared in twenty-three years, while the Trawling Expedition of the *Thetis* opened up a new field of research, deep-sea mollusca. Here again he financed or assisted in continuing his deep-sea studies, some six expeditions being initiated. Then followed the Government Vessel *Endeavour*, trawling further ahead, so he made a trip on her, dredging in the Great Australian Bight in deep-water.

All the while the Great Barrier Reef had been tormenting him with its problems as well as its molluscan fauna. His trip to Funafuti had sown the seed and he was not happy until he had investigated it. He organized a trip to Mast Head Reef, Capricorn Group, southern Queensland, as being the most accessible from Sydney and made a great success of it. It must be remembered in these days of easy access to the Reef that fifty years ago it was an unfamiliar place. He made several more trips to the Reef and was a prime mover in others such as that of Whitley and myself to Michaelmas Cay and the great British Low Isles Expedition. He wrote

papers dealing with the problems of the Reef such as its formation, and was in charge of the first Boring attempt at Michaelmas Cay. His love of Land Shells had never been lost so that at times he collaborated with Cox, listing the Land Shells of Victoria, and with Petterd on those of Tasmania. He also wrote up a collection of Queensland shells, and one of his last official (1924) papers was a return to his first Australian love, the Charopidae, of which the first part had been issued in 1892.

His conchological papers have here been stressed but Hedley was no mere conchologist, he was an observer and thinker of the highest rank and he applied his observations to higher problems. Just a few of his thoughtful essays may be noted. "The Range of *Placostylus*: a Study in Ancient Geography; On the Relation of the Flora and Fauna of Australia to those of New Zealand; the Faunal Regions of Australia; The Broadening of Atoll-islets; A Zoogeographic Scheme for the Mid-Pacific; Coral Reefs of the Great Barrier, Queensland, with T. Griffith Taylor; and The Palaeographical Relations of Antarctica." This could be continued, but one more, again a novel subject, "An Ecological Sketch of the Sydney Beaches," certainly not the least, must be added to the number of his outstanding thought-provoking papers.

COLLABORATORS.

Hedley wrote papers in joint authorship with the following collaborators. The figures refer to the numbers of items in the bibliography.

Basedow, H. 115.
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CHRONOLOGICAL LIST OF PAPERS.

1888.

1. Uses of some Queensland Plants. *Proc. Roy. Soc. Q'ld*, 5 (1): 10-13, Sept. 8.
2. A List of the Land Shells Recorded from Queensland. *Proc. Roy. Soc. Q'ld*, 5 (2): 45-70. Sept. 24.
3. Description of a New Slug; with Notes on Other Terrestrial Mollusca. *Proc. Roy. Soc. Q'ld*, 5 (4): 150-153, fig. on plate. Dec.

1889.

4. On *Aneitea graeffei*, and its Allies. *Proc. Roy. Soc. Q'ld*, 5 (5): 162-173. Plate 6. Mch. and plate 7 issued in Vol. 6 (1). Apl. 24.
5. Note (on Mr. Tryon's Errata). *Proc. Roy. Soc. Q'ld*, 5 (5): 179. Mch.
6. Anatomical Notes on the Helicidae. *Proc. Roy. Soc. Q'ld*, 6 (1): 62-63, plate 3. Apl. 24.
7. Notes on Queensland Land-Shells. *Proc. Roy. Soc. Q'ld*, 6 (2-3): 100-103. June 26.

8. Notes on the Helicidae. *Proc. Roy. Soc. Q'l'd*, 6 (2-3): 120-121, plates 6 & 7. June 26.
9. Anatomical Notes on the Helicidae (Pt. 3). *Proc. Roy. Soc. Q'l'd*, 6 (5): 249-251, plates 14, 15. Oct. 30.
10. Mollusca. Report by A. Meston on the Government Scientific Expedition to the Bellenden-Ker Range (Wooroonooran), North Queensland. *Q'l'd Parl'y Paper C.A.* 95, folio ed., 34. Reprinted in 8vo ed. by the Department of Agriculture, pp. 90-91.

1890.

11. Description of a New *Rhytida* from New Guinea. *Ann. Rept. Brit. New Guinea*, 1888-89. App. 65.
12. On the Structure and Systematic Position of *Cystopelta*. *Proc. Linn. Soc. New South Wales*, (2), 5: 44-46, plate 1. June 16.
13. On *Parmella etheridgei* Brazier. *Rec. Austr. Mus.*, 1: 78-80, plate 11. Sept.
14. List of the Mollusca collected by Sir W. Macgregor on the Fly River. *Ann. Rept. Brit. New Guinea*, 1889-90. App. 115.

1891.

15. The Land and Fresh-Water Shells of Lord Howe Island. *Rec. Austr. Mus.*, 1: 134-144, plates 21, 22. June 30.
16. On the Anatomy of Some Tasmanian Snails. *Proc. Linn. Soc. New South Wales* (2), 6: 19-26, plate 23. Sept. 9.
17. The Land Molluscan Fauna of British New Guinea. *Proc. Linn. Soc. New South Wales*, (2), 6: 67-116, plates 10-12. Sept. 9.
18. On *Hadra gulosa*, Gould. *Rec. Austr. Mus.*, 1: 196-197, plate 29. Oct.
19. Description of a New Marine Shell (C. H. & C. T. Musson). *Proc. Linn. Soc. New South Wales*, (2), 6: 247, plate 19. Dec. 22.
20. Note on the Ova of *Helicarion robustus* Gould. *Proc. Linn. Soc. New South Wales*, (2), 6: 248. Dec. 22.

1892.

- 20A. On the Cephalopoda. *The Library* (Sydney), 1: 12-13. Jan. 30.
21. Remarks on Australian Slugs. *Ann. Mag. Nat. Hist.*, (6), 9: 169-171. Feb. 1.
22. On a Collection of Land and Fresh-Water Shells. (C. H. & C. T. Musson). *Proc. Linn. Soc. New South Wales*, (2), 6: 551-564, 3 text-figs. May 23.
23. The Land Molluscan Fauna of British New Guinea. Anatomical Supplement. *Proc. Linn. Soc. New South Wales*, (2), 6: 685-698, plates 38-42. June 10.
24. On the Structure and Affinities of *Panda atomata* Gray. *Rec. Austr. Mus.*, 2: 26-31, plates 4-6. August.
25. Observations on the Charopidae, Part I. *Proc. Linn. Soc. New South Wales*, (2), 7: 157-169, plates 1-3. Sept. 1.
26. On the Genus *Perriera*. *Proc. Linn. Soc. New South Wales*, (2), 7: 311-313. Nov. 22.
27. Uses of Shells among the Papuans. *British New Guinea*, by J. P. Thomson, 8vo, Lond., 283-285.

1893.

28. On the Origin of the Land Snail Fauna of Queensland, Australia. *Nautilus*, 6: 124-125. Mch. 1.
29. The Range of *Placostylus*: a Study in Ancient Geography. *Proc. Linn. Soc. New South Wales*, (2), 7: 335-339. Mch. 16. Reprinted in *Ann. Mag. Nat. Hist.*, (6), 11: 435-439. June 1.

30. *Schizoglossa*: a New Genus of Carnivorous Snails. *Proc. Linn. Soc. New South Wales*, (2), 7: 387-392, plates 9-10. Mch. 16. Earlier in Abstract: Dec. 5, 1892, 4.
31. Reference List of the Land and Fresh-Water Mollusca of New Zealand (C.H. & H. Suter). *Proc. Linn. Soc. New South Wales*, (2), 7: 613-665. May 1.
32. An Enumeration of the Janellidae. *Trans. New Zeal. Inst.*, 25 (1892), 156-162. May.
33. Notes on *Endodonta (Flammulina) infundibulum* Hombr. and Jacque. *Nautilus*, 7: 35. July.
34. *Pholas obturamentum*: an Undescribed Bivalve from Sydney Harbour. *Rec. Austr. Mus.*, 2: 55-57, plate 14. Sept.
35. On the Relation of the Fauna and Flora of Australia to those of New Zealand. *Natural Science*, 3: 187-191. Sept.
36. On *Parmocochlea fischeri*, Smith. *Linn. Soc. New South Wales, Macleay Memorial Volume*, 201-204, plate 27, "Sept." = Oct. 13.
37. Notes on *Papuina*. *Nautilus*, 7: 73-74. Nov.
38. *Gundlachia*: a Victorian Desiderata, *Vict. Naturalist*, 10: 148, text fig. Dec.

1894.

- 38A. Additions and Amendments to the Slug List. *Journ. Malac.*, 3: 6-7. Mch. 24.
- 38B. Pfeiffer's dates of Publication. *Journ. Malac.*, 3: 9. Mch. 24.
39. A New *Papuina*. *Nautilus*, 7: 136, text-fig. Apl.
- 39A. A Trip to North Queensland by D. le Souef. *Vict. Naturalist*, 11, Mollusca, 30-31, text fig. Apl.
40. Notes to the Above (Suter's Additions Ref. List Land F.W. Mollusca of New Zealand). *Proc. Linn. Soc. New South Wales*, (2), 8: 502-503. June 5.
41. Description of *Caecum amputatum*, an Undescribed Mollusc from Sydney Harbour. *Proc. Linn. Soc. New South Wales*, (2), 8: 504, text fig. June 5.
42. On the Australian *Gundlachia*. *Proc. Linn. Soc. New South Wales*, (2), 8: 505-514, plate. June 5.
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44. The Faunal Regions of Australia. *Rept. Aust. Assoc. Adv. Sci.*, 5 (1893), 444-446. May. Reprinted in *Ann. Mag. Nat. Hist.*, (6), 14: 390-392, Nov. 1, and in *American Naturalist*, 29: 674-676, July, 1895.
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46. On the Value of *Ancylastrum*. *Proc. Mal. Soc. (Lond.)*, 1: 118. June.
47. On Some Naked Australian Marine Mollusca. Part I. *Proc. Linn. Soc. New South Wales*, (2), 9: 126-128, plate 7. Sept. 4.
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49. Note on the Destruction of young Oysters at Vaucluse by the operations of a boring mollusc (*Ricinula marginatra* Blain.). *Proc. Linn. Soc. New South Wales*, (2), 9: 185. Sept. 4.
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51. A Shell Hunt Forty Feet Under the Sea. *Nautilus*, 8: 85-88. Dec.
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53. Mollusca as Purifiers of Water. *Journ. Malac.*, 3: 73. Dec. 12.

1895.

- 53A. A Shell New to Victoria. *Vict. Naturalist*, 11: 152. Feb.
 54. Conchological Notes. *Proc. Linn. Soc. New South Wales*, (2), 9: 464-466. Mch. 26.
 55. Notes on Australian Shipworms. *Proc. Linn. Soc. New South Wales*, (2), 9: 501-505, plate 32. Mch. 26.
 56. Notes on West Australian Land Shells. *Proc. Mal. Soc. (Lond.)*, 1: 259-260. July.
 57. A Query as to the Synonymy of *Rhysota armiti* Smith. *Ann. Mag. Nat. Hist.*, (6), 16: 201. Aug. 1.
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1896.

63. Notes on Mollusca from the Alpine Zone of Mount Kosciusko. *Rec. Aust. Mus.*, 2: 101-105, plate 23, figs. 2-7. Jan.
 64. Description of *Pugnus*, a New Genus of Ringiculidae, from Sydney Harbour. *Rec. Aust. Mus.*, 2: 105, 106, plate 23, f. 1. Jan.
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 67. Stray Notes on Papuan Ethnology. *Proc. Linn. Soc. New South Wales*, (2), 9: 613-617, plate 58. Apl. 29.
 68. Description of a New Species of *Astralium* from New Britain (C.H. & A. Willey). *Proc. Linn. Soc. New South Wales*, 21: 107-109, plate 12. July 16.
 69. General Account of the Atoll of Funafuti. *Aust. Mus. Mem.* 3: 1-71, 5 text-figs. Dec. 21.

1897.

70. Description of a New Papuan Land Shell. *Rec. Aust. Mus.*, 3: 11-12, text-fig. Jan. 7.
 71. Descriptions of New Land Shells. *Rec. Aust. Mus.*, 3: 44-48, plate 11. Aug. 5.
 72. The Ethnology of Funafuti. *Aust. Mus. Mem.*, 3: 229-304, plates 13-15, 80 text-figs. Sept. 27.
 73. Stray Notes on Papuan Ethnology, Part 2. *Proc. Linn. Soc. New South Wales*, 22: 288-291, plates 14 & 15. Oct. 25.
 74. The Savage of the Pacific. *The Antipodean*, 3: 43-48, 8 text-figs.

1898.

75. Mollusca (of Sydney). *Aust. Assoc. Adv. Sci., Handbook Sydney and the County of Cumberland*: 136-142. Jan.
 76. The Broadening of Atoll-islets. *Natural Science*, 12: 174-178. Mch.
 77. Description of a New Bivalve, *Lima alata*, from Santa Cruz. *Rec. Aust. Mus.*, 3: 84-88, 2 text-figs. June 13.

78. Further Notes on Australasian Shipworms. *Proc. Linn. Soc. New South Wales*, 23: 91-96, 9 text-figs. June 23.
79. Descriptions of New Mollusca, chiefly from New Caledonia. *Proc. Linn. Soc. New South Wales*, 23: 97-105, 12 text-figs. June 23.
80. Contributions to a Knowledge of the Fauna of British New Guinea. Part V. Mollusca. *Proc. Linn. Soc. New South Wales*, 23: 369. Dec. 9.

1899.

81. The Mollusca of Funafuti. Part I. Gasteropoda. *Aust. Mus. Mem.*, 3: 395-488, 49 text-figs. Mch. 6.
82. A Review of the Systematic Position of *Zemira*, Adams. *Rec. Aust. Mus.*, 3: 118-120. Apl. 17.
83. A Shipworm New to Caledonia. *Rec. Aust. Mus.*, 3: 134. Apl. 17.
84. The Mollusca of Funafuti. Part 2. Pelecypoda and Brachiopoda. *Aust. Mem. Mus.*, 3: 489-510, 10 text-figs. July 3.
85. Summary of the Fauna of Funafuti. *Aust. Mus. Mem.*, 3: 511-535. July 3.
86. The Mollusca of Funafuti (Supplement). *Aust. Mus. Mem.*, 3: 547-565, 23 text-figs. Aug. 7.
87. A Zoogeographic Scheme for the Mid-Pacific. *Proc. Linn. Soc. New South Wales*, 24: 391-417, 2 text-figs. Dec. 9.
88. Description of a New Genus, *Austrosarepta*, and Notes on other Mollusca from New South Wales. *Proc. Linn. Soc. New South Wales*, 24: 429-434, 7 text-figs. Dec. 9.
89. Descriptions of New Land Shells, with Notes on Known Species. *Rec. Aust. Mus.*, 3: 151-154, plate 28. Dec. 11.

1900.

90. *Turricula scalariformis*, Ten.-Woods—its Occurrence in New South Wales. *Rec. Aust. Mus.*, 3: 219, text-fig. June 15.
91. *Scala revoluta*, Hedley—its Occurrence in Fiji. *Rec. Aust. Mus.*, 3: 219. June 15.
92. Studies on Australian Mollusca. Part I. *Proc. Linn. Soc. New South Wales*, 25: 87-100, plates 3, 4 and 4 text-figs. Aug. 8.
93. Studies on Australian Mollusca. Part 2. *Proc. Linn. Soc. New South Wales*, 25: 495-513, plates 25-26. Nov. 22.

1901.

94. The Marine Wood-borers of Australasia and Their Work. *Rept. Aust. Assoc. Adv. Sci.*, 8: 237-255, plates 7-10. After June.
95. Some New or Unfigured Australian Shells. *Rec. Aust. Mus.*, 4: 22-27, 8 text-figs. Mch. 29.
96. Studies on Australian Mollusca. Part 3. *Proc. Linn. Soc. New South Wales*, 25: 721-732, plate 48 & 9 text-figs. May 20.
97. A Revision of the Types of the Marine Shells of the "Chevert" Expedition. *Rec. Aust. Mus.*, 4: 121-130, plates 16-17. July 29.
98. Studies on Australian Mollusca. Part 4. *Proc. Linn. Soc. New South Wales*, 26: 16-25, pl. 2 and 1 text-fig. Aug. 13.

1902.

99. A Day on the Great Barrier Reef. *Nautilus*, 15: 97-100. Jan.
100. Studies on Australian Mollusca. Part 5. *Proc. Linn. Soc. New South Wales*, 26: 700-708, pl. 34 & 2 text-figs. May 20.
101. Notes on Tasmanian Conchology. *Pap. Proc. Roy. Soc. Tasm.*, 1902; 77-79, 1 text-fig. June 10.
102. Scientific Results of the Trawling Expedition of H.M.C.S. "Thetis." Mollusca, Part 1, Brachiopoda and Pelecypoda. *Aust. Mus. Mem.*, 4: 285-324, 22 text-figs. July 29.

103. Studies on Australian Mollusca. Part 6. *Proc. Linn. Soc. New South Wales*, 27: 7-29, plates 1-3 & 4 text-figs. Aug. 22.
104. A New Australian Volute. *Rec. Aust. Mus.*, 4: 309, text-fig. 23. Aug. 25.
105. Notes on Tasmanian and West Indian Conchology. *Nautilus*, 16: 49. Sept.
106. William Legrand. (Obituary.) *Nautilus*, 16: 60. Sept.

1903.

107. Studies on Australian Mollusca. Part 7. *Proc. Linn. Soc. New South Wales*, 27: 596-619, plates 29, 31-33. Apl. 8 or 9.
108. Notes on the Zoology of Paanopa or Ocean Island and Nauru or Pleasant Island, Gilbert Group. The Mollusca. *Rec. Aust. Mus.*, 5: 4-5. Apl. 14.
109. Scientific Results of the Trawling Expedition of H.M.C.S. "Thetis." Mollusca. Part II, Scaphopoda and Gastropoda. *Aust. Mus. Mem.*, 4: 325-402, plates 36-38 & 53 text-figs. Oct. 8.

1904.

110. Additions to the Marine Molluscan Fauna of New Zealand. *Rec. Aust. Mus.*, 5: 86-97, 12 text-figs. Jan. 28.
111. The Habitat of *Gomphina moerchi* Angas. *Rec. Aust. Mus.*, 5: 114. Jan. 28.
112. Le Père Lambert, S.M. (Obituary.) *Nautilus*, 17: 119. Feb.
113. The Effect of the Bassian Isthmus upon the Existing Marine Fauna: a Study in Ancient Geography. *Proc. Linn. Soc. New South Wales*, 28: 876-883. Mch. 1.
114. Studies on Australian Mollusca. Part 8. *Proc. Linn. Soc. New South Wales*, 29: 182-212, plates 8-10. May 10.
- 114A. On the change of name of *Poroleda lanceolata* Tate. *Vict. Naturalist*, 21: 112. Dec. 8.

1905.

115. South Australian Nudibranchs, and an Enumeration of the known Australian Species (H. Basedow and C.H.). *Trans. Roy. Soc. South Austr.*, 29: 134-160, plates 1-12. Dec.
116. Report on the Mollusca collected by Mr. Herbert Basedow on the South Australian Government North-West Expedition, 1903. *Trans. Roy. Soc. South Austr.*, 29: 161-165, plate 30, and 4 text-figs. Dec.
117. Mollusca from One Hundred and Eleven Fathoms, East of Cape Byron, New South Wales. *Rec. Aust. Mus.*, 6: 41-54, 18 text-figs. Sept. 15.
118. On a Large Example of *Megalatractus aruanus*, L. *Rec. Aust. Mus.*, 6: 98-100, plates 21-22, & 1 text-fig. Sept. 15.

1906.

119. A Pteropod Alias. *Proc. Mal. Soc. (Lond.)*, 7: 5. Mch. 9.
120. Studies on Australian Mollusca. Part 9. *Proc. Linn. Soc. New South Wales*, 30: 520-546, plates 31-33, & 2 text-figs. Apl. 12.
121. Mollusca from Three Hundred Fathoms, off Sydney. (C.H. and W. F. Petterd). *Rec. Aust. Mus.*, 6: 211-225, plates 37-38. June 19.
122. Results of Dredging on the Continental Shelf of New Zealand. *Trans. New Zeal. Inst.*, 38: 69-75, pls. 1-2. June.
123. On some Eighteenth-century Names that relate to New Zealand. Mollusca. *New Zealand Colonial Museum Bull. No. 1*: 48-49.
124. Frederick Strange, the Conchologist. *New Zealand Colonial Museum Bull. No. 1*: 50.
125. The Mollusca of Mast Head Reef, Capricorn Group, Queensland, Part 1. *Proc. Linn. Soc. New South Wales*, 31: 453-479, plates 36-38, map. Nov. 19.

1907.

126. The Results of Deep Sea Investigation in the Tasman Sea. I, The Expedition of H.M.C.S. "Miner." 1. Introductory Note on the First Deep-Sea Cruise (W. A. Haswell and C.H.). *Rec. Aust. Mus.*, 6: 271-2. Jan. 23.
127. The Results of Deep Sea Investigation in the Tasman Sea. Mollusca from Eighty Fathoms off Narrabeen. *Rec. Aust. Mus.*, 6: 283-304, plates 54-56. Jan. 23.
128. The Results of Deep Sea Investigation in the Tasman Sea. 2. The Expedition of the "Woy Woy." Mollusca from Eight Hundred Fathoms, Thirty-five Miles East of Sydney. *Rec. Aust. Mus.*, 6: 356-364, plates 66-67. July 18.
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New South Wales Dentaliidae (Phylum Mollusca, Class Scaphopoda)

By PHILLIP COLMAN.

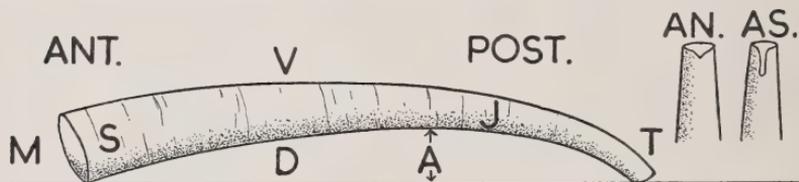
This paper is a review of the New South Wales species of the family Dentaliidae, which have never been fully described. In 1860, Sowerby described two species in his "Thesaurus Conchyliorum," *Dentalium erectum* and *D. lubricatum*. Nearly forty years elapsed before any new species were added to the New South Wales list, when Pilsbry and Sharp, in Tryon's Manual of Conchology (1898), described *D. platyceras* from Port Stephens, N.S.W. Shortly after, Hedley (1903) added two more species, *D. virgula* and *D. thetidis*, bringing the total to five. Little work has been done since, although a fair quantity of material has accumulated over the years at the Australian Museum, Sydney.

This paper is the first attempt to bring together all the New South Wales Dentaliidae. To the five species so far described I have added another seven, making a total of twelve species known from this State.

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TYPES: All specimens illustrated, as well as the types of new species described are in the Australian Museum, Sydney. Numbers prefaced with the letter C are Australian Museum Registered Numbers.

In describing the shells, various terms such as arc, slit, notch are used. The diagram below will illustrate their meaning.



Scaphopod Shell Characters: M = Aperture, T = Apex, S = Senile Shell, J = Juvenile Shell, V = Ventral, D = Dorsal, A = Arc, AN. = Apical Notch, AS. = Apical Slit, ANT. = anterior end, POST. = posterior end.

FAMILY DENTALIIDAE Gray, 1834.

Genus DENTALIUM Linne, 1758.

The genus *Dentalium* is divided into a number of subgenera, and the New South Wales species are placed in six of these.

Subgenus DENTALIUM Linne, 1758.

1758. *Dentalium* Linne, *Syst. Nat.*, ed. 10, p. 758, Type (S. D. Montfort, 1810) *D. elephantinum* Linne, 1758.

"Shell prismatic or decidedly ribbed, the ribs often very strong towards the apex, where there are generally from 4 to 14, but sometimes as many as 20. Apex with no notch or slit, or a short one." (Pilsbry & Sharp 1897.)

Key to N.S.W. species of subgenus *Dentalium*.

- a. Ribs nine.
 b. apical character present, absence of intercalations *tignum*
 bb. apical character absent, primary and secondary intercalations present *concretum*
 aa. Ribs seven *thetidis*

D. (DENTALIUM) TIGNUM, sp. nov.

(Figure 1.)

Shell long, increasing regularly in diameter, strongly curved, more so posteriorly, white opaque, dull in juvenile shell, shiny at senile end. Shell thin, peristome fragile, slightly oblique, section round. Nine pronounced longitudinal ribs run along the shell to become nearly obsolete about two-thirds of the way along from the apex. Interspaces at the juvenile end strongly curved, while senile end flat. Faint oblique growth rings observable at irregular intervals along the shell. Apex with small notch placed dorsally. Internal sculpture corresponding to external sculpture.

Dimensions. (Holotype): Length 38.8 mm., anterior diameter 2.7 mm., posterior diameter 0.6 mm., arc 3.4 mm.

Type locality. 800 fathoms, 35 miles east of Sydney, N.S.W. C.24485.

Remarks. According to Henderson (1920, p. 22) "the subgenus *Dentalium* only has a notch on the convex side, if present at all." Although the notch on *D. tignum* is dorsal, i.e. on the concave side, the shell agrees in every way with the subgeneric description, and does not appear to fit any other, so I am, for the present, placing it in this subgenus.

D. (DENTALIUM) CONCRETUM, sp. nov.

(Figure 2.)

Shell long, thick, nearly straight, dull, white. Peristome thick, apex very thick. Section circular. Internally, the shell is unsculptured, but externally there are nine prominent ribs between which in senile stages riblets occur. In some cases, even a third set of riblets shows. Faint irregular growth rings occur, mainly in the senile shell. Apex simple.

Dimensions. (Holotype): Length 36.2 mm., anterior diameter 2.8 mm., posterior diameter 1.3 mm., arc 1.3 mm.

Type locality. 300 fathoms, 27½ miles east of Sydney, N.S.W. C.62231.

Remarks. This shell is very similar to *D. tignum* but differs in the thickness and texture of the shell, its straightness as opposed to the more curved *tignum*, and the absence of any apical character; probably the best distinguishing character is the absence of internal sculpture.

D. (DENTALIUM) THETIDIS Hedley.

(Figure 3.)

1903. *Dentalium thetidis* Hedley, *Mem. Austr. Mus.*, 4: 327, fig. 61; Verco, 1911, *Trans. Roy. Soc. S.A.*, 35: 205.

"Shell white, rather thin, tapering and very little curved. Sculpture: seven elongated ribs run the whole length of the shell; those on the concave side are stronger and wider apart than the others; each interspace is grooved by a dozen fine even striae, faintly crossed by growth lines; towards the aperture one or two interstitial ribs arise. Posterior aperture simple." (Hedley 1903.)

Dimensions. (Holotype): Length 7.7 mm., anterior diameter 1.4 mm., posterior diameter 1.0 mm., arc 2.5 mm.

Type Locality. 63-75 fathoms, off Port Kembla, N.S.W. C.16212.

Records. 41-50 fathoms, off Cape Three Points, N.S.W., C.16211, and several South Australian localities (Verco, 1911).

Remarks. As yet, to my knowledge, there have been no perfect specimens found. This shell undoubtedly grows bigger than the holotype, which so far is the largest known.

Subgenus ANTALIS, H. & A. Adams, 1854.

1854. *Antalis* H. & A. Adams, *Gen. Rec. Moll.* I: 457. Type (S.D. Pilsbry & Sharp, 1897). *D. entalis* Linne, 1758.

"Shell circular or polygonal in section, sculptured with longitudinal ribs or striae at least in the young, often without longitudinal sculpture in adults, or only so sculptured near the apex; apex generally with a v-shaped notch at or near the convex side, or with a solid plug and central short tube or orifice." (Pilsbry & Sharp, 1897.)

D. (ANTALIS) WOOLACOTTAE, sp. nov.

(Figure 4.)

Shell thin, well curved towards the posterior end, white, opaque, with 28-32 valid ribs with rarely smaller ones appearing in the interspaces. The interior is smooth without sign of ribs. At intervals, increasing in proportion to the length of the shell, and more pronounced posteriorly, are rings which suggest thickenings of the shell during stages of growth. A faint apical notch is placed dorsally.

Dimensions. (Holotype): Length 10.6 mm., anterior diameter 2.3 mm., posterior diameter 0.6 mm., arc 1.1 mm.

Type locality. Cronulla, N.S.W. C.21230.

Records. 6-9 fathoms, off Sow & Pigs Reef, Sydney Harbour; Dredged off North Head; Narrabeen Beach, N.S.W. (Laserson Coll.); Manly Beach, N.S.W. C.24309; Middle Harbour, Sydney, N.S.W. C. 32706.

Remarks. The peculiar rings, which are very noticeable, distinguish *woolacottae* very easily.

Subgenus LAEVIDENTIALIUM Cossmann, 1888.

1888. *Laevidentalium* Cossmann, *Ann. Soc. Roy. Malac. de Belgique*, 23: 7, Type species (O.D.), *D. incertum* Deshayes, 1826.

Key to N.S.W. species of subgenus *Laevidentalium*.

- a. Notched dorsally.
 - b. Slit ventrally, no modified terminal pipe *erectum*.
 - bb. Slit ventrally, modified terminal pipe present *pluteum*.
- aa. Notched ventrally, or both sides.
 - c. Snow-white, notched both sides *laseroni*.
 - cc. Yellow-white, opaque, notched ventrally? *lubricatum*.

D. (LAEVIDENTIALIUM) LUBRICATUM, Sowerby.

(Figure 5.)

1860. *D. lubricatum* Sowerby, *Thes. Conch.*, 3: 97, pl. 225, fig. 56; Pilsbry & Sharp, 1897, p. 110; Hedley, 1903, p. 328; Hedley, 1907, *Rec. Aust. Mus.*, 6: 286; Verco, 1911, *Trans. Roy. Soc. S.A.*, 35: 210 & 218.

Shell long, rather solid, whitish yellow to orange, opaque, well curved towards the posterior end; section circular; peristome thin. Sculptureless with irregular growth rings along its length; smooth, glossy, with an apical notch placed ventrally.

Dimensions. (Specimen illustrated): Length 39.7 mm., anterior diameter 4.5 mm., posterior diameter 0.9 mm., arc 3 mm. C.25879.

Type locality. 45 fathoms, off Port Jackson Heads, N.S.W. The holotype is in the British Museum, No. 1957.10.10.2.

Records. 41-50 fathoms, off Cape Three Points, N.S.W. C.16213; Port Stephens, N.S.W. C.62224, and C.62226; Sydney Harbour, N.S.W. C.62222; Broken Bay, N.S.W. C.62223; 80 fathoms, 22 miles east of Narrabeen, N.S.W. C.25879; and several South Australian localities (Verco (1911)).

Remarks. This is one of the commonest of the New South Wales Sphapopods, as it is one of the few commonly washed up on the beaches, suggesting that it lives in quite shallow water.

D. (LAEVIDENTALIUM) ERECTUM Sowerby.

(Figure 6.)

1860. *D. erectum* Sowerby, *Thes. Conch.*, 3: 99, pl. 225, fig. 5.

1867. *Antalis erecta* Angas, *Proc. Zool. Soc. (Lond.)*, p. 220; Pilsbry & Sharp, 1897, p. 111; Hedley, 1905-7, *Rec. Aust. Mus.* 6: 42, 213 & 286.

Shell long, slender, scarcely and evenly curved, glossy, sculptureless, but with fine growth-rings at irregular intervals; white, opaque. Peristome thin and whole shell fragile; section circular. Posterior aperture having a slit placed ventrally, and a notch dorsally.

Type Locality. Sow & Pigs Reef, Sydney Harbour, N.S.W. The holotype should be in the British Museum.

Dimensions. (Specimen illustrated): Length 28.6 mm., anterior diameter 2.3 mm., posterior diameter 0.7 mm., arc 1.7 mm.

Records. 80 fathoms, 22 miles east of Narrabeen, N.S.W. C.25878; 300 fathoms, 27½ miles east of Sydney, N.S.W. C.24485; 111 fathoms, off Cape Byron, N.S.W. C.19827; 20 fathoms, at Wreck Bay, N.S.W. C.22417; 470 fathoms, 32 miles south by east from Green Cape, N.S.W. ("Endeavour" Collection) C.62227; Broken Bay, N.S.W. C.62228.

Remarks. Similar to *D. lubricatum*, but distinguished from it by its straightness as opposed to the more curved *lubricatum*.

D. (LAEVIDENTALIUM) LASERONI, sp. nov.

(Figure 7.)

Shell long, thick, glossy, snow-white, smooth with complete absence of sculpture; evenly and gently curved. Section round, and peristome thin and fragile. Posterior end with two small notches of equal depth situated ventrally and dorsally.

Dimensions. (Holotype): Length 36.4 mm., anterior diameter 4.1 mm., posterior diameter 1.0 mm., arc. 2.6 mm.

Type Locality. Broken Bay, N.S.W. (Holotype, C.62221. Paratypes, C.62220.)

Remarks. Easily recognised by its thickness and pure whiteness. Based on five specimens only, collected from the rather vague locality of Broken Bay, N.S.W.

D. (LAEVIDENTALIUM) PLUTEUM, sp. nov.

(Figure 8.)

Shell long, slender, slowly and evenly tapering, polished, smooth with no sculpture. Section round, peristome thin. Posterior aperture complex, with a peculiar terminal pipe formed by an interior layer of shell arising each side (left and right) to points. It then drops down on the ventral side to a narrow slit, while on the dorsal side the pipe is round, but the outer layer of shell forms a V-shaped notch.

Dimensions. (Holotype): Length 24.4 mm., anterior diameter 2.2 mm., posterior diameter 0.6 mm., arc 1.0 mm.

Type Locality. 100 fathoms, off Wollongong, N.S.W. C. 18217. (Holotype and four paratypes.)

Subgenus COMPRESSIDENS Pilsbry & Sharp, 1897.

1897. *Compressidens* Pilsbry & Sharp. *Man. of Conch.*, 17: 126.

Type species (O.D.) *D. pressum* Pilsbry & Sharp, 1897.

"Shell small, decidedly tapering, conspicuously compressed between the convex and concave sides; weakly sculptured, nearly smooth, anal orifice simple, without slit or notch." (Pilsbry & Sharp, 1897.)

D. (COMPRESSIDENS) PLATYCERAS Pilsbry & Sharp.
(Figure 9.)

1897. *D. (Compressidens) platyceras* Pilsbry & Sharp, *Man. of Conch.*, 17: 126, pl. 22, figs. 58-60.

Shell short, slender, white to dirty brown, opaque, smooth to polished when worn, otherwise dull and rough; oblique growth rings appear at irregular intervals along its length; no longitudinal sculpture, but many fine thread-like striae appear at the posterior end, soon becoming obsolete. Peristome thin, anterior aperture decidedly oblique, longer (dorso-ventrally) than wide, posterior aperture round and simple.

Dimensions. (Specimen illustrated [Paratype]): Length 9.0 mm., anterior diameter 1.0 mm., posterior diameter 0.3 mm., arc 1.7 mm.

Records. 12 fathoms, at Salamander Bay, Port Stephens, N.S.W. C.55085.

Subgenus EPISIPHON Pilsbry & Sharp, 1897.

1897. *Episiphon* Pilsbry & Sharp, *Man. of Conch.*, 17: 117.

Type (S.D., Suter, 1913) *D. sowerbii* Guilding, 1834.

"Small, very slender, rather straight, needle-shaped or truncated, slightly tapering, thin and fragile, glossy and smooth, or at least without longitudinal sculpture; apex with a projecting pipe or simple orifice; no slit, rarely a notch." (Pilsbry & Sharp, 1897.)

D. (EPISIPHON) VIRGULA Hedley.
(Figure 10.)

1903. *D. virgula* Hedley, *Mem. Austr. Mus.*, 4: 328, fig. 62; Verco, 1911, *Trans. Roy. Soc. S.A.* 35: 209.

Shell slender, white, translucent, slightly curved regularly along its length; anterior aperture round, section circular, peristome thin. Posterior aperture truncated with a narrow, smooth, brownish terminal pipe, directed excentrically, dorsally. No sculpture, but small irregularly occurring growth rings appear.

Dimensions. (Holotype): Length 10.5 mm., anterior diameter 1.1 mm., posterior diameter 0.6 mm., diameter of tube, 0.2 mm., arc 0.5 mm.

Type Locality. 63-75 fathoms, off Port Kembla, N.S.W. C.16217.

Records. 104 fathoms, off Neptune Island, N.S.W. C.33488; 41-50 fathoms, off Cape Three Points, N.S.W. C.16215; 54-59 fathoms, off Wata Mooli, N.S.W. C.16218; 50-52 fathoms, off Botany Heads, N.S.W. C.16216; Port Stephens, N.S.W. C.62225; 75 fathoms, off Sydney Harbour, N.S.W. (Laseron Coll.); and several South Australian localities (Verco, 1911).

Remarks. Specimen drawn is the Holotype, but the terminal pipe figured is from one of the paratypes. Some shells have the terminal pipe up to 1.5 mm. in length, though the usual length is about 0.6 to 0.7 mm.

Subgenus PSEUDANTALIS Monterosato, 1884.

1884. *Pseudantalis* Monterosato, *Nomencl. Conch. Medit.* p. 32. Type (S.D. Sacco, 1897) *D. rubescens* Deshayes, 1825.

D. (PSEUDANTALIS) CAESURA, sp. nov.

(Figure 11.)

Shell long, slender, fragile, strongly curved, more so posteriorly; creamish-yellow, transparent when alive, but usually opaque when dead or worn. No sculpture, but for growth lines. Section round, peristome thin, fragile. Apex obliquely cut on the dorsal side, while on the ventral side it drops down to a very long linear slit which sometimes extends up to one quarter the whole length of the shell; on the dorsal side it describes a faint notch.

Dimensions. (Holotype): Length 21.3 mm., anterior diameter 2.3 mm., posterior diameter 0.5 mm., arc 1.7 mm., length of slit 5.5 mm.

Type Locality. 100 fathoms, off Wollongong, N.S.W. C.62230.

Records. 80 fathoms, 22 miles east of Narrabeen, N.S.W. C.62229.

Remarks. The shell closely resembles *D. stenoshizum* Pilsbry & Sharp, 1897 (p. 128), from the West Indies, but because of the great distance between the two localities, I consider that the N.S.W. shells are probably specifically distinct.

Subgenus BATHOXIPHUS Pilsbry & Sharp, 1897.

1897. *Bathoxiphus* Pilsbry & Sharp, *Man. of Conch.*, 17: 121. Type (O.D.) *D. ensiculus* Jeffreys, 1877.

"Shell thin, conspicuously compressed laterally, nearly or quite smooth, with a broad slit on the convex side of the apex" (Pilsbry & Sharp, 1897).

D. (BATHOXIPHUS) APPLANATUM, sp. nov.

(Figure 12.)

Shell smooth, unsculptured but for growth lines, dull, brittle, strongly curved, more so posteriorly; thin. Peristome thin. Shell very flattened laterally, more so ventrally, where each side meets at a sharp angle; reinforced dorsally with a thick ridge running the length of the shell. Two faint ridges run dorsally externally along the shell indicating the beginning of the reinforcing ridge. Anterior aperture very oblique; apex with a very broad slit placed ventrally. This slit cuts away about half the diameter of the posterior end.

Dimensions. (Holotype): Length 8.4 mm.; anterior diameter (dorso-ventral) 1.0 mm. (left to right) 0.6 mm.; posterior diameter 0.4 mm., arc 0.9 mm., length of slit 0.5 mm., depth of slit 0.2 mm.

Type Locality. 800 fathoms, 35 miles east of Sydney, N.S.W. C.22652.

Remarks. Pilsbry and Sharp write (1897, p. 122) "Mr. Smith has placed on record (Proc. Malac. Soc. Lond. i, p. 60), a list of characteristically North Atlantic molluscs, believed to have been dredged by the "Challenger" at Station 164(b), off Sydney, N.S.W. in 410 fathoms, including . . . *Dentalium ensiculus* . . . Taking into account the association of species of other genera, it seems to us quite incredible that these forms actually occurred at the station alleged. It is far more likely that a locality label became misplaced." I quote this extract because the shell here described as *applanatus* faintly resembles *D. ensiculus*. I have complete faith in the locality data for this species, however, as other shells dredged at the same spot are recognised Australian species.

LIST OF THE NEW SOUTH WALES SPECIES OF DENTALIIDAE.

Genus <i>Dentalium</i>	Linne, 1758.
Subgenus <i>Dentalium</i>	Linne, 1758.
— <i>tignum</i>	Colman, 1958.
— <i>concretum</i>	Colman, 1958.
— <i>thetidis</i>	Hedley, 1903.
Subgenus <i>Antalis</i>	H. & A. Adams, 1854.
— <i>woolacottae</i>	Colman, 1958.
Subgenus <i>Laevidentalium</i>	Cossmann, 1888
— <i>lubricatum</i>	Sowerby, 1860.
— <i>erectum</i>	Sowerby, 1860.
— <i>laseroni</i>	Colman, 1958.
— <i>pluteum</i>	Colman, 1958.
Subgenus <i>Compressidens</i>	Pilsbry & Sharp, 1897.
— <i>platyceras</i>	Pilsbry & Sharp, 1897.
Subgenus <i>Episiphon</i>	Pilsbry & Sharp, 1897.
— <i>virgula</i>	Hedley, 1903.
Subgenus <i>Pseudantalis</i>	Monterosato, 1884.
— <i>caesura</i>	Colman, 1958.
Subgenus <i>Bathoxiphus</i>	Pilsbry & Sharp, 1897.
— <i>applanatum</i>	Colman, 1958.

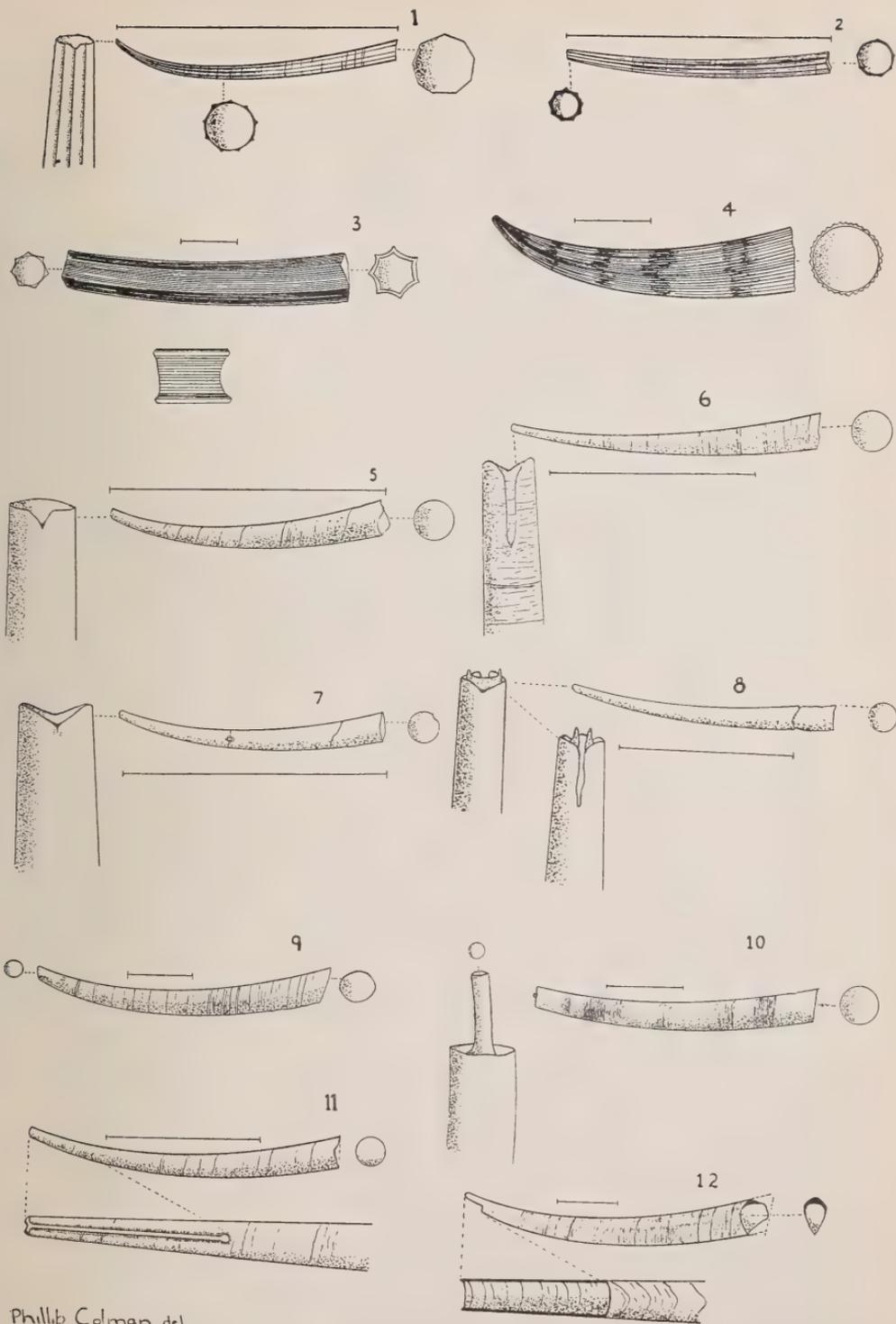
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EXPLANATION OF PLATE.

Fig.

- Dentalium (Dentalium) tignum*, sp. nov. Holotype.
- Dentalium (Dentalium) concretum*, sp. nov. Holotype.
- Dentalium (Dentalium) thetidis* Hedley. Holotype.
- Dentalium (Antalis) woolacottae*, sp. nov. Holotype.
- Dentalium (Laevidentalium) lubricatum* Sowerby. C.25879.
- Dentalium (Laevidentalium) erectum* Sowerby. C.25878.
- Dentalium (Laevidentalium) laseroni*, sp. nov. Holotype.
- Dentalium (Laevidentalium) pluteum*, sp. nov. Holotype.
- Dentalium (Compressidens) platyceras* Pilsbry & Sharp. C.55085, Paratype.
- Dentalium (Episiphon) virgula* Hedley. Holotype.
- Dentalium (Pseudantalis) caesura*, sp. nov. Holotype.
- Dentalium (Bathoxiphus) applanatum* sp. nov. Holotype.



Phillip Colman del

New South Wales Dentaliidae.

A New Name for the Heron Island Volute

By DONALD F. MCMICHAEL.
(The Australian Museum, Sydney.)

During recent years, intensive collecting of shells along the east coast of Australia has brought to light many new forms of well-known species. This has been especially true of the shells collected by trawling along the continental shelf, and several deep water species, known only from beach specimens, have been found in considerable numbers and in perfect condition. Among these new discoveries are some shells of the volutid genus *Cymbiolacca* Iredale, belonging to the series of species originally described as *Voluta pulchra* Sowerby, 1825, *Voluta punctata* Swainson, 1823, and *Voluta (Aulica) wisemani* Brazier, 1870.

A full discussion of the variation and taxonomy of this genus is in course of preparation, but a most surprising discovery is here recorded, prior to the more detailed review. This discovery came from the attempt to identify a series of shells which occur on the east coast of Queensland in the neighbourhood of Keppel Bay. The shells immediately recalled the well-known Heron Island Volute which has for more than a century been known under the name *Voluta pulchra* Sowerby. These coastal shells differed, however, in that the form was more elongate, with three bands of small dark spots circling the shell, in contrast to the bands of large spots found on the Heron Island species. Heron Island is about forty miles east of Gladstone, Queensland, in the Capricorn Group.

Reference to the original description of *Voluta pulchra* revealed that it was based on one of these coastal shells, and was not the Heron Island shell at all. The misapplication of this name has been made for over a century, and has only been brought to light now because of the intensive collecting of shells along the Queensland coast in recent years. It is indicative of the vast amount of nomenclatural work which remains to be done on even our best known groups of marine molluscs.

Once the identity of *Voluta pulchra* is considered historically, it becomes obvious that the type specimen could not have come from the Capricorn Group. Iredale (1939) has pointed out that any shells from the Queensland coast which were in England before 1825 must have been collected by Captain Cook's expedition. The narrative of this expedition reveals that Cook did not visit the Capricorn Group, but did land on the Queensland coast at Bustard Bay, south of Bustard Head, and at Thirsty Sound, near Broad Sound, about 100 miles N. of Rockhampton. At both these places, it is likely that Cook's party could have picked up one of these coastal shells.

Sowerby gave no locality when describing the shell, the later selection of Heron Island as type locality for *V. pulchra* being the result of Macgillivray's having collected shells at Heron Island, probably during the voyage of the *Fly*.*

Since these shells were close to Sowerby's figure of *pulchra*, they were at once identified with it and figured under that name by Reeve, after which the identification came to be completely accepted. However, once the

* Cox (1872) states that Macgillivray records this shell as having been found at Heron Island in "The Voyage of the *Rattlesnake*." No such record occurs however in Macgillivray's (1852) account of that voyage, on which Heron Island was not visited. Macgillivray was also on the *Fly* a few years earlier, and while there is no record of the discovery of "*V. pulchra*" in Jukes' (1847) narrative of the Voyage of the *Fly*, it is probable that the shells were picked up when that expedition visited Heron Id.

Apparently Macgillivray reported his discovery verbally to Cox when he was later in Cox's employ.

original figure of *pulchra* is examined and compared with Heron Island and coastal shells, there can be no doubt as to which is true *pulchra*. The key character is the number and size of the dark spots in the bands circling the shell; in the Heron Island shell (of comparable size) only about 15-18 spots up to 2 mm. long are visible on the oral (or ventral) surface, whereas Sowerby's illustration shows about 35 spots. Coastal shells have spot counts ranging from 25 to 60 or more. The spines are also conclusive, for in Sowerby's illustration they are low and not outstanding, a characteristic of the coastal shells, whereas in Heron Island shells, the spines are erect, outstanding, and continue down the sides of the body whorl as low ridges.

Since all subsequent authors have accepted Reeve's determination, there is only one descriptive literature reference to Sowerby's species (which must be referred to *Cymbiolacca* Iredale) and that is the original description. Cotton (1949, pl. 13) has inadvertently figured true *C. pulchra* under the name *Cymbiola wisemani* Brazier, a quite different species.

These two forms, from the Queensland Coast, and the populations from the Capricorn Group, are here considered to be subspecifically separable only. The Capricorn populations are named as new below, while the coastal populations, being the nominate race will be known as *Cymbiolacca pulchra pulchra*. Some shells from the neighbourhood of Bustard Head, appear to be to some extent intermediate between the true *pulchra* and the island subspecies, and these are considered to be hybrids between the two races. A fine specimen of *C. pulchra pulchra* (Sowerby) is illustrated in figs. 5 and 6, whilst figures 3 and 4 are copied from the original illustration of the holotype, which is in the British Museum, No. 1957.10.10.1.

Cymbiolacca pulchra woolacottae, ssp. nov.

(Figs. 1 & 2.)

Voluta pulchra, Reeve, 1849, Conch. Icon. 6: *Voluta*, pl. 21, sp. and fig. 54 a & b: (Not *Voluta pulchra* Sowerby 1825, Tankerville Cat., App. p. 28, pl. 4, fig. 2).

Voluta pulchra, Cox, 1872, Distribution of Australian Volutes. Sydney, p. 10.

Voluta pulchra, Tryon, 1882, Man. of Conch., 4: 86, pl. 25, fig. 50.

Aulica pulchra pulchra, Maxwell Smith, 1942, *A Review of the Volutidae*, p. 40, pl. 18, fig. 124.

Cymbiola pulchra, Allan, 1950, *Australian Shells*, p. 167, pl. 25, fig. 4.

Remarks: This well-known subspecies has only recently been collected in quantity from islands in the Capricorn and nearby groups other than Heron Island. There is some variation between the populations from different islands, but all preserve certain basic characters which serve to separate these island populations from the coastal race. All have decidedly fewer spots, which tend to be much larger, often exceeding 4 mm. in length (this being due to fusion of several spots). Sometimes there are practically no spots visible on the oral (ventral) surface and the number seldom exceeds 18. Heron Island shells are fairly constant and are regarded as typical, the description below being based on them. From Wistari Reef, the shells are variable, some being quite red in background colour, some having elongate spires and resembling North West Island shells. Shells from the latter island are usually small, with elongate spires, smaller white triangles and often with light background colours, pinkish-orange to yellow being common.

A shell from Lady Elliott Island is larger, the background colour light, almost creamish white, and the spots are large. A shell in the

collection of Mr. P. Goadby from Fairfax Island, Bunker Group, is similar to the Lady Elliott Island shell. Despite this variation, there can be no doubt that the populations from the several islands are to some extent members of an interbreeding population inhabiting the offshore islands of Queensland near the Tropic of Capricorn. It is likely that there is also a certain amount of gene-flow between these populations and the coastal populations, as the Bustard Head shells mentioned previously suggest.

Description: Shells small to medium sized, the maximum length about 80 mm., but specimens are commonly about 60 mm. long; the maximum width about 48% to 52% of the maximum length. Spire short, body whorl large, quite shouldered and bearing prominent, sharp, outstanding spines which are slightly recurved and continue part way down the body whorl as low rounded ridges; the spines develop quite early and as a result of their standing out from the shell, the spire has a stepped appearance. The spines continue to form right to the edge of the lip, though in populations from islands other than Heron Island, the last two spines may be a little reduced. Ground-colour of shell pinkish-brown, on which are superimposed numerous large white triangles, some reaching 5 to 10 mm. across, others smaller. Two pinkish bands run around the body whorl, one below the spines, the other half-way down the shell; there is a faint suggestion of a basal band above the columellar callus, but this is more or less obscured by white triangles. A few large black or dark-brown spots are scattered along the pinkish-brown bands, very rarely a little beyond the edges, between the bands; the spots fairly large, elongated vertically, usually more than 1 mm. long, sometimes up to 4 mm. or more.

This sub-species is named in memory of the late Mrs. Lee Woolacott, who devoted many hours of voluntary labour to the Department of Molluscs at the Australian Museum and who took a special interest in the marine mollusca of Queensland. She was much loved by all who knew her, and it is fitting that this beautiful shell should be named for her.

Types: The holotype of *Cymbiolacca pulchra woolacottae* is in the Australian Museum, Registered Number C.62264, from Heron Island, collected by Miss Elizabeth Pope, June, 1951. Paratypes are from Heron Island (C.62265), Masthead Island (C.18942), North-West Island (C.62266), and Lady Elliott Island (C.37531), Queensland.

Dimensions of Holotype: Length 77 mm., maximum width 39 mm., apertural height 56 mm.

Records: As above and from Wistari Reef, and Fairfax Island, Bunker Group (P. Goadby Collection).

Range: The Capricorn Group, Bunker Group, and Lady Elliott Island, off the Central Queensland Coast.

Habitat: On coral reefs in sand patches at low tide.

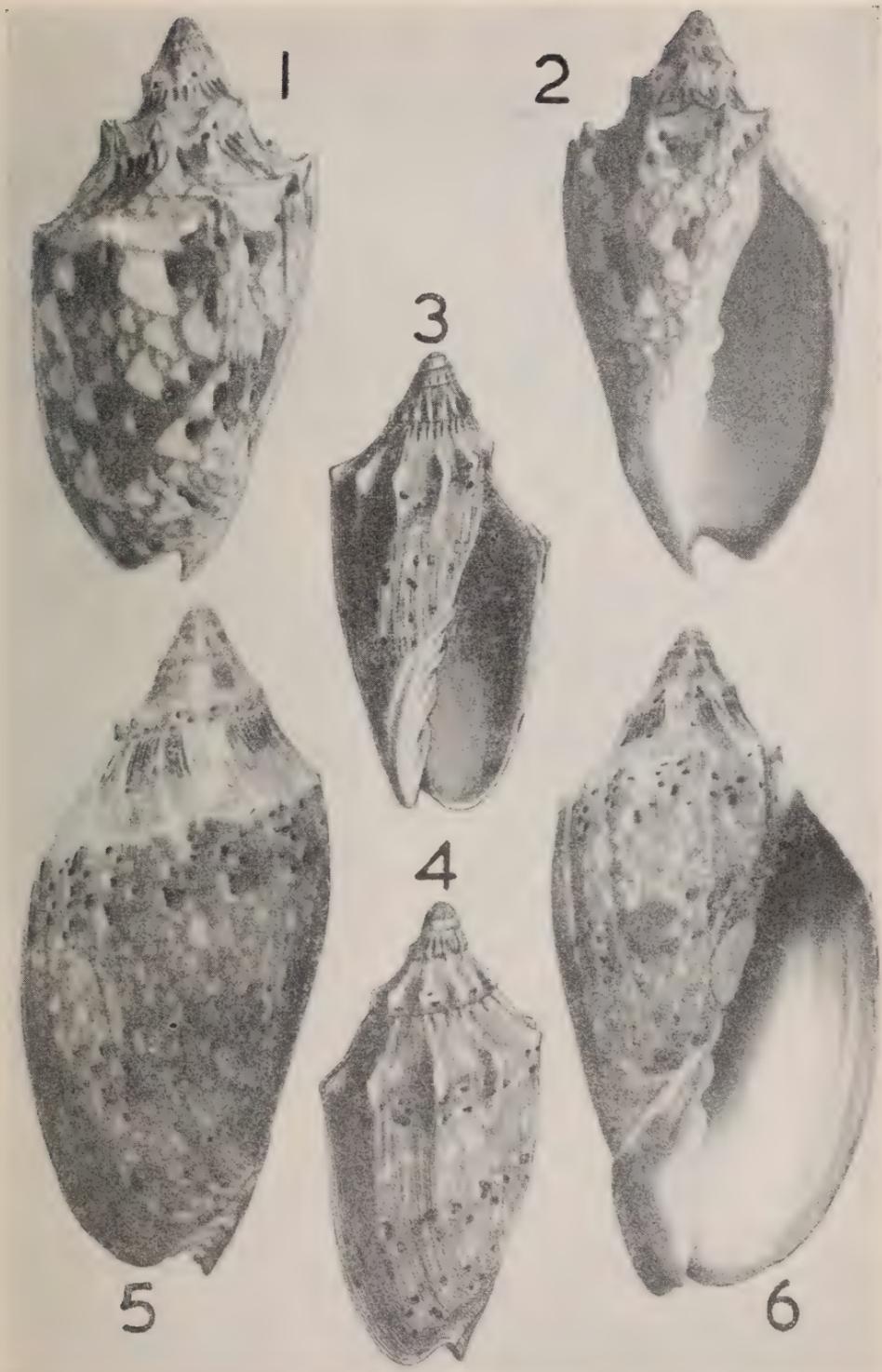
EXPLANATION OF PLATE.

(All figures approximately natural size.)

Figs. 1 & 2. *Cymbiolacca pulchra woolacottae*, ssp. nov. Holotype.
Australian Museum registered No. C.62264.

Figs. 3 & 4. *Cymbiolacca pulchra pulchra* Sowerby. Holotype (copied from original figure). British Museum registered No. 1957.10.10.1.

Figs. 5 & 6. *Cymbiolacca pulchra pulchra* Sowerby.
Yeppoon, Queensland. P. Goadby collection.



Note: In the recently-published Journal of the Malacological Society of Australia, 1: 30-31, a new form of the genus *Cymbiolacca* is described as *Aulicina perryi*, Ostergaard and Summers, from "Westaria" (*sic*, = Wistari) Reef, Capricorn Group. This form appears to be closely related to the Heron Island shells here described, and its taxonomic status will be discussed in the review of the genus which is in course of preparation.

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Descriptions of New Species of Chitons (Mollusca, Loricata)

By K. L. MILNE.

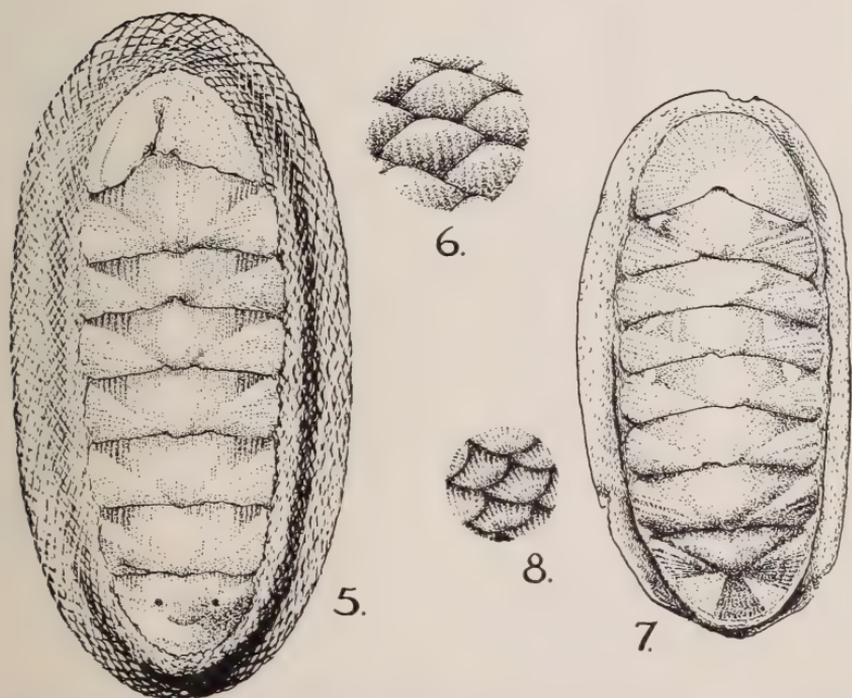
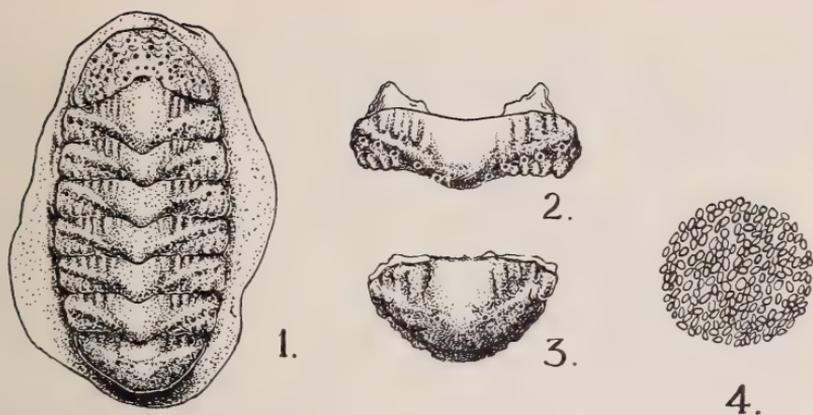
It is now some thirty years since Iredale and Hull's Monograph of the Australian Loricates was issued, classifying and describing the known chiton fauna at that time. Intensive collecting of this group of molluscs during the intervening years has confirmed the data presented by Iredale and Hull for the most part. Some new species have been found, and descriptions of three of these are given here. Unfortunately two of the new species are based on one or two specimens only, and consequently details of slitting and valve interiors are not known, but it is hoped additional material may soon be available to complete our knowledge of these forms. It is hoped that this and other papers published on the chiton fauna may one day be combined and issued as a supplement to the Monograph.

Genus LUCILINA Dall, 1881.

Type Species by Monotypy, *Chiton confossus* Gould 1846.

LUCILINA TILBROOKI, sp. nov.

Description: Shell elongate oval, dried specimen measuring 8.5 mm. in length by 4 mm. in breadth; median valves round-backed with sides distinctly convex; colour darkish dull red; anterior valve smooth near apex, with rays of inverted V-shaped nodules; shoulder valve with the beak slight, median valves with lateral areas strongly differentiated, each with 2 to 4 radiating rows of irregular pustules, the centre row shorter with pustules smaller than the outer rows; pleural area of each median valve with 6 to 7 ribs, slightly weaker near the jugum, the bases corresponding with the anterior row of pustules on the lateral areas, jugum smooth; posterior valve with mucro central, elevated, the post-mucronal slope steeply convex, vertical at base, the ante-mucronal area sulcate, with ribs as in the median valves, the post-mucronal area irregularly pustulose; girdle fleshy when alive, flat and horny when dried, relatively wide, and, when viewed under a powerful lens, seen to be covered with a closely-packed



Figures 1, 2, 3, & 4: *Lucilina tilbrooki*, sp. nov. Paratype, K. L. Milne Collection. Figure 1: Dorsal view of whole shell (Magnification X 7). Figure 2: Median Valve (Magnification X 10). Figure 3: Posterior Valve (Magnification X 10). Figure 4: Detail of Girdle Scales (Magnification X 80).

Figures 5 & 6: *Haplopax mariae*, sp. nov. Holotype, Aust. Mus. Regd. No. C.62219. Figure 5: Dorsal view of whole shell (Magnification X 6). Figure 6: Detail of Girdle Scales (Magnification X 40).

Figures 7 & 8: *Ischnochiton weedingi*, sp. nov. Holotype, Aust. Mus., Regd. No. C.62218. Figure 7: Dorsal View of whole shell (Magnification X 6). Figure 8: Detail of Girdle Scales (Magnification X 100).

B. P. Bertram del.

mosaic of minute, elongate scale interspersed with numerous lanceolate glossy spicules which are more frequent towards the outer edge; ocelli occurring in 5 or 6 rows on the anterior valve, one row on each side of the median valves, and 2 or 3 irregular rows on the post-mucronal area of the posterior valve.

Type Locality: Heron Island, Capricorn Group, Queensland.

Habitat: Living on algae the same colour as the shell, growing on coral rocks well inside the reef, near the shore at low-tide mark.

Types: The holotype (a complete shell) and one disarticulated paratype are in the National Museum of Victoria, Melbourne, Registered numbers F.18471 and F.18061, respectively. Paratypes in the Australian Museum, Sydney (C.62216), the South Australian Museum, Adelaide, and the specimen here figured in the author's private collection.

Remarks: The generic placing of this species is confirmed by the prominent toothed insertion plate of the posterior valve, which serves to separate it from *Onithochiton*. On the other hand, it resembles *Onithochiton ashbyi* in that the species loses its "outer covering" and colour when placed in alcohol. In this it differs from both *Lucilina fortilirata* and *L. shirleyi*. It was thought that this species might be the same as *Onithella helenae* McKay, but comparison with the type of that species in the National Museum proved that the two are quite distinct, for in *L. tilbrooki* the side slopes are more convex, and the external areas are irregularly pustulose, whereas in *O. helenae* they are smooth. The posterior valve of *O. helenae* is "small, triangular, depressed, mucro terminal," which is very different from the condition found in *L. tilbrooki*. Compared with the species which *L. tilbrooki* most resembles, namely, specimens of *Lucilina fortilirata* of comparable size, it will be seen that *L. tilbrooki* is narrower, the smooth jugal area is wider, the sculpture is coarser, and there are fewer sulcations in the pleural area of the median valves.

This species is named in honour of Mr. Max Tilbrook, of South Australia, an enthusiastic collector and student of chitons.

Genus HAPLOPLAX Pilsbry 1894.

Type Species by Original Designation, *Lophyrus smaragdinus* Angas 1867.

HAPLOPLAX MARIAE, sp. nov.

Description: Shell medium sized, moderately elevated, subcarinated, side slopes convex, form elongate oval, the dried specimen measuring 11.5 mm. in length by 6mm. in breadth; colour mottled slate-green, glistening; anterior valve with very faint growth lines, no sculpture; median valves with lateral areas slightly raised, smooth, with faint growth lines; pleural area smooth to naked eye, but with 6 weak striations under a lens; posterior valve with mucro raised, ante-median; ante-mucronal area smooth, post-mucronal area slightly concave, with faint growth lines; girdle very wide, with approximately 17 rows of large glistening opaque-silver and blue-green scales, faintly striate under a lens, diminishing as they approach the shell and outer margin (generic); the blue-green scales giving irregular striped or mottled effect amid the more frequent, opaque-silver scales. Interior and slitting unknown.

Type Locality: Heron Island, Capricorn Group, Queensland.

Habitat: Living under dead coral blocks, just inside the outer edge of the coral reef, coral overgrown to resemble rock surface.

Types: The holotype and paratype, the only specimens known, are in the Australian Museum, Sydney, Registered number C.62219.

Remarks: The additional width of the girdle in this species may have developed as a result of its station in more agitated water than is usually inhabited by members of the genus *Haploplax*. The species is named in honour of my wife, who has been of great assistance to me in collecting chitons.

Genus ISCHNOCHITON Gray 1847.

Type Species by Subsequent Designation, *Chiton textilis* Gray 1828.

ISCHNOCHITON WEEDINGI, sp. nov.

Description: Shell small, elongate oval, the dried specimen measuring 11.5 mm in length by 6 mm. in breadth; semi-carinated, side slopes slightly convex; colour pink, mottled with white on lateral areas, with yellow patches on pleural areas near the girdle; also two white triangles on the posterior valve with apices at the mucro; anterior valve finely granulose, with approximately 40 weak radiating rays; median valves with the lateral areas bearing three or four weak ribs, the pleural areas finely granulose; posterior valve with mucro slightly antemedian, slightly elevated; ante-mucronal area finely granulose, post-mucronal area concave, weakly rayed with numerous small, closely-packed, embricating scales with eight or more striations under the lens; scales of varying size in irregular rows, more regular near the shell. Interior and slitting unknown.

Type Locality: Caloundra, northern end of Moreton Bay, Queensland.

Habitat: Under large, smooth rocks on a rocky headland, in a position protected from the heavy seas; in shallow water at low tide.

Types: The unique holotype is in the Australian Museum, Sydney, Registered number C.62218.

Remarks: There is a dark patch on the apex of the anterior valve and on the mucro of the posterior valve. This description may require modification later, as it is based on the single known specimen. The species is very similar to some variations of *Ischnochiton ptychius* from South Australia. The main differences are that the central areas of *I. weedingi* have no zig-zag sculpture as do those of *I. ptychius*, and the girdle scales are smaller.

This species is named in honour of the Rev. B. J. Weeding, who made many valuable contributions to our knowledge of chitons.

Some Observations on Cowries Found at Woolgoolga, New South Wales

By V. POPPINS.

The only way in which we can learn anything of the lives of such difficult subjects as marine animals is by careful recording of our observations and the exchange of this usually meagre knowledge with other students.

Like many others, I have been attracted to the Cowry family by the beauty of the shells. But unlike most collectors I have the good fortune to live in a district where many species of cowrie can be found; not easily, perhaps, but in sufficient numbers to make the hunt always exciting and hopeful.

Most species in the Woolgoolga area, New South Wales, lay their eggs in summer. In the case of *Monetaria moneta* a batch of several hundred eggs is laid in a semicircular heap about $\frac{3}{4}$ inch in diameter on the under surface of a rock. Other species produce masses in proportion to the size of the animal. After laying, an adult sits on the eggs until they are hatched. On many occasions I have noticed a second animal nearby on the rock, always a little smaller in size than the sitter. I do not know which is the male or female. If the sitter is taken off the eggs it will usually crawl back to them immediately. Sometimes it will withdraw into its shell and fail to return straight away but will always return by the next day. One interesting point I have observed is that the sitter invariably crawls back into exactly the same position it had before being disturbed. The eggs are round and transparent when laid, and gradually elongate until they hatch. I have watched a batch of eggs over a period of ten days, and this seems to be about the full period of incubation judging by the shape of the eggs when I first saw them and when they finally disappeared. I understand that the young have a free-swimming period and finally settle down once more to life among the rocks.

The animal progresses to a certain stage in the formation of the shell—it is the same stage in all species—and then marks time with its building operations until it grows big enough to complete the shell. My justification for this opinion is that I discovered two animals with shells in that particular stage of development on the first day of March and watched them every few days until May 5. Until that date neither had moved a fraction from the exact spot on the rocks on which I first saw them, nor could I detect any advance with the building of the shell. On that day a cyclone was forecast, and, as I feared my "pets" would be shifted by the heavy seas and I would lose sight of them, I moved one of them to a pool in a more sheltered position. As it turned out, this was the wrong thing to do, as I found the dead shell in the pool on my next visit to the headland. The other one survived, and I watched it until June 10, when it also met an unfortunate end. It had moved on the rock and I crushed it with my finger when I rolled the stone over. For the 102 days I had it under observation, and the lesser time of its mate, there was no sign of any progress with the building of the shell and no sign of any movement from the one spot on the stone. Many juvenile shells are found on the beaches, and practically all are in that one stage of completion. This could hardly be a coincidence, and I think it shows that they remain in that one stage for a much longer period than any other except for the completed stage. I have had many animals under observation for lesser periods and I have seen nothing to indicate that my assumptions are wrong, but have seen a lot of supporting evidence. I have had as many as twenty (mostly adult) under view at the one time. I transferred them to convenient pools and looked them up every few days. It is usually about September when the shells are completed, and I think that the period of the juvenile form is about 6 months. They are then big enough to complete the full shell. If the back is broken out of an old shell the juvenile shell can be seen inside.

Mating seems to occur in early summer. I have had adult shells under observation for months but have found that at this time of the year they disappear from their usual place under a rock, and many are seen moving about. This suggests to me that they are looking for mates. Although I have not been able to watch one particular specimen throughout the year I have had some under view all the time, and the indications are that they follow this set plan even though it be in a rather loose manner.

LIST OF COWRIES FOUND AT WOOLGOOLGA.

Collected alive:—

<i>Ravitrona caputserpentis</i> Linne.	<i>Evenaria ursellus marcia</i> Iredale.
<i>Erronea nimiserrans</i> Iredale.	<i>Palmadusta clandestina</i> Linne.
<i>Ponda carneola thepalea</i> Iredale.	<i>Paulonaria macula</i> Angas.
<i>Mystaponda vitellus</i> Linne.	<i>Ovatipsa caurica longior</i> Iredale.
<i>Monetaria moneta</i> Linne.	<i>Amphiperas ovum</i> Linne.
<i>Ornamentaria annulus</i> Linne.	<i>Melicerona felina velesia</i> Iredale.
<i>Arabica arabica</i> Linne.	<i>Trivia</i> sp.
<i>Erosaria erosa</i> Linne.	

Species found dead:—

<i>Gratiadusta walkeri</i> Sowerby.	<i>Umbilia hesitata</i> Iredale.
<i>Gratiadusta xanthodon</i> Sowerby.	<i>Nuclearia nucleus</i> Linne.
<i>Ravitrona labolineata nashi</i> Iredale.	<i>Paulonaria fimbriata blandita</i> Iredale.
<i>Ravitrona poraria theoreta</i> Iredale.	<i>Paulonaria becki</i> Gaskoin.
<i>Ravitrona helvola callista</i> Shaw.	<i>Staphylea staphylea consobrina</i> Garrett.
<i>Ovatipsa chinensis sydneyensis</i> Schil- der.	<i>Lyncina lynx caledonica</i> Crosse.
<i>Evenaria asellus</i> Linne.	<i>Solvadusta subviridis anceyi</i> Vays- sierre.
<i>Evenaria hirundo cameroni</i> Iredale.	<i>Proterato lachryma</i> Sowerby.
<i>Erosaria metavona</i> Iredale.	<i>Ellatrivia merces</i> Iredale.
<i>Erosaria tomolini prodiga</i> Iredale.	<i>Dolichupis pilula</i> Kiener.
<i>Basilitronea isabella</i> Linne.	<i>Amphiperas costellata</i> Lamarck.
<i>Purperosa facifer</i> Iredale.	<i>Calpurnus lacteus</i> Lamarck.
<i>Palmadusta ziczac signata</i> Iredale.	<i>Notocypraea piperita</i> Gray.
<i>Palmadusta lutea humphreysi</i> Gray.	<i>Primovula striatula</i> Sowerby.
<i>Talostolida teres pentella</i> Iredale.	

The names of the above cowries have been taken from Joyce Allan's "Cowry Shells of World Seas."

A New Epitonium from Eastern Australia

By J. KERSLAKE.

Family EPITONIIDAE.

Genus EPITONIUM Roding 1798.

Sub-genus *Globiscala* de Boury, Journ. de Conch., 1909, Vol LVII, No. 3, p. 258.

Type Species *Scalaria bullata* Sowerby, Thes. Conch., Vol. 1, p. 94, pl. XXXIV, fig. 87.

It is with some diffidence that I use the sub-generic name proposed by de Boury. This is one of many which he published with only a type designation and no description. I have not examined a specimen of Sowerby's *bullata*, but from his illustration it appears to be closely related to our shell, and I quote his description for purposes of comparison: "Shell white, short, broad, very ventricose; whorls few, rounded; varices thin, very oblique, elevated at the suture; aperture large; umbilicus small. Habitat, Island of Capul, Philippines."

EPITONIUM (GLOBISCALA) WOOLACOTTAE, sp. nov.

(Figure 1.)

Description: Shell about 24 mm. in length, 15 mm. in width, thin, minutely perforate with whorls attached. Apex missing, adult whorls 5, moderately convex. Colour white with traces of pale horn-coloured perio-

stracum. Suture not deeply impressed. Aperture oblique, ovate. Outer lip slightly thickened and reflected, formed by the last costa. Columella short. Axial sculpture of numerous low, irregular costae, about 25 on the body whorl; these not continuous with those of the preceding whorl. Costae mostly thread-like at the periphery, becoming more prominent at the suture where they are appressed to the preceding whorl. Between these are numerous irregular axial scratches. Spiral sculpture of numerous irregularly spaced scratches between the axial costae; the scratching giving the impression of a dull, slightly translucent texture, but under magnification the interspaces are shining. Basal ridge absent. Parietal area covered by a glaze, the inner lip thickened by the fusion of the costae. Operculum of a very pale horn colour, very thin, chitinous, and paucispiral. Growth lines well defined. Radiation of growth lines interrupted by a slightly sunken groove somewhat irregularly defined, about 2 mm. from the outer edge.

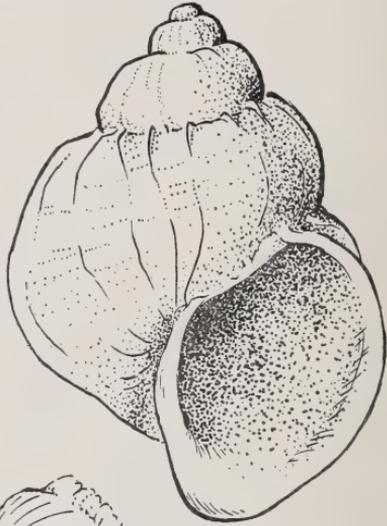
Holotype, Australian Museum No. C62272, from Caloundra, South Queensland. T. Iredale, collector.

Distribution. Queensland: Tryon Island, Capricorn Group (Bowman Collection); Caloundra (Curry Collection; Kerslake Collection); New South Wales: Long Reef, near Sydney (Colman Collection); Kurnell, Botany Bay (Woolacott Collection).

Remarks. I am naming this shell in honour of the late Leone Woolacott, to whose knowledge and enthusiasm Sydney conchologists owe much.

The only living specimen of this rare species to have been collected was found by Mr. Roy Bowman under a coral block at Tryon Island, Capricorn Group, Queensland, and it is from this example that a description of the operculum was made. This living shell is from the most northerly location known so far. Its known southern limit is Kurnell, Botany Bay, N.S.W.

I wish to thank Mr. Tom Iredale and Dr. D. F. McMichael for their assistance, and also the collectors mentioned above, who made their shells available for study.



A New *Epitonium*

The Barnacle, *Xenobalanus globicipitis* Steenstrup, in Australian Seas

By ELIZABETH C. POPE.

The Australian Museum, Sydney.

By permission of the Trustees of The Australian Museum.

In contributing to this number of the Marine Zoologist, which is a memorial to Mrs. Lee Woolacott, I wish to record my sincere appreciation to her both as a collector and friend. For many years, during the course of her own investigations into the habits and distributions of tropical molluscs, Lee Woolacott collected many excellent series of tropical cirripedes for me from rare and little-visited localities, thus materially helping my studies in this group.

Class CIRRIPEDIA.

Family BALANIDAE.

Genus XENOBALANUS Steenstrup, 1851.

XENOBALANUS GLOBICIPITIS Steenstrup, 1851.

(Figure 1.)

Xenobalanus globicipitis Steenstrup (1851), Pl. III, figs. 11-15.

Id. Steenstrup (1852), pp. 158, 161.

Id. Darwin (1854), pp. 438-446, Pl. xvii, figs. 4a-c.

Id. Pilsbry (1916), pp. 282-284, Pl. lxx, figs. 1-2b. Synonymy of genus.

Id. Barnard (1924), pp. 96-97. Synonymy is discussed.

Id. Nilsson-Cantell (1930), pp. 258-259. List of host-species given.

Xenobalanus natalensis Stebbing (1923), pp. 12-13, Pl. xvi.

A batch of eight specimens of this peculiar and somewhat rare barnacle, *Xenobalanus globicipitis*, was taken late in January, 1956, from the tail flukes of a dolphin, stranded on Heron Island, near the southern end of the Great Barrier Reef, Queensland, by Mr. Harold Cogger, of the staff of The Australian Museum. Although Nilsson-Cantell (1930) and Cornwall (1955a) consider this species to be cosmopolitan, this is the first record of it in the Australian region.

While such a record can reasonably be expected of a species which is epizoid on widely ranging hosts like dolphins, whales, and porpoises, it is nevertheless interesting to have positive record of it in the Western Pacific. This short note and illustration are being published to draw attention to its occurrence here, in the hope that marine naturalists will find further specimens and forward them to the author for examination. Besides the chance of finding *Xenobalanus* on stranded mammals cast up on beaches, the recent establishment of land-based whaling industries should increase the likelihood of collecting more specimens. Any discoveries from northern or west Australian shores will be of particular interest.

If any specimens are found it would be appreciated if they could be speedily preserved in methylated spirits to preserve the soft parts as well as the shell.

The present series fits closely the description by Darwin (1854) in that the mouthparts are villose and the cirri armed with short, stiff bunches of bristles. Nilsson-Cantell (1921, text-figure 88) and Cornwall (1955 b, figure 40) depict mouthparts for this species which are much less bristly than in the present series of specimens. There is, however, no doubt that

the Australian specimens belong to Steenstrup's spcies. One can only conclude that there is a fair degree of variability in the structure of the mouthparts with regard to hairiness. A second species, *X. natalensis*, proposed by Stebbing (1923) has been invalidated by Barnard (1924), and in the present series the differences observed are only of the order used by Stebbing to establish his new species and disallowed by Barnard.

The main features of this unmistakable species are shown in text-figure 1A. In spite of the superficial resemblance to stalked barnacles—especially to *Conchoderma aurita* (Linn), *Xenabalanus* is in reality a highly aberrant acorn or sessile barnacle. Opercular valves are entirely missing, the body of the animal and the opercular membrane are greatly extended



Text-figure 1.—A. The whole animal about twice life size: (1) shell embedded in skin of host; (2) pseudopeduncle; (3) hood portion of pseudopeduncle; (4) horn-like outpushing of hood; (5) cirri; (6) penis.

B. Lower surface of the shell. F J. Beeman del.

and protrude through the orifice of the shell to form a dark, purply-chocolate-coloured peduncle-like structure (2, text-figure 1A). This pseudopeduncle is wider at the distal end than at the point of emergence from the orifice of the rudimentary, irregularly, star-shaped shell. The latter is six-rayed and always embedded in the outer layers of the skin of the host. The shell size is so greatly reduced that it is best seen from the lower surface after removal (together with the outer layers of skin) from the dolphin. The shape of the shell is seen in text-figure 1B (view of lower surface).

The expanded free end of the "pseudopeduncle" is rolled into a collar-like hood (3, text-figure 1A), and this bears two stumpy outpushings or "horns" (4, text-figure 1A). The swollen hood from which the cirri, mouth, etc., project (5, text-figure 1A) is reminiscent of the capitulum of regular stalked species like *Conchoderma aurita*, with its ear-like pro-

jections. The resemblance is, however, purely superficial, and *Xenobalanus* has its closest affinities with the genera *Coronula*, *Platylepas* and *Tubicinella* (Darwin 1854, p. 445).

The cirri are dark purple in colour, but the penis, which is stout and prominent, is light (6, text-figure 1A). The shell is also white and shows distinct lines of growth. Its basis is membranous. The general dark colouring is in keeping with the habit of growing attached to the skin of marine mammals from which *Xenobalanus* hangs down like a short tassel.

The present series (Australian Museum Registered number P. 12975) ranges in length from 17 to 37 mm., and the diameter of the largest shell is 6 mm. The exact species of the host is not known, but it is definitely either *Tursiops catalania* or *Delphinus delphis*, both of which have already been listed as hosts by Nilsson-Cantell (1930).

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History of New South Wales Shells

Part III: The Settlement Years (Continued):

Thomas Watling, Artist.

By TOM IREDALE.

To students of Australian Ornithology the name Thomas Watling is very familiar. In that connection, enough has been written to fill a book, indeed a book has been written about him alone. References are given at the end of this note covering the major accounts up to the present, though the morrow may easily bring forth something new. As intimated in the preceding part the novel creatures of this new land aroused interest, so that paintings and sketches were made of everything strange, thus including shells. Paintings of the much more attractive birds amounted to hundreds, and many new species were described from the paintings alone. The paintings were mostly in private possession, and probably very many have been lost or mislaid. In fact, the "Watling" paintings were made between 1792 and 1794, and did not turn up until 1902, over a century later. They were sent to the British Museum (Natural History), apparently loose, with a history that has been shown to be erroneous. The number of paintings exceeded five hundred, of which nearly three hundred were of birds, the remainder being of general interest, views, mammals, fishes, shells and plants. Dr. Bowdler Sharpe, head of the Bird department, was so intrigued with the birds that he reviewed the species, but unfortunately his enthusiasm produced so much confusion that the next half century was taken up trying to dispel it. The only name appearing among these paintings was Thomas Watling, and the whole lot was designated the "Watling" paintings, although it was obvious that two or three other painters' work was included. It is well known that the work of each artist has its own personality, and can generally be recognized without recourse to a signature. Indeed nearly all the old painters rarely added any mark, allowing their work to speak for itself. Watling's paintings are all signed, but are easily recognizable from their style and medium. All the paintings are in water colour, but Watling added something which has given them a slight glaze recalling oil paintings. Fifty-nine illustrations of shells were included, and of these thirty are signed, the others unsigned, by two or three artists. Through the courtesy of the British Museum (Natural History) black and white photographs of these have been made and sent to the Royal Zoological Society. It must be remembered that the paintings are in colour and would have been more easily determined in that state. Notes are written, in some cases, on the sheets, giving native names and other items of interest. The writers of these notes are not all known, at first all were assigned to Watling, but some of the remarks seemed to contradict that view, and other names have been put forward. But who was Thomas Watling? The first account has proven to be false but most of his history has now been made known. Thomas Watling was a native of Dumfries, Scotland, his parentage doubtful, his birth (apparently) unknown, his baptism accrediting him as "lawful son to Ham Watlin, soldier," no mother's name given, but as he was brought up by his unmarried aunt, Marion Kirkpatrick, his mother was apparently a Kirkpatrick. He was by trade "a painter or limner," but was convicted of forgery in 1789. He had forged a Bank of Scotland note by hand, showing he was a skilled draughtsman. The penalty for forgery at that date was death, but somehow he escaped with fourteen years' transportation. Although convicted in 1789 he did not arrive in Sydney until October

1792. Watling must have been a strange individual as he wrote letters to his aunt, and they were published, giving most of the information about himself. In one letter he wrote: "My employment is printing for J—. W—, esq., the nondescript productions of this country." This was regarded as a reference to Surgeon-General John White, and this is now certain. Some of the notes appear to be in White's handwriting and a suggestion may be that the specimens were brought to White, who gave them to Watling to paint, and thereafter White annotated some, but not all the notations were made by him as instance the one about the Violet Snail, quoted later. A letter has been found in which White sent his paintings and a "large rude manuscript" to Aylmer B. Lambert for advice as to their publication, with apparently no result. The shells, which were painted on pieces of paper, have been mounted and appear on four large pages, which have been photographed and these are here reproduced. The first plate shows five sheets, all signed by Watling. Sheet 1 is of a large Volute bearing a note "Native name Gung-e-rung. This shell tho' not very plenty, they are found from this size or less to six times the size, the one from which this drawing was taken was four times larger." (Owing to the reduction in the photograph and reproduction on this plate, the size cannot be calculated.) Sheet 2 is of a Tun (Beer Barrel) Shell (*Tonna cerevisina* Hedley), an excellent painting. Sheet 3 is also a beautiful painting, this time a Red Australwelk (*Charonia rubicunda* Perry), with a long note. "The native name of this shell is Nag-ga-rang. This shell which is very common in New South Wales, is about the Natural size, though many are to be met with much larger and smaller as will be seen by the great variety I have sent to Thos. Wilson, Esqr. Gower Street Bedford square London, to whom I have sent the other Varieties of shells which I collected in this Country." This comment must have been written by White as he noted in his earlier published Journal that the Journal owes much to Wilson's persuasion and it is possible that Wilson overlooked that publication as White was at the time still in Australia. Sheet 4 has three paintings lettered *, No. 1, No. 2, and explanation "No. 1. Gna gorong. No. 2. Gung a rang. * The operculum of No. 1,—The natural size." The lettering shows Watling's best calligraphy, as he had used it in Forging the Bank Note, very careful and beautiful script and neat and regular printing while the painting is very well done. No. 1 and the operculum are of the Red Australwelk and No. 2 of the abovementioned Volute. A note written in small backhand at the corner of Sheet 4 reads "Quest Are any of these the Melon Shell." Sheet 5 is of the Volute again. "Native name Gung a rong." Note the different spellings of the native names each time as if endorsed at the time.

The second plate has four sheets, two signed by Watling, the other two being unsigned. Sheet 1 is signed and has six figures, the first being of the Sydney Whelk (*Pyrazus ebeninus* Brug) with the native name "Gud-de-ga"; the second is of the Trochowink (*Austrocochlea obtusa* Dillwyn); the third being of the Scaly Scallop (*Scaechlamys peroniana* Ired.); and the fourth is of another local bivalve, the Saucer (*Pexocodakia rugifera* Reeve). The last two however seem to confirm the opinion that Watling merely painted what was offered to him as these are of New Zealand origin, one the well-known Star-Turban (*Astraea heliotropium* "Martyn"), the other the Corded Turban (*Cookia sulcata* "Martyn").

Sheet 2 has six figures with the annotation "Native name Gna-go-rang. No. 1—are Shell very numerous among the Rocks near the mouth of Port Jackson Harbour. No. 2—are two tile shells from the Island of Sambo en Gan a spanish settlement No. 3—is perfectly white when taken out of the sea, but on being put into spirrirts, the Fish if alive tinges the Shell of the blue or rather a purple, and any other Shell put in with it, it is a

rare shell and the only one we have seen as yet." Three shells are numbered "1." The first one is the Volute to which the native name given is applicable, the other two are of the Red Australwelk. No. 2 refers to two figures of the Frilled Clam (*Tridacna "squamosa"*), the settlement mentioned being obviously Zamboanga in the Philippine Archipelago. No. 3 is a small local representative of the Wentle-trap (*Opalia australis* Lam.). The sheet suggests it is the work of a copyist or imitator of Watling, and confused the Australwelk and Volute, the other shells either being not seen or else ignored by Watling. Sheet 3 is signed by Watling and inscribed, "This seems to Mr. White to be a species of the Nautilus. The reticulated net work is thin and transparent and is distended from the shell by the interior air. Perhaps it is truly pictured by the bubbles children blow from a pipe. The liquor in the shell is a most beautiful purple and stains linen that colour but on paper it appears a lightish blue. The drawing represents perfectly the back and foresides, the shell of natural size. Native name Boala." Two excellent figures of the Violet Snail (*Janthina violacea* Bolten, auct.). Sheet 4 gives "Native name Kallee dere." It is notable that it shows three paintings of the Rose-petal Bubble Shell (*Hydatina physis* L.). The first with the animal extended out of the shell, the second with the animal expanded like a full rose with six petals, showing no shell and the third the shell alone. The artist who painted this sheet is unknown, but he was an excellent painter. The third plate is somewhat crowded with shells, six sheets with no fewer than thirty-three figures. Only two are signed but some of the others fully deserve a signature. The first sheet has seven figures, the first of a Mussel, apparently the young of the sixth, the common Mussel (*Mytilus obscurus* Dunker) "native name Goo-rung"; the second is Spengler Australwelk (*Cymatilesta spengleri* Perry); the third Tent Star Shell (*Bellastraea sirius* Gould), the native name not clear; the fourth, Trochowink (*Austrocochlea obtusa* Dillwyn); the fifth, the Hairy Australwelk (*Monoplex australasiae* Perry), and the seventh a Cone, (*Floraconus papilliferus* Sow.). The second sheet may be by the same painter except that these shells are numbered 1 to 8, but only 1 to 4 are explained by native names. No. 1 has the "native name Kow-er-ring" and is the King Scallop (*Notovola fumata* Reeve); No. 2 is the Razor-Shell (*Subitopinna menkei* Reeve) native name Kow-ill; No. 3 is the Flame Medal (*Veletuceta flamma* Reeve) "native name Kaa-din"; No. 4 is a very small Ear-Shell (*Notohaliotis coccoradiata* Reeve) "native name Walgan"; No. 5 is the Saucer (*Pexocodakia rugifera* Reeve) native name "Wee-dang-ira"; No. 6 is the Common Austral Cockle (*Cardium racketii*, Donovan); No. 7 may be the Venerid known as *Notocallista disrupta* Sowerby, and No. 8 is the Ear-drop or Kelp Shell (*Phasianotrochus eximius* Perry) with operculum. The third sheet has one beautiful painting of the Red-mouthed Stromb (*Conomurex luhuanus* L.), flamboyantly signed in large flowing script, "Thomas Watling delt.—" In another writing "The native name of this shell is Gung-e-ra-nere." But the next two sheets, with only one shell on each, are the most intriguing. The first one is of the Wavy Volute (*Amorena undulata* Lam.) and the second of the Agate Cassid (*Xenogalea labiata* Perry). Both paintings are beyond criticism. Now we come to the last sheet on this plate figuring no fewer than fourteen shells. This is signed by Watling and native names are written against some of the figures. The first is of the Hairy Australwelk (*Monoplex australasiae* Perry): this differs from the one abovementioned in that it shows the colourful animal in the aperture, the other figure showing the operculum on the withdrawn animal; the second is a Dark Mitra (*Vicimitra contermina* Ired.); the third is of the Agate Cassid (*Xenogalea labiata* Perry) not comparable with the one abovementioned; two small shells are quite unidentifiable, followed by the Harbour Conniwink (*Bembicium kiellmannseggi* Fraunfeld) native name "Bittanda"; the next appears to be the

common Pheasant Shell (*Mimelenchus ventricosus* Swains). This is followed by the Tent Star-Shell (*Bellastraea sirius* Gould) and two figures of the Trochowink (*Austrocochlea obtusa* Dillwyn), one with a few broad longitudinal bars, showing the horny operculum, the other with many narrow bars. Below the Star Shell is a painting of a Sand Snail (*Polinices strangei* Reeve). The lowest row has first: the Common Austral Limpet (*Cellana tramoserica* Holten) with the native name "Caib-bow-ah," second the common Austral Tapestry Shell (*Tapes watlingi*, sp. nov.) native name "Bal-bou-ree," and the third the Rosepetal Bubble-Shell (*Hydatina physis* L.) with the dead animal in the aperture, not comparable with that already mentioned.

Now we come to the fourth plate which has only two large paintings by two very different artists, the first of which will be very interesting to the conchological readers as it is a schematic painting of an Octopus. Among the bird paintings with which I am very familiar there are many which recall the work of a draughtsman rather than of an artist. It was suggested that these paintings may have been made by some ship's officers, all of whom had to have the ability to prepare a chart. In support of this supposition many paintings had a marginal border such as surrounded every chart. The present painting appears to have been made by such an individual. The wording below seems to follow the above reasoning as it reads "Reduced to $\frac{1}{4}$ the size of the Fish the drawing was taken from." Even the writing is distinctive. The lower painting is of an Octopus, perhaps the same specimen, an artistic view. There is appended a note probably by a third person "Back view of the Fish. Drawn $\frac{1}{4}$ the size of the Fish the drawing was taken from," and added by someone else below "The natives use it for bait in fishing."

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Minor references will be easily picked up from these major accounts.



St. L.

Watling



N^o 1

N^o 2

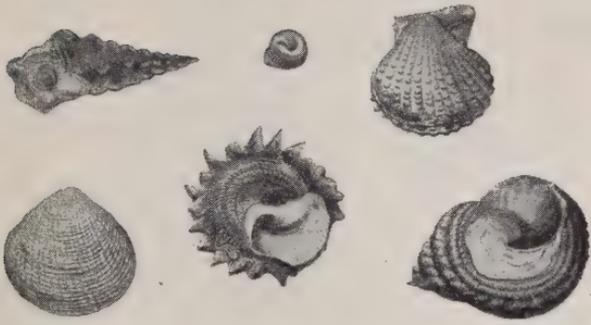


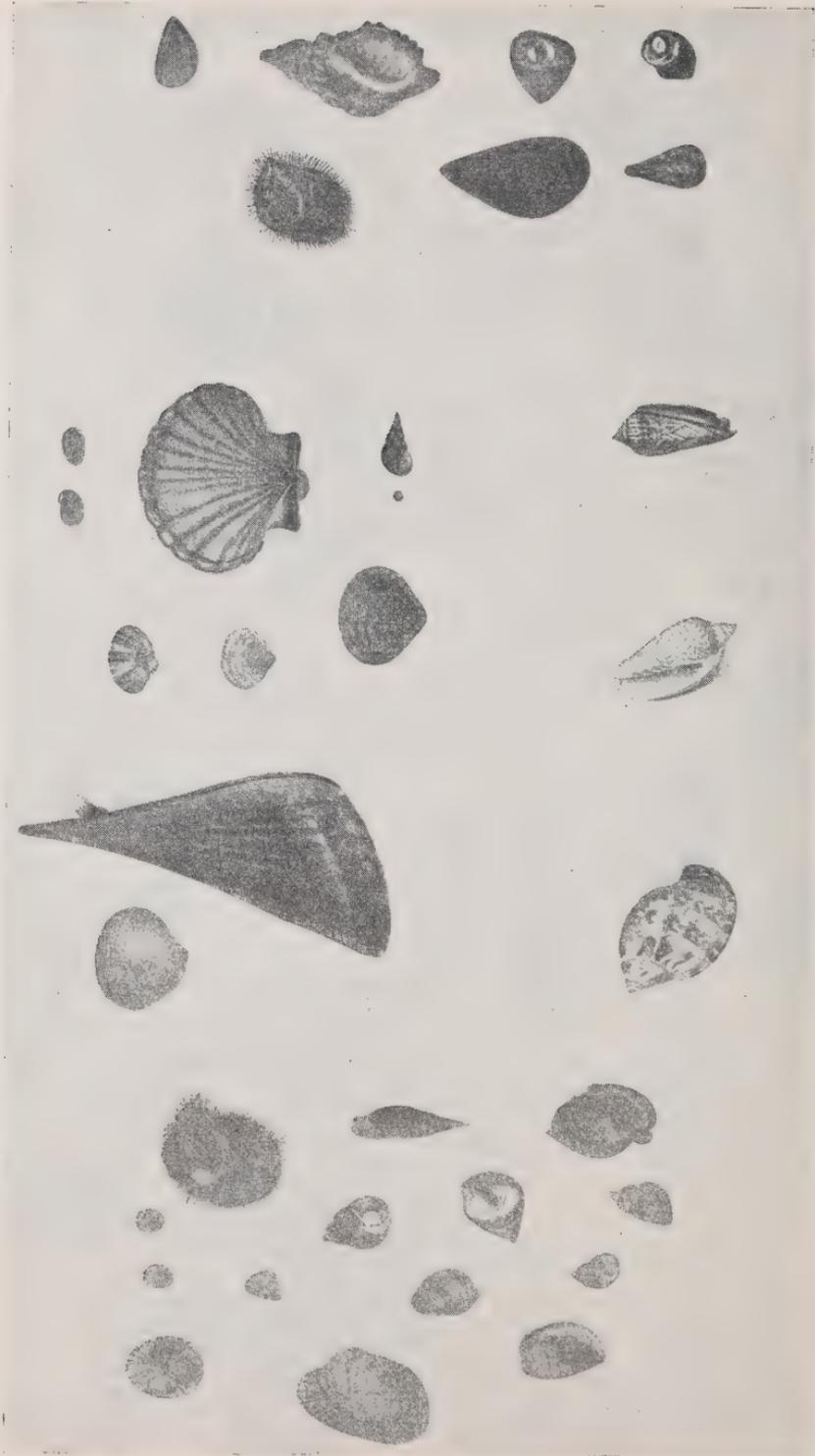
St. L. Opusculum of N^o 1

• TL. Opusculum of N^o 1

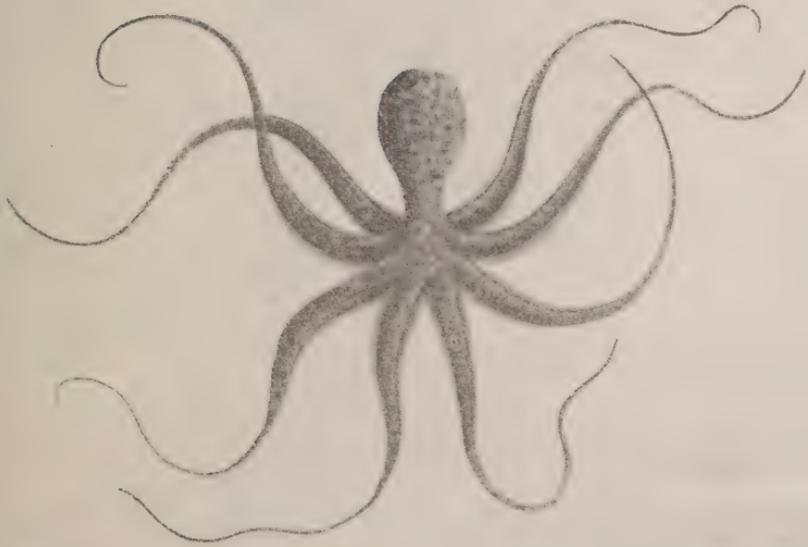
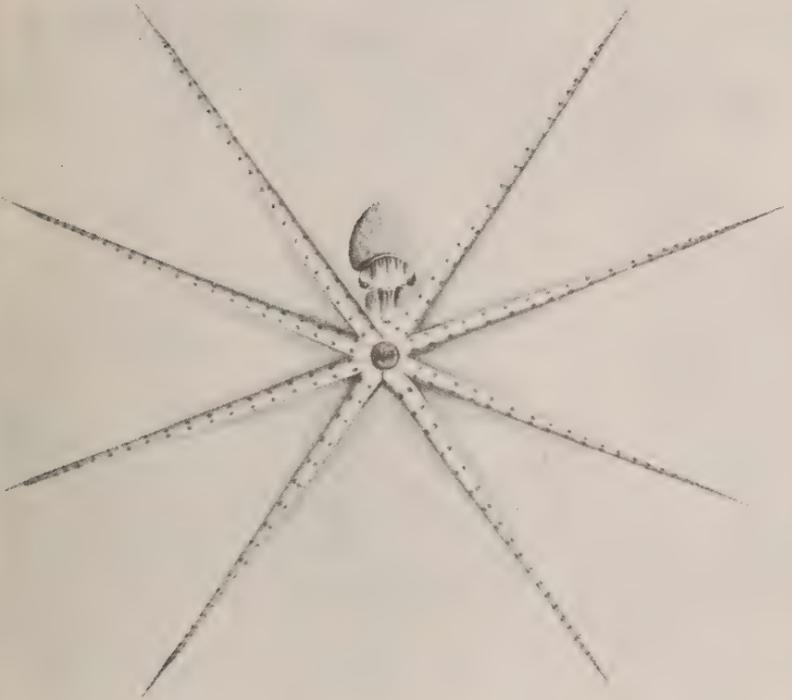
Watling







Watling Paintings.



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Johnstone, Peter Robert, 15 Fairfax Rd., Mosman.
Keast, James Allen, 313 West Botany St., Rockdale.
Mackay, Roy David, 90 French St., Maroubra.
Mackillop, John C., "Cumbrae," Ellamatta Ave., Mosman.
McCamley, F., Flat No. 6, 25 Clarendon Rd., Stanmore.
Manwaring, H. A., 2 Altona St., Abbotsford.
Meyer, George Rex, 91 Bowden St., Ryde, N.S.W.
Minell, Mrs. Dorothy Ebsworth, 85 Birtley Towers, Elizabeth Bay.
Monticone, Dr. Charles Albert, Box 2058, G.P.O., Sydney.
Morgan, H. E., 74 Pitt St., Sydney.
Murray, C. Stuart, Box 2427, G.P.O., Sydney.
Musgrave, Anthony, Australian Museum, Sydney.
Oldham, Roland V., 52 Inwood Street, Woolloowin, N.3, Brisbane, Queensland.
Ormsby, Anthony Irwin, 3 Castlereagh St., Sydney.
Packer, H. E., 1588 Pittwater Rd., Mona Vale.
Pope, Miss Elizabeth, 36 Kameruka Road, Northbridge.
Rogers, William James, 12 Bradley's Head Road, Mosman.
Scott, N. A. H., 22 Terminus St., Petersham.
Slater, K. R., c/- Australian Petroleum Co., Port Moresby, Papua.
Smith, Warren Frederick, 43 Bannockburn Rd., Pymble.
Spring, Robert Alexander, "Woodford," St. Elmo St., Mosman.
Street, The Honourable Sir Kenneth, K.C.M.G., Chief Justice of New

South Wales, 2 Greenoaks Avenue, Edgecliff.
 Troughton, Ellis Le Geyt, Australian Museum, Sydney.
 Turner, W. H., 15 Sutherland Road, Chatswood.
 Vickery, Ottomar George, 110 Homebush Rd., Strathfield.
 Ward, Melbourne, Gallery of Natural History and Native Art, Medlow Bath, N.S.W.
 Warland, Leslie Keith, 8 Westbourne St., Carlton, N.S.W.
 Warland, Oswald Edward, 8 Westbourne St., Carlton, N.S.W.
 White, Alfred Henry, Bell Trees, Scone, N.S.W.
 Whitley, Gilbert Percy, Australian Museum, Sydney.
 Wiley, Dr. C. J., 193 Macquarie Street, Sydney.
 Worrell, E. F. A., Ocean Beach Aquarium, Umena, Woy Woy, N.S.W.
 Yardley, H., 10 Great North Rd., Five Dock.
 Zeck, Emil H., Entomological Branch, Dept. of Agriculture, Box 36a, G.P.O., Sydney.

ORDINARY MEMBERS:

Adkins, John, 10 Middle Head Road, Mosman.
 Ahmad, M. B., 33 French St., Kogarah.
 Allan, Miss Elizabeth May, "Vergemount," Gilliver Ave., Vaucluse.
 Allen, H. A., 12 Audrey St., Balgowlah.
 Allen, Mrs. H. A., 12 Audrey St., Balgowlah.
 Allen, Keith Wickham, 3 Clifton Street, Clifton Gardens.
 Allen, Wickham Taylor, 3 Clifton Street, Clifton Gardens.
 Allsop, Lindsay Hartley, 38 Burrawong Avenue, Clifton Gardens.
 Angell, A., Flat 11, Hepburn Court, 30a Lavender St., Lavender Bay.
 Anstey, A. Mervyn, 6 Bradley's Head Rd., Mosman.
 Armstrong, J. E., 70 Wolseley Rd., Mosman.
 Arnall, Vincent, c/- Mrs. Mackenzie, 17 St. Neot's Ave., Potts Point.
 Asher, David A., 59 Falcon St., Crow's Nest.
 Atkinson, Major Gerald B., 8 Superba Parade, Mosman.
 Austin, Miss M., 352 Victoria Ave., Chatswood.
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 Barclay, T. D., 511 Kent Street, Sydney.
 Barrett, Frederick William, Scottish House, 17 Bridge St., Sydney.
 Baur, George N., 100 Victoria St., Coff's Harbour Jetty, N.S.W.
 Beahan, William John, 28 Martin Place, Sydney.
 Beardsall, Mrs. Lois, 15 Levick St., Cremorne.
 Berckelman, Miss Edith M., 29 Bradley's Head Rd., Mosman.
 Berne, Norman, 3 Duntroon Ave., Wollstonecraft.
 Berry, Edgar George, 15 Ruby St., Mosman.
 Beswick, G. H., LL.B., Solicitor, 282 George Street, Sydney.
 Biber, William David, 61 Prince St., Mosman.
 Bishop, W. S., 31 Paul Street, Bondi Junction.
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 Blenkarn, G. G., c/- C.T.A. Club, Martin Place, Sydney.
 Bond, R. B., 35 Calvert Parade, Newport Beach.
 Bouchier, Reginald W., 191 Nicholson Parade, Cronulla.
 Bradley, Miss E. B., 46 Iluka Road, Mosman.
 Bray, Miss Q., 10 St. Elmo Street, Mosman.
 Bromwich, Miss L., 277 Cleveland St., Redfern.
 Brooks, Wm. & Co., Ltd., 723 Elizabeth Street, Waterloo.
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 Bruce, Robert, 126 Falcon St., Crow's Nest.
 Bruce-Steer, Colonel J. M., Hurlstone, Bermagui South, N.S.W.
 Bryden-Brown, C., 41 Iluka Road, Clifton Gardens.
 Buchanan, Rear-Admiral H. J., R.A.N., 1 Wentworth St., Point Piper.

Budd, Miss Marita Ann, 26 Mistral Ave., Mosman.
 Bullen, Errol, 7 Burrabirra Avenue, Vaucluse.
 Burgh, Colonel Henry Bertram, 42 Through Rd., Burwood E.13, Victoria.
 Bush, Kent Willard, 704 Forest Rd., Peakhurst.
 Butler, Miss J., 94 Cabramatta Rd., Mosman.
 Campbell, Miss J., 39 Derwent St., Glebe Point.
 Campbell, T. G., c/- C.S.I.R.O., Box 109, Canberra, A.C.T.
 Campe, Mrs. I., 96 Sugarloaf Cres., Castlecrag.
 Chadwick, N. J., 34 Bradley's Head Rd., Mosman.
 Chaffer, Norman, 1 Roslyn Avenue, Roseville.
 Chambers, William, 7 Rutland Ave., Castlecrag, N.S.W.
 Chapman, Mrs. Barbara, No. 4 Athol Flats, Whiting Beach Rd., Mosman.
 Clark, Dr. Ernest D., 18 Waimea Rd., Lindfield.
 Clerk, Eric Edward, 148 Franklin Street, Matraville.
 Clark, Roland C., 33 Kardinia Rd., Mosman.
 Clayton, Mrs. C., 42 Rickard Ave., Mosman.
 Clayton, Charles, c/- Printers Pty. Ltd., Box 36, P.O., Waterloo.
 Clyne, The Hon. Daniel, 29 Farleigh St., Ashfield.
 Collett, Sister M., Donald St., Greenwich.
 Copland, Stephen J., Chilton Parade, Warrawee.
 Coppleson, Dr. V. M., 225 Macquarie St., Sydney.
 Cornell, V., 10 Lennox Street, Mosman.
 Cornish, Miss J., 27 Killeaton Street, St. Ives.
 Croyley, Mrs. Dorothy Lee, 15 Alexander Avenue, Mosman.
 d'Alpuget, Miss B., Box 2757, G.P.O., Sydney.
 Darrell, Herbert, "Bushlands," Acres Road, Kellyville.
 Darrell, Mrs. M. K., "Bushlands," Acres Road, Kellyville.
 Dawson, Richard Stanley, 36a Burrawong Avenue, Mosman.
 Deakin, Dr. John Edward Ferdinand, "Vindoro," Military Rd., Mosman.
 Deck, Dr. Ernest Field, 9 Kardinia Rd., Clifton Gardens.
 Desmarchelier, Theo, 3 Flat, 11 Bradley's Head Rd., Mosman.
 Dewhurst, Norman, "Yantara," 2 St. Elmo St., Mosman.
 Dobbin, Miss Dolce Mabel, 2 Tryon St., Chatswood.
 Done, Dorothy M., 6 Shadforth St., Mosman.
 Doswell, R., 12 Burrawong Ave., Mosman.
 Dougall, Andrew, 43 Lancaster Road, Rose Bay.
 Downing, Honourable R. R., 6 Abbey St., Gladesville.
 Drake, J. M., 40 Burrawong Ave., Clifton Gardens.
 Duff, J.G., Sr., 7 Cross St., Mosman.
 Duncan, Grantley A., Cnr. Cooyong and Pittwater Rds., Terrey Hills,
 via Chatswood.
 Dykes, Harold James, 4 Bradley's Head Rd., Clifton Gardens.
 Edmanson, R. G., "Yarrabin," 3 Prince's Promenade, Seaforth.
 Edwards, D. William, c/- 96 Harrington St., Sydney.
 Edwards, Edward Oliver, Cummins Road, Menangle Park.
 Ellis, Mrs. Barbara, 6 Chesterton, The Esplanade, Balmoral Beach.
 Ellison, N., 13 Whiting Beach Rd., Mosman.
 Emery, Oswald Frank, 28 Kylie Ave., Killara.
 Ensor, E. G., 1 Gundimaine Ave., Neutral Bay.
 Ethernon, L. R., 29 Baxter Ave., Kogarah.
 Fairfax, John & Sons, 38 Hunter St., Sydney.
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 Ferguson, George A., c/- Angus and Robertson, Ltd., 89 Castlereagh St.,
 Sydney.
 Finckh, Dr. E. S., No. 1 Valley Road, Lindfield.
 Finckh, E. V., 1 Valley Road, Lindfield.
 Fisk, Norman, 335 Young Street, Annandale.
 Fitzhardinge, Miss Julie G., 19 Beccroft Road, Pennant Hills.

Flanagan, Martin, 16 Moore St., Canley Vale, N.S.W.
 Fleming, A., 30 Prince Albert St., Mosman.
 Fletcher, E., 22 Morden St., Cammeray.
 Ford, Robert Paul, Athol Flats, Whiting Beach Rd., Mosman.
 Francis, James John, 3 Castlereagh St., Sydney.
 Friend, Norman Bartlett, c/- L. W. Chant, 12 Spring St., Sydney.
 Gadsden, Ernest Jeffrey, 7 Greenknowe Ave., Potts Point.
 Galvin, P. F., 17 Castlereagh Street, Sydney.
 Garrard, Thomas A., 3 The Circle, Dundas, N.S.W.
 Gates, Edward Roy, 98 High St., Willoughby.
 Gatliff, Henry Ernest, 82 Raglan Street, Mosman.
 Glauert, L., Western Australian Museum, Perth, W. Australia.
 Goadby, P., "Glengairs," Dennis Street, Indooroopilly, Queensland.
 Goddard, Brian W. S., 4 Lennox Street, Mosman.
 Godfrey, James C., Ritz Hotel, 48 Milson Rd., Cremorne.
 Godfrey, Mrs. Edith, Ritz Hotel, Milson Road, Cremorne.
 Gollin, Mrs. B., Flat 65, 4 Macleay St., Potts Point.
 Goodwin, Miss Patricia May, c/- The Australian Museum, College St.,
 Sydney.
 Graham, F. A., 115 St. George's Crescent, Drummoyne.
 Green, R. Rae, 5 Whiting Beach Rd., Mosman.
 Gregg, M. H., 13 Moonbi St., Summer Hill.
 Gregory, Mrs. Hilda, Flat 4, 2 Musgrave St., Mosman.
 Hall, Miss Nancy Myra, "Lynwood," 1 Major St., Mosman.
 Halloran, Dr. Garnet, 143 Macquarie St., Sydney.
 Harris, Dr. Clive, 5th Floor, 235 Macquarie St., Sydney.
 Harrison, Dr. John Leslie, 4 Thompson St., Clifton Gardens.
 Harvey, Mrs. P. F., 7 Pacific St., Clovelly.
 Harvey, Percy F., 7 Pacific St., Clovelly.
 Hastings, W. K., 13 Seebrees St., Manly Vale.
 Heath, Gladstone H., 3 Thompson Street, Clifton Gardens.
 Hely, Prosper Carlyle, 8 Duke St., Gosford.
 Henderson, Ernest, 24 Prince Albert St., Mosman.
 Herrmann, Reginald A., 15 Cambridge St., Enmore.
 Hewitt, Dr. George H., Park St., Bellingen, N.S.W.
 Heyde, Charles W., 216 Nicholson Parade, Cronulla.
 Hill, A. C. W., 115 Pitt Street, Sydney.
 Hill, F. T. 21 Coolawen Rd., Northbridge.
 Hill Miss Jean B., Dalton House, 115 Pitt St., Sydney.
 Hindwood, Keith A., Wingello House, Angel Place, Sydney.
 Hirst, Brian, Pine Ridge, Castle Hill, N.S.W.
 Hockings, Arthur T., Box 1761, G.P.O., Sydney.
 Holgate, W. E. M., 8 St. Elmo St., Clifton Gardens.
 Holland, E. F., 76a Ninth Avenue, Campsie.
 Hooke, R. Waldron, 34 Thompson St., Mosman.
 Hordern, Anthony, No. 7 Holt Street, Double Bay.
 Hordern, Samuel, 14 Ginahgulla Road, Bellevue Hill, N.S.W.
 Hudson, William A., 40 Bradley's Head Rd., Mosman.
 Hughes, John, 48 Rosebery Road, Killara.
 Hunt, W. L., 27 Hunter Street, Sydney.
 Hunt, Reginald T., 14 Burrarong Ave., Clifton Gardens.
 Huntington, G, 69 Bay Street, Mosman.
 Inglis, Eric, 57 Nixon St., Surry Hills.
 Irwin, Henry H., 22 Campbell St., Eastwood.
 Ivey, Miss Lily, 15 Gladswold Gardens, Double Bay.
 Jarvis, Mrs. A. E., Flat 3, 205 Walker St., North Sydney, N.S.W.
 Jenkinson, Mrs. M., 31 Monash Rd., Gladesville.
 Jervis, T. H., 74 Roseville Ave., Roseville, N.S.W.

Johnson, Geoffrey Alan, 546 George St., Sydney.
 Johnson, Mrs. G. A., Flat 3, 40 Coonanbarra Rd., Wahroonga.
 Johnson, Murdoch M., c/- P.O. Box 40, Queen Victoria Buildings, Sydney, N.S.W.
 Johnson, Rosemary Anne, c/- Sunshine, 212 Pacific Highway, Gore Hill.
 Jones, Sir Charles Lloyd, c/- David Jones, Ltd., Sydney.
 Kater, Dr. Norman M., 146 Wolseley Road, Point Piper.
 Kaveney, Morton, 145 Griffith St., Balgowlah.
 Kay, Mrs. F., 358 Victoria Road, Marrickville.
 Kaltenbach, Miss D., 33 High Street, Wauchope, N.S.W.
 Keighley, Frank M., Golden Valley, Sutton Forest, N.S.W.
 Kennedy, Miss Grace, 80 Warrane Rd., East Willoughby.
 Kellner, Stephen, 174 Phillip St., Sydney.
 Keogh, John Harold, 22 Bradley's Head Road, Mosman.
 Kerslake, Mrs. Joy, 29 Nundah St., Lane Cove.
 Kerslake, Richmond, 29 Nundah Street, Lane Cove.
 King, Ambrose, 116 Croydon Road, Croydon.
 Kinghorn, James Roy, 8 Arabella Street, Northwood.
 Knights, Edith Alice, Flat 2, 76 William St., North Sydney.
 Lambert, Stephen Bryce, St. John's Rectory, Balmain.
 Lanceley, Edward James, 22 Lucknow St., Willoughby.
 Langmuir, Ronald John, 26 Strickland Street, Rose Bay.
 Laseron, C. F., 15 Hill Street, Balgowlah.
 Laseron, John, 15 Hill Street, Balgowlah.
 Lavett, J. K., Box 4256, G.P.O., Sydney.
 Lawson, Albert A., 3 Harden Road, Artarmon.
 Lawson, Miss E., 30 Thompson Street, Mosman.
 Leeds, Richard Alan, Warana, Wyandra, W. Line, Queensland.
 Lennon, Edward Francis, 48 Prince Albert St., Mosman.
 Levitt, Miss D. C., 94 Rossmore Ave., Punchbowl.
 Levitt, Miss V. C., 94 Rossmore Ave., Punchbowl.
 Lewis, George Owen, c/- Tooth and Co., Kent Brewery, Sydney.
 Lions, Mrs. F., 160 Alt Street, Haberfield.
 Lippmann, Herbert M., 14 Buena Vista Ave., Mosman.
 Llewelyn, Arthur Stuart, 131-133 Pitt Street, Sydney.
 Lloyd, Miss Edith Florence, c/- Sister May, 2 Bradley's Head Rd., Mosman.
 Locke, Wallace Leslie Murdie, 36 Dickson Ave., Artarmon.
 Loveday, G. C., 28 Kardinia Rd., Clifton Gardens.
 Luckie, Miss Nina Estelle, 110 Benelong Rd., Cremorne.
 McAlpine, D. K., 12 St. Thomas St., Bronte, N.S.W.
 McColl, S., Box 5003, G.P.O., Sydney.
 MacCulloch, Dr. H. T. C., "Berckton," Lilli Pilli Point Rd., Lilli Pilli
 McDonald, A., 4 Holt Street, North Ryde.
 MacDonald, Miss A., 13 Bradley's Head Rd., Mosman.
 MacDonald, Andrew, 11 Bradley's Head Rd., Mosman.
 McDonald, R. William, 20 Saville St., Gore Hill.
 McDowell, Mrs. J. H. C., 3 St. Elmo St., Clifton Gardens.
 McDowell, R. E., 3 St. Elmo St., Clifton Gardens.
 McGill, A. Robert, 119 Wollongong Rd., Arncliffe.
 McHolme, George M., 7 Bradley's Head Road, Mosman.
 MacIntosh, Professor Neil W. G., 35 Benelong Crescent, Bellevue Hill.
 Mackenzie, Miss Sonja H., 17 St. Neot's Ave., Potts Point.
 MacKenzie, Mrs. V. J., 17 St. Neot's Ave., Potts Point.
 MacKillop, J. A., 7 Clytha House, Thrupp St., Neutral Bay.
 McNeill, Frank A., Australian Museum, College St., Sydney.
 McRae, Colin, 1 Bradley's Head Road, Mosman.
 McRae, David Beattie, 1 Bradley's Head Rd., Mosman.
 Marlow, H. J., 164 Victoria Road, Marrickville.

Mason, Dr. Richard M., Mount Errington, 1 Rosemead Road, Hornsby.
 Matthews, Bert, "Petgar," West Street, Brookvale, N.S.W.
 Matthews, R., 730 Princes Highway, Sylvania.
 Mayer, Matron E., 25 Homebush Road, Strathfield.
 Mayne, Stephen Leigh, 748 Military Road, Mosman.
 Mell, Miss E. E., c/- Sister May, 2 Bradley's Head, Mosman.
 Mellor, Walter L., "Stamford," 437 Forest Rd., Penshurst.
 Micholson, Julius Charles, 9 Whiting Beach Rd., Mosman.
 Milne, Mrs. J., "Elsinora," 21 Joubert St., Hunter's Hill.
 Monaghan, R., 45 "Texas," Greenknowe Ave., King's Cross.
 Mooney, Desmond J., 8 Clanville Rd., Roseville.
 Moore, William Robert, 12 Kywong Ave., Pymble.
 Moore, Harold Hamilton, 6 Mudies Road, St. Ives, N.S.W.
 Morison, Commander Leslie N., 24 Tivoli Ave., Rose Bay.
 Morgan, N. J. H., Snow Elliott Pty. Ltd., Hogbin House, 80 Clarence St., Sydney.
 Morley, William A., 50 Kingslangley Rd., Greenwich.
 Morse, Miss Jean S., Burraga, via Bathurst.
 Mosley, Miss Gillian M., 14 Morella Rd., Mosman.
 Moulton, A. F., 29 Kardinia Rd., Mosman.
 Moulton, D. W., 29 Kardinia Rd., Mosman.
 Mullins, Harold C., 37 The Esplanade, Balmoral Beach.
 Munro, I. S. Ross, C.S.I.R.O., Division of Fisheries and Oceanography, P.O. Box 21, Cronulla, N.S.W.
 Murnin, R. B., Flat 7, 322 Victoria Street, Darlinghurst.
 Murray, Prof. P. D. F., Dept. of Zoology, University of Sydney, Glebe.
 Murray, Mrs. R. J., 198 Princes Highway, Carlton, N.S.W.
 Muston, H. K., 45 Phillip St., Sydney.
 Nash, Robert L., 2 Lennox Street, Mosman.
 Neill, Miss Frances F., 13 Bradley's Head Road, Mosman.
 Nettheim, R. F., 21 Thompson St., Mosman.
 Nevill, J. J., 26 Prince Albert St., Mosman.
 Noble, Rupert F. S., 5 Prince Albert St., Mosman.
 Oatley, Percy Allan, 4 Prince Albert St., Mosman.
 Oberg, Olaf. D. A., Gardeners Rd., Mascot.
 Orsben, Henry Joseph, 43 Bradley's Head Road, Mosman.
 Osgood, Mrs. M. E., 26 Wyalong St., Willoughby.
 Palmer, Lynton Edward, 96 Pitt Street, Sydney.
 Parle, F. O., 11 Lennox Street, Mosman.
 Parrott, Arthur W., "Lochiel," Wakapuaka Rd., Hira R.D., Nelson, New Zealand.
 Paterson, J. G., 21 Kardinia Rd., Mosman.
 Paterson, Miss J. M., 21 Kardinia Rd., Mosman.
 Paton, F. A., Flat No. 11, 46 Birriga Road, Bellevue Hill.
 Patten, Robert A., "Dunromin," Windsor Rd., Kellyville.
 Patterson, William, 14 David St., Clifton Gardens.
 Peard, Percy Garde, 11 Thompson St., Clifton Gardens.
 Pearson, Richard Browning, "Nelgowrie," Coonamble, N.S.W.
 Percy, Dr. C. E., Flat 2, 4 Thompson St., Mosman.
 Perkins, Gavin Owen, 30 Kardinia Rd., Clifton Gardens.
 Perry, Leonard John, 9 Thompson St., Mosman.
 Pescott, J. M., 32 Kardinia Road, Mosman.
 Pescott, Miss Beverley May, 32 Kardinia Road, Mosman.
 Peters, R. E., 2 Simpson Street, Mosman.
 Phillips, Edward Arthur, 68 Prince Albert St., Mosman.
 Pilcher, James E. H., St. Ann's, Morella Rd., Clifton Gardens.
 Pittaway, Rita M., 52 Centennial Ave., Lane Cove.
 Playoust, Maurice, 22 Prince Albert St., Mosman.

Podmore, G. A., 17 Grand Parade, Brighton le Sands.
 Podmore, S. Hastings, 28 Woids Ave., Allawah.
 Poolman, Noel K., 6 St. Elmo St., Clifton Gardens.
 Powell, F. D., 9 David St., Clifton Gardens.
 Power, Barry John, No. 2 Asquith Ave., Rosebery.
 Rae, Robert Ian, Box 1719, G.P.O., Sydney.
 Rainbird, Patricia, 11a Cameron Ave., Artarmon.
 Ramsay, J. S. P., "Kalia," Gale St., Woolwich.
 Ratment, Mrs. R. E., 146a Waterloo Road, Bankstown East.
 Raves, J. V., No. 1 Clumba Court, 66 Prince St., Mosman.
 Ray, Miss J. K., 33 French St., Kogarah.
 Read, B., 17 Pine Street, North Sydney.
 Reddan, Clive, 14 Wilson St., Cammeray.
 Richardson, Harold R., 181 Clarence St., Sydney.
 Roberts, Kenneth Stewart, "Myalla," 19 Richmond Ave., Cremorne.
 Roberts, Noel L., 43 Hannah St., Beecroft.
 Roberts, P., 125 Copeland St., Beecroft.
 Robertson, Stanley Gladstone, 42 Prince Albert St., Mosman.
 Robertson, William James, 134 Awaba Street, Mosman.
 Rodd, Norman W., 204 Beecroft Rd., Cheltenham.
 Rogers, Miss Ellen, "Atholside," 23 Bradley's Head Rd., Mosman.
 Rollason, Donald Ernest, 36 Bradley's Head Rd., Mosman.
 Romanis, H. F., 46 Prince Albert St., Mosman.
 Rule, Jack, 19 Thompson Street, Mosman.
 Rush, Arthur John, 15 Milner St., Mosman.
 Sachistral, N. A., "Charlton" Boys' Home, Avona Ave., Glebe Point.
 Sampson, Mrs. R., 102 Birrell St., Waverley.
 Saunderson, M., 181 Clarence St., Sydney.
 Sayers, E. C., 87 Eddy Rd., Chatswood.
 Scammell, George V., 7 David St., Clifton Gardens.
 Scammell, R. B., "Storrington," 10 Buena Vista Ave., Clifton Gardens.
 Scott, Alban Edward, 72 Middle Head Rd., Mosman.
 Shaw, C. Vernon, 61 Concord Road, Concord.
 Shipway, Bruce, 8 Elizabeth Street, South Perth, W. Australia.
 Sibree, J. Jessie, 13 Simpson St., Mosman.
 Simpson, W. H., 2 Effingham St., Mosman.
 Sisters of the Good Samaritan, c/- Sister Mary, Convent of the Good Samaritan, Moruya, 6.C, N.S.W.
 Slater, Edric Sutherland, Havelock House, Canberra, A.C.T.
 Small, John Gordon, 21 Gordon St., Mosman.
 Smith, Richard Dermer, 13 Muston St., Mosman.
 Smith, Reginald William, Lot 15, Hunter Ave., Matraville.
 Soady, Miss Mary E., c/- Union Trustees, 2 O'Connell St., Sydney.
 Spain, Ian Alfred Hamilton, "Ulundri," Old Castle Hill Rd., Castle Hill.
 Spencer, Jack L., 21 David St., Mosman.
 Stedman, B. J., 37 Cheltenham Rd., Croydon.
 Stedman, Frank Milton, 19 David St., Clifton Gardens.
 Stephen, Alfred Ernest, Box 1158 H.H., G.P.O., Sydney.
 Stephens, Henry John, 41 Lords Ave., Asquith.
 Stinson, E. R. D., 48 Raglan Street, Mosman.
 Stott, S. G., 2 David St., Clifton Gardens.
 Street, James Harold, 5 Glen St., Harbord, N.S.W.
 Stempel, E. A., c/- The Adelaide Steamship Co., Ltd., Box 1535, G.P.O., Sydney.
 Tansley, H. E., 50 Bradley's Head Rd., Mosman.
 Taylor, Dr. Arthur Thornton, 175 Macquarie St., Sydney.
 Taylor, Barry Thornton, 11 Kardinia Rd., Clifton Gardens.
 Thellefsen, E. S., c/- Royal Danish Consulate, 115 Pitt St., Sydney.

Thomas, L. R., c/- Burnside Homes, North Parramatta.
 Thomas, Mrs. Madge Isobel, 25 Rickard Ave., Mosman.
 Thomson, Charles Napier, 20 Young St., Sydney.
 Thomson, James M., 58 Karimbla Rd., Miranda.
 Thornley, E. W., 23 Mitchell Rd., Brookvale.
 Thornley, Miss Gertrude, 37 Auburn Rd., Lidcombe.
 Thornthwaite, Ormond Robert, 17 Raglan St., Mosman.
 Tooker, Miss Eileen Aird, c/- Miss E. Wieland, 6/460 New South Head Rd., Double Bay.
 Trebilco, Capt. P., 1 Raymond Ave., Turramurra.
 Trebitsch, F., 13 Elfrieda Street, Mosman.
 Trebitsch, Mrs. M., 13 Elfrieda Street, Mosman.
 Tremlett, Frank C. G., 22 Thompson St., Mosman.
 Trenerry, Mrs. Muriel, 7 St. Paul's Rd., Balgowlah.
 Trenerry, William Leo, c/- Com. Banking Co. of Sydney, 12 Esther Road, Mosman.
 Trenerry, W. A., 7 St. Paul's Rd., Balgowlah.
 Utz, Gordon Albert, 6 Silex Road, Mosman.
 Vellenga, S. L., Flat 19, 10a Challis Ave., Potts Point.
 Verboog, M. J., 7a Millwood Ave., Chatswood.
 Vicars, Robert John, Victoria Rd., Marrickville.
 Voorwinde, Jacob, 115 High St., Kirribilli.
 Waite, Maxwell Lawrence, 37 Iluka Road, Clifton Gardens.
 Wake, R. F. B., 19 Elfrieda St., Mosman.
 Walters, A. Lloyd, 10 Eastview Ave., North Ryde.
 Ward, Miss Betty, 29 Bradley's Head Road, Mosman.
 Warn, Mrs. Agnes Mary, 20 Forbes Street, Croydon Park.
 Waterhouse, John, 4 Lightcliffe Ave., Lindfield.
 Webster, Donald J., 2 Buena Vista Ave., Mosman.
 Webster, R. J., 2 Buena Vista Ave., Clifton Gardens.
 Webber, L., 6 Grandview Pde., Epping.
 Wheeler, Henry E., 41 Hannah St., Beecroft.
 Wheelwright, A. H., "Rosedale Narrawa," Private Bag, via Crookwell.
 Whitburn, A., 24 Boyd Road, Cabramatta.
 Whitfield, C., 414 Kingsway, Caringbah.
 Williams, R. A., Flat 2, 34 Charlotte St., Ashfield.
 Wills, J. R., 29 Highlands Ave., Wahroonga, N.S.W.
 Wills, Mrs. O., 6 Skillcorn Ave., Jannali.
 Williams, Amos E., Wyoming, Berridale, N.S.W.
 Winter-Irving, Mrs. A., c/- Smith, Webb, and Co., Chartered Accountants (Aust.), 10 Martin Place, Sydney.
 Wiseman, William A., 10 Effingham St., Mosman.
 Wood, Harold, 54 Abbotsford Pde., Abbotsford.
 Wood, John Roy, 8 Claremont Rd., Enfield.
 Woolacott, R. C., 11a Everview Ave., Mosman.
 Woolley, B., 18 Beauty Point Rd., Mosman.
 Wootten, John Halden, 182 Phillip St., Sydney.
 Young, William, 8 Hansard St., Waterloo.
 Zeck, Mrs. E. H., 694 Victoria Rd., Ryde.

HONORARY ASSOCIATE MEMBERS:

Chisholm, Alex, c/- Angus and Robertson, Castlereagh St., Sydney.
 Hough, Prof. J., 1515, Mariposa, Boulder, Colorado, U.S.A.
 Malloch, J. R., 5635 Nth. 8th St., Arlington, Va., U.S.A.
 Moore, Prof. John, 520 W. 122 St., N.Y. 27, New York, U.S.A.
 Pattison, George, 68 Partridge St., Glenelg, South Australia.

LIFE ASSOCIATE MEMBERS

- Chadwick, C. E., Entomological Branch, Dept. of Agriculture, Farrer Place, Sydney.
Colliver, F. S., c/- Geological Dept., University of Queensland, Brisbane, Queensland.
Director, Dominion Museum, Wellington, N.Z.
Hardy, G. H. H., "Karambi," Letitia St., Katoomba.
Hopkinson, Dr. Emilius, C.M.G., Balcombe, Sussex, England.
Houston, J. K. S., 342 Church St., Parramatta.
Johnston, Mrs. P. R., 15 Fairfax Road, Mosman.
Kershaw, R. C., "Manorama," Clarence Point, West Tamar, Tasmania.
Mackay, Mrs. R. D., 90 French St., Maroubra.
Morrison, Philip Crosbie, M.Sc., 9 Maroona Rd., Brighton, S.5, Victoria.
McDonald, Miss P., 29 Dee Why Parade, Dee Why, N.S.W.
McMichael, Donald Fred, c/- The Australian Museum, College St., Sydney.
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Thackway, A. E. J., "Wyoming," 57 Albyn Rd., Strathfield.
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Colefax, Alan, Department of Zoology, University of Sydney, Glebe.
Cotton, Bernard Charles, South Australian Museum, North Terrace, Adelaide, South Australia.
Dawson, J. B., 155 Stanmore Rd., Stanmore.
Dept. of Harbours and Marine, Edward St., Brisbane, Queensland.
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 McKie, Thomas, Pomeroy Road, Goulburn.
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 McSwiggin, Thomas James, 50 Railway Parade, Penhurst, N.S.W.
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 Queensland.
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 Newbolt, Harry Grattan, 7 Douglas Haigh St., Oatley.
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 Osborn, Bruce Kingsbury, 2 Mount View Rd., Upper Ferntree Gully,
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 Thomas, I. M., Dept. of Zoology, University, Adelaide, S.A.
 Tuckson, Mrs. J. A., 61 Elgin Street, Gordon.
 Turnidge, Frederick, c/- Bank of N.S.W., 341 George St., Sydney.
 Vellenga, Mrs. R. E., Flat 19, 10a Challis Ave., Potts Point.
 Waite Agricultural Institute, University of Adelaide, Private Mail Bag,
 Adelaide.
 Wareham, Miss V., 11 Walsh Ave., Maroubra.
 Waterer, Jill Alma, 61 Newbridge St., Sth. Lismore, N.S.W.
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