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PROCEEDINGS
OF THE
ROYAL ZOOLOGICAL
SOCIETY
OF
NEW SOUTH WALES
FOR THE YEAR
1936-7



AUGUST, 1937.

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ROYAL ZOOLOGICAL SOCIETY OF NEW SOUTH WALES

(Established 1879.)

Registered under the Companies Act, 1899 (1917).

PATRONS :

His Excellency the Lieutenant-Governor, Sir Philip Street, K.C.M.G.
Sir Philip Woolcott Game, G.B.E., K.C.B., D.S.O.

COUNCIL, 1937-1938.

President : Tom Iredale.

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Honorary Auditor : R. J. Stiffe, A.C.A. (Aust.).

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Hon. Secretary : A. I. Ormsby, LL.B.

Budgerigar Section.

Chairman : R. J. Murray.

Hon. Secretary : F. Brennan.

Marine Zoological Section.

Chairman : C. F. Laseron.

Hon. Secretary : Miss M. Golding.

Ornithological Section.

Chairman : Tom Iredale.

Hon. Secretary : Roy Cooper.

ROYAL ZOOLOGICAL SOCIETY OF NEW SOUTH WALES

Box 2399MM, G.P.O., SYDNEY

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service. Dr. Tillyard was an associate member, and both he and Mr. Froggatt were accorded the honour of election as Fellows of the Society in recognition of their distinguished services to Australian Zoology. Dr. A. J. Spiller Brandon, a member for many years, and a Councillor from 1934, will be greatly missed from Council meetings. Mr. T. P. Austin, a noted Zoologist, was a life member, joining in 1917; Mr. Percy B. Colquhoun, one of the Trustees of Taronga Park, and Mr. H. L. Spring were members of many years' standing.

FINANCES.

The balance sheet shows that the Society has well maintained its satisfactory financial position.

HANDBOOK FUND.

During the year a further amount of £200 was invested in Australian Consolidated Funds, but the capital is still far below the original objective of £5,000. The Department of Education accepted a gift of 1,000 copies of the late Mr. Froggatt's "Australian Spiders and their Allies" for distribution amongst the principal State schools. This gift was designed to stimulate interest in the Society's work, and may be the forerunner of similar gifts in the future.

PUBLICATIONS.

The *Proceedings* for the year 1935-36 formed a vehicle for conveying information of the Society's activities to all members, associates and institutions with which exchange relations are conducted. These institutions number 120, and are in many foreign countries as well as throughout the Commonwealth. Part 5 of Volume 8 of *The Australian Zoologist* was issued in March, 1937, the chief feature being an account, historical and zoological, of the Elizabeth and Middleton Reefs, north of Lord Howe Island.

SECTIONS.

Steady progress was made in the work of each Section, increased interest being shown in that of Marine Zoology. Full reports of the four Sections will be published in the forthcoming volume of the *Proceedings*.

IMPORTATION OF QUAIL AND THRUSH.

Dr. Emilius Hopkinson, a noted English aviculturist, visited Sydney in February last, and was entertained at luncheon at Taronga Park by the President and members of Council. He stated that he had seen an advertisement in England, offering 7/6 per pair for English thrushes to be despatched to Australia for liberation at Canberra. This Society forwarded to the Minister for the Interior a protest against importing these birds, on the grounds that they were of no economic value, and might possibly become pests. In reply we were informed that a number of the birds had been procured from New Zealand, where they were plentiful, and liberated for the purpose of destroying the English snail, which was damaging the garden plants. This had been done under advice of the Royal Society of Australia. Further representations were made through the Hon. J. A. Perkins, M.L.A., but the mischief having been done, it was too late to rectify the error. It did not appear to occur to the advisers that the thrush is one of the commonest birds in England, breeding in all the suburban parks and in many private gardens, but the snail is just as plentiful as ever!

A movement to procure a number of Californian Quail for liberation in New South Wales was initiated by the Restoration and Acclimatisation Society, the purpose being the provision of more game birds for local sportsmen to shoot. A protest against this movement was forwarded to the Chief Secretary, who replied that a permit had been granted, after careful consideration, to import 500 pairs of these birds. This Society enlisted the support of kindred societies, and met with enthusiastic co-operation; the Wild Life Preservation Society submitted the matter to the Minister for the Interior, with the result that the Commonwealth Government placed an embargo upon the proposed importation.

In both of these cases this Society was instigated solely by a desire to prevent a repetition of the errors committed in past years by misguided individuals and governments in introducing birds such as the sparrow and starling, and animals such as the rabbit and fox. The original intention of the "importers" may have been quite honestly to provide something of value to the community, either from an economic or an æsthetic point of view. The results, however, have been so disastrous that every effort should be put forth to prevent the importation of any animal or bird unless it can be incontrovertibly shown that it is not only of economic value, but that it is not likely to become a pest.

PRESERVATION OF TASMANIAN TIGER.

The threatened extinction of the Tasmanian (so-called) tiger, *Thylacinus cynocephalus*, has been viewed with concern by members of Council, and a communication has been addressed to the Tasmanian Government offering financial assistance in any scheme for an attempt to breed this animal in captivity. The matter is under consideration by the Fauna Board, and it is hoped that some means will be found by which the scheme may be brought to a successful termination.

TARONGA PARK TRUST.

The relations between the Trust and the Society continue to be most cordial. The vacancy on the Trust caused by the death of Mr. P. B. Colquhoun was filled by the appointment of Dr. W. J. Dakin, Professor of Zoology, Sydney University. Professor Dakin is a member and past President of this Society, whose appointment to the Trust was supported by your Council in 1931, when a previous vacancy occurred.

AWARDS FOR NOTABLE ACHIEVEMENTS IN ZOOLOGY.

During the year the question of awarding medallions or diplomas to members who had achieved some notable results in zoological experiment or research was discussed in detail. Rules were drawn up, principally in reference to avicultural work, and having been adopted by your Council, were published in *The Australian Zoologist*.

AUSTRALIA'S 150TH ANNIVERSARY.

In connection with the celebrations to be carried out next year, this Society proposes to prepare and publish a booklet entitled "150 Years of Australian Natural History". The work will relate to the early Australian naturalists, amongst whom may be mentioned Sir Joseph Banks, Solander, Lewin, Swainson, John Gould and many others who were connected either as explorers, collectors or authors, with the study of the animals and plants of Australia. It is also proposed to organize an exhibition of objects of natural history, paintings, photographs, literature and other features of interest relating to the same subject. This exhibition will form an adjunct to the celebrations, and the co-operation of the Celebrations Committee and kindred societies is being sought.

Sir Philip Street, in moving the adoption of the report and balance sheet, observed:

It gives me very much pleasure to preside over this annual meeting, and in these beautiful surroundings and on this beautiful afternoon to move the adoption of the annual report of the Society, the 57th. We do not always remember, I think, how fortunate we who live upon the shores of our harbour are, but the view spread before us from these wonderfully situated and well laid-out gardens is one which should be an abiding joy to us.

Although you have done me the great honour of making me one of your patrons, I am sorry to say that I have no pretension to any kind of scientific knowledge or attainment; but biology, the science of life, the science which observes the forms of life by which we are surrounded; and zoology, which deals with the geographical distribution and classification of life in the universe, are allied sciences which should be of absorbing interest to us all. The combination of a zoological garden and a zoological society seems

eminently fitting. The first zoological garden in Australia was opened as a private enterprise in 1854 by the licensee of the Sir Joseph Banks Hotel at Botany. The animals were afterwards removed by his successor in title to Watson's Bay, and the widow of that successor, after failing to induce the government of the day to purchase the animals, got rid of them by poisoning them. The New South Wales Zoological Society, which, I suppose, was the forerunner of this Society, was formed on March 24th, 1879, under the presidency of Mr. Walter Bradley, of Bradley, Newton & Lamb, a firm of auctioneers. I remember well his house at Randwick. A collection was built up, beginning with pheasants and such like, and expanding until the well-known Zoological Gardens were opened to the public at Moore Park in 1884. In 1916 the collection was removed to its present site at Taronga Park, and large enclosures providing as close an approximation as possible to natural conditions took the place of the then existing houses and enclosures. Much has been done since then in the way of appropriately grouping the animals and birds, I believe.

The report before us tells of a successful year's work. There has been a slight reduction in the number of members, but nothing more, it seems to me, than the natural fluctuation which is to be expected, and there have been some much to be regretted losses from death. In particular we may regret the deaths of Mr. Froggatt, a member of 27 years' standing, and Dr. Tillyard. They were both Fellows of the Society, and were both gentlemen of outstanding scientific distinction. We also regret the death of Mr. George Judah Cohen, a member for 35 years, and the oldest Life Member of the Society. His son, Mr. Samuel Cohen, who is also a member of the Society and who is well known as a public-spirited citizen, has received with general acclamation the honour of knighthood, and to him and to Mr. Robert Dallen, a member of long standing who has received the honour of being made an officer of the Order of the British Empire, we offer our very cordial congratulations.

The balance sheet shows the Society is in a satisfactory financial position, and I understand also that steady progress has been made in the work of each Section.

It is gratifying, too, if I may say so, to find that the Society is not only justifying its existence by its valuable biological and zoological studies, resulting as they must in an increased spread of knowledge and enlightenment, but that in addition to this the intervention in the matter of the importation to N.S.W. of English thrushes and Californian quail shows that it is commendably alert in its efforts to protect the country from the introduction of bird and animal life which might in future become a menace. The importation of such birds and animals may have had the best of motives behind it, but the results have been so unfortunate in some cases that we must agree with the Society "that every effort should be put forth to prevent the importation of any animal or bird unless it can be incontrovertibly shown that it is not only of economic value, but that it is not likely to become a pest".

Colonel Alfred Spain, Chairman of Taronga Park Trust, in seconding the motion, welcomed the members and their friends to Taronga Park.

ELECTION OF COUNCILLORS.

The six members of Council, who retired under the provisions of Article 22, were re-elected. They were Messrs. C. W. Firth, W. B. Gurney, A. Littlejohn, N. L. Roberts, T. C. Roughley and P. Shipway.

PRESIDENTIAL ADDRESS.

The President, Mr. Phillip Shipway, delivered an address entitled "Animals and the Law", which is printed hereafter. (See page 9.)

CHANGE OF ROOMS.

It has long been felt that the Society required more room for its meetings, and an opportunity occurring at the end of June of moving to the sixth floor of Bull's Chambers, the step was taken. The new rooms are more commodious, lighter and quieter than those on the third floor. Members were notified of the change in the Notice of Annual Meeting.

BALANCE SHEET AS AT 30th JUNE, 1937.

[illegible]

**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, 1937, 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, 1937, 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, as specified under the N.S.W. Companies Act, 1936, and by the Society's Articles, and am of opinion that such records have been properly kept.

(Sgd.) ROBT. J. STIFFE, F.C.A. (Aust.),
Hon. Auditor.

Sydney, 19th July, 1937.

**INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED
30th JUNE, 1937.**

GENERAL ACCOUNT.

	£	s.	d.	£	s.	d.		£	s.	d.	£	s.	d.
To Publication <i>Australian Zoologist</i> , Volume 8, Part 4	150	13	1				By Subscriptions—						
„ Publication Annual Report ..	35	17	1				Annual	324	6	6			
„ Office Rent ..	108	6	8				Life	31	10	0			
„ Office Printing and Stationery ..	27	13	2				„ Sales— <i>Australian Zoologist</i>	23	11	9			
„ Rent—Post Office Box	1	0	0				„ Rent—Subletting Offices	23	2	0			
„ Annual Meeting and Social Functions	11	0	0				„ Exhibitions	2	3	6			
„ Telephone	22	15	0				„ Bank Exchange and Postage	0	13	10			
„ Electricity	12	16	6				„ Telephone	6	2	4			
„ Insurance	2	12	0				„ Sale of Bird Rings	3	3	5			
„ Equipment and Repairs "Cabin" ..	9	4	5				„ Capitation Fee	0	7	0			
„ Bird Rings	3	2	6				„ Sundry Receipts	2	0	6			
„ Capitation and Affiliation Fees ..	2	3	6				„ Savings Bank Interest	4	12	10			
„ Office Furniture and Expenses ..	15	13	10				„ Balance — Excess of Expenditure over Income for the year				421	13	8
„ Petty Cash Expenses	24	12	8										
				427	10	5							
				£427	10	5					£427	10	5

HANDBOOK FUND ACCOUNT, 1937.

	£	s.	d.	£	s.	d.		£	s.	d.	£	s.	d.
To Net Premium on Purchases of Investments	0	12	6				By Handbook Sales ..	21	17	9			
„ Royalty on Sales of <i>Australian Spiders and their Allies</i>	15	13	0				„ Interest on Investments	76	13	2			
				16	5	6					98	10	11
„ Balance — Excess of Income over Expenditure for the year				82	5	5							
				£98	10	11					£98	10	11

PHILLIP SHIPWAY, President.
 NEVILLE W. CAYLEY, Vice-President.
 KEITH A. HINDWOOD, Honorary Treasurer.

Presidential Address

ANIMALS AND THE LAW.

By PHILLIP SHIPWAY.

It has been the custom at each Annual Meeting of this Society for the retiring President to read an address on some subject appertaining to zoology. Many notable addresses have been presented in this way by my predecessors in office. As I am not a scientific zoologist, I am unable to follow the accustomed procedure of speaking on some particular section of scientific zoology; I hope that nevertheless this address, which I have entitled "Animals and the Law", will be of some interest to you, even if only as a diversion from the usual type of subject. When I knew that our guest of honour was to be a former Chief Justice, I felt somewhat diffident about talking on any subject dealing with the law. However, I have so much faith and confidence in the extreme degree of courtesy which has always been so characteristic of Sir Philip Street that I have no fear of any interjections or severe criticism from him. In fairness to Sir Philip, I think I might say that my address is without prejudice, so that it is not to be assumed, in the absence of comment, that Sir Philip agrees with any or all of my legal statements.

Now I do not propose to go into this very wide subject with any degree of detail for three reasons, all of which, I think, are very good. Firstly, the time for my address is limited; secondly, details would make the address too dry for you altogether; and thirdly, because, as an eminent jurist once said, "Legal advice that you get for nothing is not worth a damn". So, a brief dissertation on "Animals and the Law".

The law itself is sometimes described as being a particular kind of animal, but usually only in a jocular way or by an unfortunate solicitor endeavouring to explain why his client lost his case. If the law *is* an ass, it is a very wise one indeed.

Now animals, be they beasts, reptiles, birds, fishes or insects, do not comprehend laws which man has made; to them the law of the jungle is still the law. Therefore it would be hardly humane if not waste of time for man to make laws regarding the animals as between themselves. Mostly, if not wholly, the law regarding animals deals with mankind's association with them, and it is upon these lines that my address proceeds.

From a zoologist's point of view, there may be many different classes of animals. In the eyes of the law there are, generally speaking, two classes only, namely, Tame and Wild. Tame or domestic animals include cattle, horses, sheep, goats, pigs, poultry, cats and dogs. Wild animals include not only lions, tigers and eagles and other animals of an undoubtedly savage nature, but also *all* animals not classed as domestic or tame, such as rabbits, foxes, pigeons and the like, and all fishes, reptiles and insects. One finds on surveying "Animals and the Law" that two of the most important aspects are the rights of animal ownership and the duties of animal ownership. Taking the rights first, there is a marked distinction in law between the ownership of tame animals and the ownership of wild animals. A person may have *absolute* ownership of a domestic or tame animal, and which he continues to retain even if such animal strays or is lost. The young of tame animals (with one exception) belong to the owner of the mother animal. The exception to which I refer is the swan. Young swans, or cygnets, belong in equal number to the owner of the male bird and the owner of the female bird. Swans have been made this exception because it is said to be a fact that a male swan will mate with one female swan only.

In a law case about swans decided in the year 1592, it was stated by a learned jurist that the male swan "is the emblem of an affectionate and true husband to his wife above all other fowls". Noble swain, swan !

Socrates, the Greek philosopher, said on this point, about 450 B.C., that the song of the swan at its death was a song of joy, not of sorrow, on account of, in effect, the clear conscience which the swan had for leading such a goodly life. Whilst the lion may be the king of the animals, the swan has a regal position, too, for the white swan, unmarked and in open and common rivers, is a royal fowl, and legally belongs to the King. A private person may, however, own white swans on private waters, and if they escape he may bring them back again, but if they regain their natural liberty the King's representatives are entitled to seize them. The swans on the River Thames, incidentally, now belong to the King, the Dyers' Company and the Vintners' Company, and are all marked. The young of these particular swans are apportioned in a proportion of three to the owner of the male bird and two to the owner of the female bird. Owing to the domestic habit of swans which I just mentioned, the owners have no difficulty in sorting out the cygnets on this basis.

Now coming to the *rights* of ownership in the case of *wild* animals, the law holds that there can be no such absolute ownership as there is with *tame* animals ; at any rate whilst the animals are alive. Under certain circumstances the law recognizes a qualified right to ownership of wild animals. This can come about in any of the following ways : the owner of land has a qualified right to the young of wild animals born on his land, until they are able to fly or run away, or a landowner who has retained the exclusive right to hunt wild animals on his own land has a qualified right to them while they are still there. Again, if a person takes and tames a wild animal, it becomes his property. This right he loses, however, if the animal regains its natural liberty. Bees, which are legally and sometimes in actual fact classed as wild animals, are a typical example of qualified ownership. If a swarm of bees settles on a tree on a man's property, no ownership passes until they are hived ; then they become the property of the hiver. If later the swarm leaves the hive, the ownership continues only so long as they can be seen and followed.

As to when a captured wild animal can be said to have legally regained its natural liberty and so destroyed its owner's qualified right to it is a very debatable point. A leading American case has gone so far as to say that almost any escape from the owner's captivity deprives him of this right of ownership, but the general law seems to be that the animal must have got back to its native place, or at least into a natural environment. So if you should see one of Taronga's lions walking up Bradley's Head Road, don't catch it there, but chase it into Ashton Park or some adjoining bushland, and then you may catch it and take it home with you, providing of course the lion doesn't get the same idea first. The legal position may not be quite as easy as all that, but you would be able to put up a very good case. The rule as to losing ownership in the case of wild animals which have escaped does not apply to those animals which are accustomed always to return after escape, such as pigeons, but the custom of returning must be one that has been created by artificial means, such as by training or by offering them food. The point was extensively argued in connection with the international dispute between America and England in regard to the ownership of the seal herds in the Behring Sea. America claimed that as the seals always returned to that continent at certain times of the year, they came under her control. England, however, argued that the return was on account of natural migration, and not brought about by artificial causes, and that once the seals were beyond the three-mile limit of the American coastline they were outside that country's control. This view was adopted by the arbitrators, who held accordingly.

Now when a wild animal dies there may be an absolute or unqualified ownership in the carcass. Generally speaking this rests in the owner of the land on which the animal is killed, irrespective of whether the killing has been done by the owner or someone else. It has been held for some time, at least as far back as the year 1697, that, under the English common law, and which was of course adopted here when the colony of New South Wales was formed, if a stranger starts a fox on one person's land and chases it on to another's, and there kills it, the fox belongs to the stranger. If, however, he

starts it and kills it on the same person's land it belongs to the landowner. Again, if a man starts a fox on his own land and kills it on the land of another, it belongs generally to the person on whose land it was started. This law has been affected in England by the English Game Act, but we have not such an Act here.

The distinction between wild and tame animals arises again when one considers "Animals and the Law" in regard to the legal duties of ownership. When an injury is caused by an animal, the owner, if the animal comes under the legal class of a tame animal, is not as a rule liable, apart from negligence, of course, unless the person injured can prove that the animal had dangerous habits, and what is more, that those habits were known to the owner. That is to say, if a horse happened to bite you whilst you were standing on the sidewalk or footpath, it is no good your paying any of your money to a certain well-deserving class to try and get you compensation unless you have pretty good evidence that the horse concerned already had biting habits, and that the owner knew it. For the onus will be on you to prove these two facts to the four good men and true, in whose hands, according to the time-honoured practice of British Justice, your claim for compensation would finally rest.

The rule in effect is that the tame or domestic animal can have one bite and get away with it, but it is simply courting disaster to take a second bite. An exception to this rule in the case of domestic animals is the dog. Under the Dog and Goat Act of 1898, the owner of a dog is liable for any injury done to a person, property, or other animal by his dog, and it is not necessary for the person claiming damages to show that the dog had done something like that before, and that the owner knew it.

The question of the liability of the owner of a wild animal for damage differs from that of the tame animal inasmuch as there is no necessity to prove that the wild animal has biting habits known to the owner. If your name happens to be Tarzan, and you keep a pet tiger or two wandering around your place, the first bite off your neighbour, or your mother-in-law, as the case may be, counts against you. You can only pay up and look pleasant, and, if you care for real he-man sport, take it out of the tiger.

The law in regard to stealing animals is of interest. It used not, for instance, to be a crime to steal a dog or a cat, the reason given, according to the records which have been handed down to us, being that these animals were of such a base nature and were considered no use to man; the true reason no doubt was the severe punishment inflicted by the law in those days for felony.

From a report of a case before the English courts some 300 years ago the position was summed up in the following words by one of the judges: "Bloodhounds or mastiffs are of so base a nature that no felony can be committed on them, and no man shall lose life or member for it."

The law was not always so, however, in the case of the cat. The ancient Britons at one time regarded the offence of killing a cat as a crime, and if the cat was one of those kept to protect the king's granary, a peculiar method of fixing the penalty was adopted. The dead cat was tied up to a beam by a rope attached to its tail, so that its nose just touched the floor. The offender had then to give the king enough grain to make the heap big enough to cover the cat right to the tip of its tail. History does not record what happened if the deceased cat was a manx.

Nowadays Parliament has, however, provided that all animals, both tame and wild, which *have value* and are the *property* of anyone, may be the subject of larceny. The value need not be of any money value, as for instance in one reported law case where a man's pig became *diseased* and then *deceased*, and he buried it. Someone, like the piper's son Thomas, stole it and away he ran. When caught and charged with larceny, his counsel argued that the thing had no value, and that therefore a charge of larceny could not be made out. The court held, however, that even a *diseased, deceased, buried* pig was of sufficient legal value for the purpose of establishing the charge. There must be a property or ownership in the animal already existing when the act of stealing or taking occurs. For instance, if a poacher kills a rabbit on someone's land and immediately takes it away, ordinarily he would not have committed the crime of stealing, because the rabbit does not belong to the owner of the land until it is dead, and when it instantly came into the possession of the poacher. If the poacher abandons the dead rabbit

and then decides to come back and take it, he would be guilty of stealing, however, for as soon as he leaves the carcass it becomes the property of the landowner. A fine point, no doubt, but you would probably find that it would get you off spending a month or two as the guest of the government should you ever get yourself into this position.

The criminal liability in regard to taking or stealing animals has been extended here by the Crimes Act, which makes it a criminal offence to steal *any* animal "ordinarily kept in a state of confinement", as well as any animal kept for "domestic purposes".

The Dog and Goat Act which I mentioned earlier is worthy of our attention. It contains some perhaps not so well known drastic measures, at least drastic from the dogs' point of view. It provides that anyone is authorized by law to kill any dog, whether registered or not, wandering about at large and not under the immediate custody, protection or control of some competent person, unless the dog has a collar with its owner's name and address engraved thereon, and also in the case of a mastiff or bulldog unless it is, in addition, muzzled. Had this Act been a recent one instead of some forty years old, it is probable that another type of dog rather popular at present would also be required to be muzzled. If you wish to take advantage of your legal rights under this Act to kill dogs, you can cover your out-of-pocket expenses by taking the tails of the dogs which you have killed along to the local court house, and if you can show that you have acted in accordance with the provisions of the Statute, you will receive 2/6 per tail. I would, however, strongly advise anyone, before embarking on a career of dog-killing, to carefully peruse the relevant sections of the Act. One catch in the Act is that you are required to prove that you have buried or otherwise disposed of the body, and you would probably find that your statement made quite cheerfully to the court officer in support of your application for the 2/6 per tail would be taken down and used against you by the local health inspector and you would be fined £1 and be out on the deal to the extent of 17/6, plus fares and ammunition. Should you happen to be a policeman, you are not only *permitted*, but *ordered* by the law under this Act, to kill all dogs which you find not complying with the above requirements, and what is more, if you do not do so, you have to pay back out of your weekly wage cheque the sum of anything from 10/- to £1 per dog. On the other hand, if you are a policeman and you do not kill the dog *strictly in accordance with the provisions of the Act*, you become liable to a fine of anything up to £5. This is probably one reason why policemen in the execution of their duties have not found themselves forced to turn our quiet suburban streets into shooting alleys, using the all and sundry legally stray dogs frequenting the same as targets. "Every dog shall have its day" is the saying, but if the dog knew what Parliament, in the exercise of its worldly wisdom, had done about it, he would wish the day a good deal shorter than twenty-four hours.

Whilst the law has perhaps not been over-generous in its protection of the dog, it has provided a substantial measure of assistance in regard to the welfare of certain other animals by virtue of the statute known as the Birds and Animals Protection Act. This Act, a State one, first came into force in 1918, replacing and consolidating in some respects the Birds Protection Act of 1901 and the Native Animals Protection Act of 1903. The Act has since been amended on two occasions, once in 1922 and again in 1930. A protected bird or animal under this Act is any bird or animal *not* mentioned in the list given or added thereto later. So it is not a matter from the bird or animal's point of view of getting *on* the list, but of getting *off* it.

The first Bird Protection Act of 1901 was a comparatively short Act, and was designed to take the place of the English Act, which up till then had been in force in this State by adoption. It contained a schedule setting out the names of all the birds which *were* protected, and gave the Colonial Secretary, as he was then called, power to add to or remove from the list. Having regard to certain happenings earlier this year, it is perhaps of interest to note that the Californian quail was one of the thirteen protected birds in the list headed "Foreign Birds". The list of protected birds headed "Australian Birds" numbered 48. The action of *naming* all the *protected* birds was reversed by the 1918 Act, which named only the birds that *were not protected*. The 1901 Act provided a penalty for persons wilfully killing, capturing or injuring a protected bird. The word "wilful" was carefully

deleted from the 1918 Act. Under the 1901 Act it was an offence to use a gun having a greater length barrel than six feet for the purpose of shooting any protected bird. The present Act reduces the maximum length of the barrel to 36 inches, and in addition, provides a penalty for using or *merely carrying* any firearm having a greater length of barrel, no matter whether it is being carried or used for the purpose of shooting protected birds or animals or not.

The first *Animals Protection Act* of 1903 was, like the *Bird Protection Act* which preceded it by two years, a comparatively short Act, and again named the *protected* animals, a position which was reversed in 1918. Power was given to the Colonial Secretary to add to or remove from the list. The only names, i.e. protected animals, on the original schedule of this Act were the red kangaroo, wallaroo, native bear, platypus, porcupine, squirrel, flying opossum and the wombat. Of these, the last-named, the wombat, is the only animal to have the somewhat doubtful distinction of being specified on the *protected* list of 1903 and on the *unprotected* list of 1918. In addition to a close *annual* season for these animals, which was from 1st August to 31st January, a period of *absolute* protection was fixed from the date of commencement of the Act to the 31st January, 1905. Again, as in the case of the birds, a penalty was for *wilfully* killing, capturing or injuring. Both these earlier Birds and Animals Protection Acts provided that half the fines received from the penalties inflicted under the Acts were to be paid to this Society. This provision was *not* re-enacted when the 1918 Statute came into force. The 1918 Birds and Animals Protection Act has been amended on two occasions, once in 1922 and again in 1930. One of the most marked alterations made by the 1918 Act was, as I have mentioned earlier, that the birds or animals on the list are the unprotected ones, whilst those not mentioned are the protected ones.

Protection is also given under this Act to the eggs of any protected bird, and, by the 1930 amendment, to the skin or any part of such protected bird or animal, and the feathers of any such bird. The Minister in charge of the Department which administers the Act, that is the Chief Secretary, has power to add to or remove from the list, or to specify any particular protected or unprotected locality. A penalty of up to £20 is provided for anyone taking or killing protected birds or animals or using any instrument as a means for that purpose, or failing to comply with any restrictions relating to the taking or killing of protected birds or animals. So you will observe that it is rather difficult to get out of it if, of course, you are caught. The Act provides machinery for the issue of a permit or licence to take or kill protected birds or animals. By the 1930 amendment the Minister's general power to issue permits was limited to birds, and in the case of animals only so far as the Governor in effect directed. If you buy or sell or offer for sale or have in your possession any protected bird or animal, the fine is £5 per bird or animal. This at one time did not apply in the case of any bird or animal caught outside Australia and New Zealand, but the 1930 amending Act, by adding "or elsewhere" to the described area, spoilt that story. Your only chance these days is to prove, if you can, that the animal or bird was caught in an open season, if any, or under permit or licence. The 1930 amending Act amongst its fifteen clauses and numerous sub-clause contains the following provision: "The Minister (that is, at present, the Chief Secretary) may by licence under conditions therein specified permit the importation of any protected bird or animal." Protected bird or animal means, under the Act, you will remember, *any* bird or animal which is *not* down on the list. How the State Government expected to get away with that I do not know, in view of the Commonwealth powers regarding imports, nor do I know how many of such permits have ever been issued. The Commonwealth overruled this provision, however, on one occasion early this year—and which caused quite a lot of comment at the time—namely regarding the importation of a bird known as the Californian quail, as has been mentioned in the annual report. Various societies, including this Society, took objection to the importation of the bird, but the Chief Secretary's Department overruled the objectors and issued a permit, apparently under this clause of this Act. The Federal Government, in turn, overruled the State Department, and under its power by virtue of the Federal Customs Act prohibited the importation of the bird. Obviously the rights or wrongs of the ban on the Californian quail do not

come within the scope of this address, nor would this meeting be the time and place to enter into further discussion on that matter. I mention it now only as a matter of interest appertaining to my subject "Animals and the Law".

As I have stated earlier, the Birds and Animals Protection Act is administered by the Chief Secretary's Department. Probably this was done in the first instance because the Act is a *protection* Act, and since the administration of other provisions for *protection*, such as the Police Force, fall to the lot of the Chief Secretary. Scientific research has, however, made such strides of late years, and it has been discovered how necessary or in some cases unnecessary certain birds and animals are for the preservation and protection of farming and grazing activities, that in my opinion, and I believe I am by no means alone in this view, the administration of the Act should be transferred to an Agricultural Department. I make that statement not on account of any particular shortcomings in the Chief Secretary's administration of the Act, but because I think the result of such scientific research has altered the circumstances sufficiently to warrant the transfer. It has been suggested in some quarters that a separate board should be appointed to administer the Act, but I do not agree with that, chiefly because in my opinion we already have too many of such boards. I believe that an Agricultural Department would be quite capable of doing all that is necessary for the proper and thorough administration of an Act which no doubt at one time was thought to be chiefly for the protection of our native fauna for its own sake, but which science has clearly found to be a matter of national importance from the point of view of protecting our great asset the work and activities of the man on the land. I conclude my address on "Animals and the Law" by stating that in my opinion, and as a believer in the widening of the powers of the Federal Government, there should be a Federal Birds and Animals Protection Act administered by a Federal Department on the advice and with the co-operation of the already existing Commonwealth Council for Scientific and Industrial Research.

OFFICERS FOR 1937-38.

At a meeting of the Council held on the 24th July, the following officers were elected for the current year:

President: Tom Iredale.

Vice-Presidents: T. C. Roughley, Neville W. Cayley, Dr. Garnet Halloran, and Dr. F. Marshall.

Honorary Secretary and Editor: A. F. Basset Hull.

Honorary Treasurer: Phillip Shipway.

Honorary Librarian: A. S. Le Souef.

Honorary Assistant Secretary: Betty French.

Honorary Auditor: R. J. Stiffe.

REPORTS OF SECTIONS.

AVICULTURAL SECTION.

Annual Report.

The year commenced with Mr. W. H. Relton as Chairman of the Section and Mr. W. R. Smith as Vice-Chairman. Mr. Murray also acted as Chairman on several occasions.

The average monthly attendance was 23, with a maximum of 28 at the March meeting and a minimum of 19 at the April meeting.

Only seven, however, attended the December meeting, which was unavoidably postponed at the last moment owing to an unexpected public holiday, and unfortunately the date of the postponement clashed with the meetings of several other bird societies.

Although the attendance at monthly meetings is slightly less than in previous years, the attendance book reveals that a considerable number of members have been most regular in their attendance and most interested in regard to the work of the Society.

During the year the following interesting lectures were given :

" African Love Birds ", by Mr. W. R. Smith. Mr. Smith went to a considerable amount of trouble with this lecture, and exhibited examples of seven specimens of this family which are at present the only species in captivity.

" Aviary Construction and Management ", by Mr. R. J. Murray, was a most interesting and practical lecture, and was of great assistance to the members, who profited from Mr. Murray's wealth of experience.

" Neophema Parrakeets in Captivity ", by Dr. Garnet Halloran, was of exceptional interest, and furthermore a feature of this lecture was that it was illustrated by moving pictures taken in the doctor's own aviaries.

" The Great Barrier Reef ", by Mr. T. C. Roughley, was an unusual and absorbing lecture, and in which Mr. Roughley related his experiences on the Great Barrier Reef, in respect of which he has just written a book.

" Australian Parrots ", by Mr. T. Iredale, was of considerable avicultural interest on account of Mr. Iredale's extensive scientific and practical knowledge of the birds with which he dealt, and a feature of this lecture was that he exhibited a considerable number of species of the actual birds.

Several other lectures were promised the Section, but were unavoidably postponed owing to the illness of the lecturer.

A Hybrid Night was held one evening, and the response was somewhat disappointing, although a similar night along the same lines was promised in the future. Hybrids were exhibited by Messrs. Steeles, Dummett and Ormsby.

It was unanimously decided that no show should be held this year by the Avicultural Section.

A most interesting afternoon was spent by members of the Section inspecting the aviaries of Dr. Garnet Halloran, and the many members who attended were most interested in the doctor's collection. The thanks of the Section are due to both Dr. and Mrs. Halloran, who so ably entertained them on that occasion.

During the year the question of the proposed awards for notable achievements in zoology was considered at length by the Section, and eventually, when Council had approved and drawn up new rules to meet the circumstances, the Section's committee prepared a report in regard to this matter and same was forwarded to the Council for consideration.

Three committee meetings were held during the year, the last one being in conjunction with the newly elected Awards Committee, for the purpose of discussing same and preparing a report in regard to the proposed awards.

During the latter part of the year it was decided by all the members present to advertise the Section's meetings, and this was done. Furthermore, Mr. Deane was appointed Publicity Officer, and he played a considerable part in giving the Section and its work the publicity necessary to enable it to carry on more efficiently.

Although a considerable number of aviary notes were collected during the year and recorded in the minutes of the Section's monthly meetings, it is to be greatly regretted that these reports are not written out and given in greater detail, as I feel quite sure that a considerable amount of work is being done by the members and not receiving the prominence that it deserves. However, it is to be hoped that the new Awards Committee will be able to assist in this matter to a certain extent during the ensuing year.

In conclusion, I should like to refer to one matter which seems to me of great importance, and that is the excellent spirit in which the meetings have been held during the past year. The wholehearted support of the members, coupled with the absence of any petty jealousy, will, I feel sure, contribute in no small measure towards the future success of the Section, and it is to be hoped that with the co-operation of those members who have been regular attendants during the past year the Section will have an even better year for 1937-1938.

A. I. ORMSBY,
Hon. Secretary.

BUDGERIGAR SECTION.

Annual Report.

In submitting the annual report of the activities of the Budgerigar Section for the year just closed, I feel it my duty to draw your attention to the falling off of attendances at the monthly meetings.

This may possibly be accounted for by over-production and the consequent lack of interest displayed by many who in past years found budgerigars to be a good source of revenue, and the fact of the value of birds of indifferent quality having fallen considerably has resulted in the disappearance of their interest altogether.

Notwithstanding this, it is gratifying to report that the production of budgerigars capable of measuring up to the standard set by the Australian Budgerigar Council has been sufficient incentive to the members of this Section to stand by the Australian Budgerigar Council in furthering its incentive: that of producing quality in preference to quantity.

During the year the Australian standard of perfection was subjected to no small amount of criticism. Notwithstanding this, however, the improvement in type, colour, and general quality of birds exhibited by members of this Section at all shows held during the year, and their success very fairly indicates its influence, and even though it may not be letter perfect, it has proved itself to be worthy of the efforts of those responsible for its compilation.

Although no officially organized show was held during the year, this Section decided to accept the kind invitation of Mr. and Mrs. Hubert Fairfax to promote a lawn show at their residence. A suitable schedule was compiled, and a number of beautiful cut crystal trophies were offered as prizes. The result proved to be a financial and social success. The show was capably judged by Messrs. French, McSwiggan and Brennan, and Mr. R. L. Johnson is to be congratulated on winning the judging competition conducted in conjunction with the show.

During the past year a series of popular discussions created interest, and these, together with some very interesting lectures rendered by Dr. Clunies Ross, Messrs. A. N. Colefax, Neville Cayley, R. B. Browne and T. McSwiggan were enjoyed and appreciated by members.

A. H. GARDNER,
Hon. Secretary.

MARINE ZOOLOGICAL SECTION.

Annual Report.

The Committee has pleasure in submitting its report for 1936-1937.

A series of interesting illustrated lectures has been given, as under :
1936—

July 6 : "Houtman's Abrolhos", Mr. Price Conigrave.

August 4 : "Graveyards of the Pacific", Mr. G. P. Whitley, F.R.Z.S.

September 7 : "Ecology of the Sydney District", Mr. T. Iredale.

October 6 : "Barrier Reef Collections", Mr. F. J. Briggs.

November 2 : "Life and Habits of Shells", Miss Joyce Allan.

December 7 : "Biological Regions", Professor McDonald Holmes.

1937—

February 2 : "A Naturalist's Notes in Northern N.S.W.", Mr. Mel. Ward, F.Z.S., F.R.Z.S.

March 1 : "N.Z. Notes, Science Congress", Mr. G. P. Whitley, F.R.Z.S.

April 5 : "Experiences in N.Z.", Miss Joyce Allan.

May 3 : "A Naturalist Abroad", Mr. E. J. Bryce, F.R.G.S.

June 7 : "A Naturalist in Central Australia", Mr. H. O. Fletcher.

In November, 1936, a collecting trip round the shore from Taronga Wharf to Taylor Bay gave a dozen members and friends much interesting data.

In February, 1937, a very successful innovation was a trip to Shark Island, the Maritime Services Board kindly placing the launch "Scylla" at the disposal of a party of eighteen members and friends. The tide being exceptionally low (—five inches), good collections were made from almost untouched areas.

A great number of interesting exhibits have been shown during the year, principally by Messrs. C. F. and J. Laseron, who employ an ingenious and inexpensive home-made dredge.

Attendances have been encouraging, and much information has been gained from lectures, exhibits and discussions, which have all helped to make this, the eleventh year of the Section, a satisfactory one.

Efforts to finalize the long-standing "handbook" question have made great progress, and your Committee recommends that a series of handbooks dealing with the marine life of Sydney District be published, each to consist of 150 to 200 pages, including illustrations, to sell at 2/- to 2/6, the first handbook to include general features of the seashore, physiography, ecology, also the algæ, vertebrates, etc.; the second handbook to include the crustacea, barnacles, sponges, tunicates, and the lower invertebrates; the third handbook to include the mollusca and brachiopods. Books one and two to be published immediately, book three when completed.

A handbook on fishes already exists, so there is no urgency in this direction.

Your officers wish to thank all those who so kindly gave of their knowledge and experiences to our advantage.

HAROLD S. MORT,
Chairman.

P. N. WHITLEY,
Hon. Secretary.

NOTES BY MEMBERS OF THE MARINE SECTION.

NEW RECORDS OF SHELLS FROM NEW SOUTH WALES.

By C. F. and J. Laseron.

At the regular monthly meeting of the above Section, held on February 2, Messrs. C. F. and J. Laseron exhibited several shells not previously recorded from this State. The following species must therefore be added to the list of mollusca recorded from New South Wales :

NIOTHA ALBESCENS Dunker.

1846. *Buccinum albescens* Dunker, Zeit. f. Malak., 1846, p. 170, Nov.

1849. *Buccinum albescens* Philippi, Abb. und Besch. Conchylien, p. 68-16.
Bucc. Pl. 2, fig. 15.

1909-10. *Arcularia albescens* Hedley, Pres. Address, Aust. Assoc.
Adv. Science, Section D, p. 367.

This species was originally described as from the West Indies, but as with many early records, localities were casually applied, and later it was identified, both by comparison with the excellent figure and the type, as the common Queensland littoral shell. A single perfect specimen found among the rocks at the Outer Lighthouse, Port Stephens, now extends its range downwards into New South Wales.

EUPHICA VARIANS Sowerby.

1844. *Columbella varians* Sowerby, *Thes. Conch.*, Vol. 1, pl. 37, figs. 49, 50.

1909-10. *Pyrene varians* Hedley, *loc. cit.*, p. 368.

This is also a common Queensland species. A single specimen was collected at Point Halliday, on the North Coast, near Forster, and another specimen in the Australian Museum was collected by R. Blackett at Long Reef, near Sydney.

MARGINELLA PYGMÆA Sowerby.

1846. *Marginella pygmæa* Sowerby. *Thes. Conch.*, Vol. 1, p. 386, pl. 75, figs. 78, 79.

1923. *Marginella pygmæa*. W. L. May, "Mollusca of Tasmania", pl. 31, fig. 9.

Dredgings from shallow water in the entrance of Pittwater, Broken Bay, brought to light a number of Marginellids, amongst which this species was quite abundant. Careful comparison with both Sowerby's and May's figures, and also with Tasmanian specimens, showed no difference, and therefore this also must be added to our local fauna. Other species of *Marginella*, such as the common *M. turbinata*, have a similar wide range.

A SIMPLE DREDGE.

MESSES. C. F. and J. LASERON exhibited a simple and cheap form of dredge, with which they have at various times dredged successfully in depths up to eighteen fathoms. The basis of the dredge is simply a two-gallon tin, the edges of which are strengthened with a piece of copper sheeting, which, protruding somewhat and splayed outwards, gives a little more weight and bite, though even without this refinement the tin alone is quite satisfactory. A suitable length of light line, a leaden weight a foot or two in front, a sieve, and the outfit is complete, at the cost of a few shillings. The light weight of the whole makes it easily operable by one man from the stern of an ordinary skiff, and in actual practice a haul can be made even in deep water in a few minutes, so that the number of hauls compensates for its small capacity. When dredging, a tub is usually taken into the boat, into which the dredgings are emptied, and when the tub is full it is taken ashore and sifted, as this is easier than sifting over the side of the boat. When going afield by tram or bus, a collapsible canvas bucket is substituted for the tub, and as the dredge and all accessories fit into a small canvas bag, there is no trouble about transport. It might be added that results procured on at least one occasion in fourteen fathoms a mile and a half off Long Reef, compare favourably with those procured by properly equipped deep-sea vessels with the most elaborate of apparatus.

ORNITHOLOGICAL SECTION.

Annual Report.

During the past twelve months, many matters of interest came under discussion at the Ornithological Section's meetings. Although the average attendance was only 34, this is more than compensated by the consistency of visits of the regular members.

A full series of lectures had been maintained during the year. These are as follows:

1936:

July 17: "Early Australian Ornithologists", by Gilbert Whitley.

August 21: "Nature Travels Abroad", by E. J. Bryce.

September 18: "The Value of Field Observations", by K. A. Hindwood.

September 18 : "The Value of Photography", by M. S. R. Sharland.
 October 16 : "The Value of Nestlings", by P. A. Gilbert.
 November 20 : "The Value of Egg Collecting", by A. F. Basset Hull.
 December 18 : "The Value of Aviculture", by Clifford Coles.

1937 :

January 15 : "Honeyeaters", by P. A. Gilbert.
 February 19 : "Birds of the Swamps" (Cinema), by N. Chaffer.
 March 19 : "Birds of Centennial Park", by K. A. Hindwood.
 April 16 : "Afield with a Camera", by M. S. R. Sharland.
 May 21 : "Australian Parrots", by Neville W. Cayley.
 June 18 : Chairman's Address, by T. Iredale.

The five lectures dealing with different phases of ornithology were an innovation, and proved most interesting to members. Each lecturer was well versed in his subject, and fully proved its value. A general discussion followed the delivery of the last lecture, and members agreed that all phases were necessary to complete the study of ornithology. The remaining lectures were up to the standard that we are led to expect from these members, while the still photographs and cinematography were equal to any that have been shown in the past.

Mr. Neville W. Cayley, a member of this Section, was elected President of the R.A.O.U. for the year, and attended the annual congress and camp-out of the Union at Adelaide. While there, he was very much impressed with the aviaries he inspected, and reported that a number of parrots that had previously been supposed to be extinct were breeding freely.

Application for the creation of three new sanctuaries had been made during the year. Baker's Lagoon, near the Hawkesbury River, has been proclaimed. This is a fine area for waterfowl. Great numbers of black swan feed there, and some breed in the sheltered reaches. Ibis, spoonbills and egrets are also frequently to be seen.

The formation of a national park for the North Coast is being actively canvassed, while the Inverell Pastures Protection Board have requested the Government to provide hatcheries and sanctuaries throughout the north-west for the protection of Ibis.

Dry seasons prevailed throughout the year, which led to an influx of masked and white-browed woodswallows to the coastal areas. Serious bushfires occurred, which destroyed large belts of bushlands and were instrumental in driving birds from their usual haunts. Dr. Osborne, of the University Geology Department, reported from Lochinvar that crows and magpies were so prostrated by the heat that he could push them with his foot without their attempting to get away.

A number of English thrushes have been imported and liberated in Canberra during the year, and protests were made to the Minister for Internal Affairs. An attempt was made to import Californian quail into N.S.W., but after requests had been sent to the Federal Government they were banned under the Customs Act.

The question of egg collecting has been further discussed by the R.A.O.U. members of the Society, in conjunction with the other States, and eventually twelve resolutions were forwarded to the Victorian Government. It is hoped to have the report adopted by all States.

Another matter of importance to come before the Section was the destruction of birds through the eating of poisoned bait laid for grasshoppers. Newspaper reports showed a diversity of opinions among pastoralists as to whether the birds destroyed were of greater importance than the grasshoppers, as it had been proved that ibis and wood swallows especially were instrumental in killing large swarms of these insects annually. Certain sections of the community maintained that birds were not killed through eating the poisoned bait, and we are endeavouring to obtain evidence during the coming season.

Following an account in the *Emu* of the damage caused to the rookery on Cat Island by visitors, representation was made to the Council of the R.A.O.U. with a view to devising some means for protecting the colony. The Council then took the matter up with the Tasmanian Government, with the result that a ranger will now be placed on the island during the breeding season.

The Royal Australasian Ornithologists' Union members of the Section commenced the issue of a monthly Bulletin, comprising items of interest in

ornithology. Nine parts have now been issued, and letters of congratulation have been received from all States. This has been the medium of acquainting members with all matters of domestic nature, in addition to keeping them posted with full details of the Society's and Union's work.

Mr. Cherry Kearton, who visited us in 1936, has published a book entitled "I Visit the Antipodes". Many interesting items observed by him during his trips with our members are recorded, and his book is illustrated with local photographs.

The observations handed in during the year have been equal to those of previous years, and many successful trips have been undertaken. Three journeys during October resulted in lists, each containing over 100 species, being placed on record.

The following extract from the November issue of the *Bulletin* shows the nature of some of these excursions:

"During the last month several of our members have undertaken trips away from the city in search of birds, and all have something interesting to report as the result of their observations. In addition to the visit to Adelaide by Mr. Cayley and to Lord Howe Island by Mr. Hindwood, the State Secretary (Mr. Roy P. Cooper) and party visited Dungog and the Barrington Tops for two weeks; Mr. Sharland made an extensive tour along the coast from Port Stephens to Port Macquarie, and thence inland to the Comboyne plateau, and Mr. Norman Chaffer has gone to try his luck with the camera among the birds of Rochester, just over the River Murray, in Victoria. Mr. Clifford Coles made a comprehensive bird list during a visit to Bourke and Brewarrina."

The officers desire to express their thanks to those who assisted the Section throughout the year, and request the continuance of this help, also that all members endeavour to take an active part in future discussions and outings.

TOM IREDALE,
Chairman.

ROY COOPER,
Hon. Secretary.

RULES GOVERNING AWARDS FOR NOTABLE ACHIEVEMENTS IN ZOOLOGY.

The following Rules were made by the Council of the Royal Zoological Society on February 24, 1937:

1. The rules governing the award of Fellowship of the Society remain unaltered.
2. In the case of each Section of the Society an "Awards Sub-Committee", consisting of three members, may be appointed annually by each Section, and these members shall not necessarily be members of Council.
3. Each Awards Sub-Committee shall furnish a report to the Council annually in the month of June, stating whether any outstanding work suitable for award has been carried out. Such report shall indicate the order of merit of any achievement, placing it first, second, third, etc., on the list.
4. If considered by the Council to be of sufficient merit, a medallion may be awarded to the first on such list, and thereafter diplomas may be issued.
5. No awards shall be made to residents outside the State of New South Wales.
6. In the case of the Avicultural and Budgerigar Sections the award may be given to the member first reporting his successful breeding in captivity of any species of bird not included in the list of birds "not eligible". Any member wishing to obtain an award must send a detailed account to the honorary secretary [of the Section within a week of young birds leaving the nest, and furnish such evidence of the facts as the Executive Committee may require. The award will be made only in cases where the young shall live to be old enough to feed themselves and to be independent of their parents. Birds must be reared by their natural parents. On notification a

member of the Committee will inspect. The account of the breeding must be reasonably full so as to afford instruction to members of the Society ; it should describe the plumage of the young and be of value as a permanent record of the nesting and general habits of the species, and must be forwarded within eight weeks to the Secretary of the Society for publication in the Society's Journal before it is published or notified elsewhere.

7. The list of species which are "not eligible" for awards shall be declared annually in June by each Awards Sub-Committee.
8. Hybrids and sub-species of species may be included in the list for which awards may be given.

SYLLABUS OF SECTIONAL MEETINGS, 1937-38.

AVICULTURAL SECTION (Second Monday in the month, except when a Public Holiday, then on Tuesday)—

- July 12.—"Finches", by F. Buckle.
 August 9.—"Aviaries I have Visited", by R. J. Murray.
 September 13.—"Bird Life Around Sydney", by K. A. Hindwood.
 October 11.—"Australian Parrot-like Birds", by Neville W. Cayley.
 November 8.—Hybrid Night. Exhibition and discussion on Hybrids.
 December 13.—"Finches in their Natural State", by Tom Iredale.
 January 10.—"Zoological Societies as Research Centres", by Dr. Garnet Halloran.
 February 14.—"Ornamental Pheasants", by C. Lawrence.
 March 14.—"Softbills", by W. J. Wood.
 April 11.—Members' Night. Being short lecturettes by members on individual species.
 May 9.—"Central Australia", by H. O. Fletcher.
 June 13.—Annual Meeting.

BUDGERIGAR SECTION (Third Tuesday in the month)—

1937.

- July 20.—Judging Competition.
 August 17.—"Parrots and their Relation to Australian History", by Neville W. Cayley.
 September 14.—Table Show. Green, Laurel and Olive.
 October 19.—Lecture.
 November 16.—Table Show. Sky Blue, Cobalt, Mauve.
 December 21.—Lecture.

1938.

- January 18.—Cinema at Taronga Park by C. Camp.
 February 15.—Table Show. Young birds, any variety.
 March 15.—Lecture.
 April 19.—Table Show. Light coloured varieties.
 May 17.—Lecture.
 June 21.—Annual Meeting. Chairman's Address.

MARINE ZOOLOGICAL SECTION (First Monday in the month, except when a Public Holiday, then on Tuesday)—

1936.

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| July 5 | } | Subjects to be selected. |
| August 3 | | |
| September 6 | | |
| October 5 (Tues.) | | |
| November 1 | | |
| December 6 | | |

1938.

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| February 7 | } | |
| March 7 | | |
| April 4 | | |
| May 2 | | |
| June 6.—Annual Meeting. | | |

ORNITHOLOGICAL SECTION (Third Friday in the month)—

1937.

July 16.—“ Birds of Tasmania ”, by M. S. R. Sharland.

August 20.—“ Bird Books—Curious and not so Curious ”, by K. A. Hindwood.

September 17.—“ Experiences in Northern Australia ”, by C. Price-Conigrave.

October 15.—“ A Naturalist in the West Indies ”, by E. J. Bryce.

November 19.—“ Interrelations of Bird Life ”, by Noel L. Roberts.

December 17.—“ Bush Rambles ”, by Norman Chaffer.

1938.

January 21.—“ A Trip to Central Australia ”, by H. O. Fletcher.

February 18.—“ Economic Ornithology ”, by K. C. McKeown.

March 18.—“ Colour in Birds ”, by Roy P. Cooper.

April 22.—“ Travels Abroad ”, by G. P. Whitley.

May 20.—“ Birds of the Barrier Reef ”, by Mel. Ward.

June 17.—Annual Meeting. Chairman's Address.

Meetings of all Sections are held in Room 6, Sixth Floor, Bull's Chambers,
28 Martin Place, Sydney, at 7.30 (for 8) p.m.

SOME NOTES ON THE BIRD-DUNG SPIDER (*CELÆNIA EXCAVATA*).

By N. L. ROBERTS.

(Plate I.)

It is well known that observations restricted to a single member of a species may not be applicable in every respect to other members of the same species owing to the margin of variation and adaptation that one finds in the behaviour of living organisms. Subject to this limitation, however, such observations serve a useful purpose because they enable the biologist gradually to build up the fundamental truths of an animal's life history from records which are in agreement. Where there is disagreement, there must be further sifting by careful and competent observers until the variable and invariable factors are fully known. My own observations concerning a single specimen of the Bird-dung Spider are recorded with a sincere recognition of the limitations involved, but as comparatively little is known concerning this sedentary member of the Arachnida, I believe they are worth placing on record even although they still leave much of its life history shrouded in mystery. Business obligations made it possible for me to study this spider only during a limited period in the morning and evening, and there were whole weeks during which I was absent in other States.

McKeown⁽¹⁾ records three popular names for *Celaenia excavata*—the Orchard Spider, the Death's Head Spider, and the Bird's Dung Mimicking Spider. Butler⁽²⁾ asserts that the name Death's Head Spider has been accepted owing to its "general use", and although this may be true so far as Victoria is concerned, I doubt whether this name is generally applied in any other State where the spider is found. In any case, observers who have carefully studied its appearance will agree with McKeown, I think, that the appellation of Bird-dung Spider is "the most apt when the spider's appearance is concerned", the resemblance to a human skull requiring a greater exercise of the imagination. The simulation of bird dung is the characteristic that has appealed most to observers of related species in other parts of the world, and this, too, is a point that should carry weight.

On July 17, 1936, I discovered a female Bird-dung Spider with eight egg-sacs on a camellia tree in my garden, and as the branch was too high for observation purposes, I severed it and fastened it securely at a more convenient altitude. A glance at the accompanying photograph (Plate I) shows such a remarkable similarity, both in form and pattern, between the egg-sacs and the camellia bud below them that a casual observer might be pardoned by assuming the resemblance was not entirely fortuitous—a salient example of the danger of generalizing from one observation! McKeown refers to a suggestion that the egg sac pattern is protective, as the sacs bear a general likeness to the fruit of the Quondong and also to the rounded cones of the Cypress or Murray Pine. He points out, however, that the range of the spider does not coincide with that of the Quondong, and there seems to be no recorded discovery of the egg-sacs on a Cypress or Murray Pine. Despite the close resemblance of the egg-sac and bud in the photograph, I should imagine camellia trees are not sufficiently common to justify any theory of protective resemblance, while an aggregation of egg-sacs obviously nullifies to a considerable extent the protective value that a single sac might involve. Butler describes the colour of the egg-sacs as "dark brown", asserting also that they are "the same colour as the spider, and nearly the same size". He makes no mention of markings, but McKeown states that they are "easily distinguished by a criss-cross pattern of intersecting lines of dark brown". The egg-sacs I had under observation were intersected

irregularly with jet black markings, the black colour being more noticeable on the egg-sac on the extreme right, as a finely-woven supporting web tended to obscure the intensity of the markings on the other sacs. The brown colour, too, was not the same colour as the spider, the colour of the latter on the under surface being lighter and less uniform. Apparently the number of egg-sacs varies, Butler stating that it is usually five, although he mentions a spider which had thirteen in Mr. Charles Barrett's garden. McKeown records the usual number as six or seven, adding that on rare occasions he has seen clusters containing as many as a dozen. In a letter I received from Professor V. V. Hickman, of Hobart, reference is made to two lots of this spider's egg-sacs in the University grounds, one containing seven and the other eight sacs. My own specimen increased the number of sacs from eight to thirteen between July 17 and October 6. On the last-named date I noticed the thirteenth sac, which appeared to have cost a great physical effort, for the spider had a peculiar "collapsed" appearance, being shrunken and only a shadow of her former plump self. It was exasperating misfortune to miss the actual construction of a sac during a period of three months, the spider choosing to accomplish this task either after I had retired for the night or during my absence from home. On October 3 I opened one of the sacs and counted 224 spherical yellow eggs, the fluffy lining making a snug shelter for them during the cold wintry days. Assuming there were 200 eggs in each sac, in the normal course of events this spider would be the mother of 2,600 spiderlings, but one must make allowance, of course, for parasitic wasps—those efficient and relentless controllers of numbers—which pierce the hard covering of the egg-sacs and deposit their own eggs within them. Butler states that the sacs are "caught together by a few untidy silken ropes, and the female keeps guard over them". The egg-sacs I had under observation were supported in two different ways, the sacs themselves being securely held together by a fine, but strong and irregular web, which was connected at strategic points by thick and tough "guy-ropes" to the bud, leaves and stem as supports. This arrangement is clearly seen in the photograph. Both web and guy-ropes were strengthened at intervals by the spider, beginning at the bottom sac and gradually working up to the highest point of attachment, the legs spinning rhythmically all the time. An observer could not doubt that the sacs were a definite centre of interest and activity to her. Perhaps it is going too far to say that she "keeps guard" over them, for her extremely sluggish temperament and limited nocturnal movements seem to leave them very much at the mercy of any predator. While showing the sacs to visitors I inadvertently broke off a dead leaf which formed a partial cover for them, and it is worthy of note that the same night the spider, apparently grasping the nature of the damage, tied down another leaf in a position as near as possible to that of the leaf which had fallen.

All observers are in agreement concerning the sedentary habits of the Bird-dung Spider, McKeown commenting that there is "something strangely uncanny in such complete immobility". During the day the spider which I had under observation remained huddled on one of the egg-sacs, her legs folded as shown in the photograph, and only occasionally varied her position. At night she hung suspended below one of them—the bottom one most frequently—her legs in a semi-extended position, which was quite different from the one adopted during the daytime and appeared to be a characteristic attitude while awaiting her prey. A close relative of this spider (*Celænia calotoides*), who suspends her egg sacs in a line, also seems to cling to the bottom one. In the case of *Celænia excavata* there was very little nocturnal activity, the usual attitude being varied by repair work or slow movements over the egg sacs. It is not surprising, therefore, that the sedentary habits of this spider have led to considerable speculation concerning the method of securing food and, so far as I know, no reliable information has been published to date about the specific insects it catches or the means it employs to secure them. Butler states it "seems never to bother about food", while McKeown mentions that certain observers have hinted at the possibility of *Celænia* angling for her prey in the same way as the Magnificent and Hairy Imperial Spiders. Butler also states it is "difficult to understand how it obtained nourishment to amass enough substance for its task of egg-bag making".

On the night of September 10 I found *Celænia* feeding upon a moth, having bound its wings tightly before proceeding to suck the body juices, and although I had visited her fairly regularly, morning and evening, since July 17, this was the first definite evidence obtained regarding feeding habits. The moth was found on the ground next morning under the egg-sacs and placed in a jar for identification. On September 17 I found another moth on the ground, while on September 21 a morning visit revealed two moths, one suspended from an egg-sac and the other in the process of being devoured. Both were lying on the ground at night. I collected a total of fifteen moths between September 10 and October 13—on which date the spider disappeared—an approximate average of one moth every two days. As eight egg sacs had been completed by July 17, it seems reasonable to assume that *Celænia* undergoes a long fast through the winter, and must accumulate sufficient internal food reserves during the warmer months both to survive and to accomplish the vital task of perpetuating the species. The egg-sacs were constructed in a very exposed position, and it is extremely unlikely that her prey would be available on cold nights. Unfortunately I was not able to get the moths identified, for tiny ants found their way first to the cupboard which contained the jar, and then to the jar itself, squeezing between the lid and the rim, and leaving nothing but a mass of wing and body scales. The moths were nearly all the same species and uniform in size, the wing-spread being approximately one inch. No snare could be detected and the method of capture still remained a mystery. On October 9, however, I went out late with a torch and noticed a moth fluttering near the spider, which appeared to be greatly agitated, moving one pair of legs up and down rapidly, and even falling an inch or two on a thread and then climbing up again. The moth continued to flutter near the spider as if lured by some irresistible attraction, although it could scarcely fail to see the spider's movements. There was not the slightest sign of a line with a sticky globule, nor indeed was there any perceptible clue to the potent charm which this siren exercised over her hapless victim. When the torch was extinguished I could barely discern a glimmer of colour on the upper surface of the spider, but it would be foolish to rule out visual attraction on the part of the moth, with its large compound eyes, so admirably adapted to the creature's nocturnal activities. Olfactory attraction, too, is a possible explanation, for there are many well attested examples of "directive odours" in the animal kingdom which are not perceptible to human senses. All I can vouch for is that some fatal influence seemed to be exercised by the spider, for suddenly the moth fluttered too near, and this notoriously sluggish creature shot out long legs with a lightning, springing movement of the whole body, clutched its victim, and instantly buried its fangs in the moth's thorax. There was a rapid beating of wings, but the venom quickly took effect, the moth's struggles growing weaker until the spider was able to manipulate it with her feet and seize it by the head. She then dropped about an inch, attached to a sac by a strong thread, and holding the moth with her legs, curled her body up so that the spinnerets could weave a shroud while the legs deftly rotated her prey. This accomplished, she suspended the moth from the spinnerets, climbed the short thread to the egg-sac, and seizing her victim by the head, proceeded to suck its body juices. That is, in the words of Professor Lloyd Morgan, "a plain tale", without any attempt to "explain" the plot, but, at least, it establishes the fact that *Celænia* is a subtle enchantress of moths and rules out the theory that she angles with line and bait.

There are other points of interest worth mentioning. I wrote to Professor Hickman concerning *Celænia*'s egg-laying capabilities and also the missing male. My letter elicited the interesting information that the male has been found. "As you remark", writes Professor Hickman, "the male has not been recorded. As a matter of fact I think he has been overlooked. I have a male specimen in my collection, and he is quite a dwarf compared with the female. He is a little over two millimetres long, but quite mature. In colouring and shape he resembles the female, but, of course, has the clubbed palpi usual in male spiders." Concerning *Celænia*'s egg-laying propensities, Professor Hickman writes: "Although the spider lays a very large number of eggs during the season, these eggs are not all present in the body at the one time. They develop gradually in the ovary, which lies in the spider's abdomen. When a batch of eggs is ready for laying they are extruded

and then enclosed in the familiar egg-sac. The spider then has to wait for several days (or weeks) until another batch of eggs has developed in the ovary and is ready for laying. If food is plentiful *Celania* may make over a dozen egg-sacs in the season."

Professor Hickman inquired if I had discovered how the young spiders made a hole in the egg-sac. The baby bird has an egg-tooth to assist it in piercing the shell, and there are many extraordinary adaptations in the insect world that enable the adult to emerge from the pupal state. How then can these tiny spiders make that neat circular hole in the tough egg-sac? There is only one hole in each sac. Is it cut by the first spiderling to emerge from the egg, or is there some chemical secretion which enables it to dissolve the stout covering? Examination of a sac failed to reveal any point at which the cover is thinner than other parts, and a superficial examination of the spiderling gave me no clue to the mystery. Apparently temperature is a factor in controlling the development of the young spiders for the period that elapsed between their emergence from the first and last egg-sacs was very much shorter than the period between the construction of those sacs. The actual time taken in emerging seemed to vary considerably with individual spiderlings, but was never less than a few minutes in the case of those I observed personally. Some of them wove a hammock of the finest silk between the egg-sac and a leaf, where they remained for an hour or two, an examination of the leaves a few days later confirming the view that the young spiders construct snares and doubtless feed on small insects, abandoning this method later to prey upon moths. At the slightest touch the spiderlings feigned death, dropping on my hand and remaining motionless for a few seconds. So powerful and perfect is instinct! It is instinct again when they lower themselves on a gossamer thread for the great migration adventure, imperceptible air currents or a breeze carrying them quickly to unknown destinations, where they will be exposed to attack from lizards, birds, insects and other spiders. As the survival rate is in inverse proportion to the number of eggs it is necessary for the female to lay, the mortality of *Celania* spiderlings must be great. Assuming that two thousand emerged successfully from the egg-sacs, not one of them was to be found a week or two later in my garden, and probably most of them perished. How colossally wasteful it seems to frustrate such biological intensity of purpose on *Celania's* part, and yet how necessary if the land is not to be overrun with spiders! *Celania* herself remained completely indifferent to her offspring for, after all, she is not required to be more than a mechanical mother, her babies being wise, after their kind, from birth.

Rainbow states that *Celania* lies upon her back in order to simulate a bird's dropping—a statement which is queried by McKeown, who has been unable to discover her in this attitude. Strangely enough, Pycraft⁽³⁾ quotes a similar statement by Dr. H. O. Forbes, who describes his discovery of a Bird-dung Spider in Java, as follows:

"I had been allured into a vain chase after one of those large, stately flitting butterflies, a *Hestia*, through a thicket of prickly *Pandanus horridus*, to the detriment of my apparel and the loss of my temper, when on the bush that obstructed my further pursuit I observed one of the Hesperidæ at rest on a leaf on a bird's dropping. I approached with gentle steps, with ready net. It permitted me to get quite close, and even to seize it between my fingers; to my surprise, however, part of the body remained behind . . . adhering, as I thought, to the excreta. I looked closely at—and finally touched with the tip of my finger—the excreta to find if it were glutinous. To my delighted astonishment I found that my eyes had been most perfectly deceived, and that the excreta was a most artfully-coloured spider lying on its back, with its feet crossed over, and closely pressed to the body. The appearance of the excreta rather recently left on a leaf by a bird, or lizard, is well known. Its central and denser portion is of a pure white, chalk-like colour, streaked here and there with black, and surrounded by a thin border of the dried-up, more fluid part, which, as the leaf is rarely horizontal, often runs for a little way toward the margin. This spider, which belongs to the family Thomisidæ, possessing rather tuberculated, thick, and prominent abdomened bodies—is of a general white colour; the upper side, which is the one exposed, is pure chalk-white, while the

lower portions of its first and second pairs of legs, and a spot on the head and on the abdomen are jet black. This species does not weave a web of the ordinary kind, but constructs on the surface of some prominent, dark leaf only an irregularly shaped film, of the finest texture, drawn out towards the sloping margin of the leaf into a narrow streak, with only a slightly thickened termination. The spider then takes its place, on its back, on the irregular patch I have described, holding itself in position by means of several strong spines on the upper sides of the thighs of its anterior pair of legs, thrust under the film, and crosses its legs over its thorax. Thus resting, with its white abdomen and black legs as the central and dark portions of the excreta, surrounded by its thin web film representing the marginal, watery portion become dry, even to some of it trickling off, and arrested in a thickened extremity such as an evaporated drop would leave, it waits with confidence for its prey—a living bait so artfully contrived as to deceive a pair of human eyes even intently examining it.”

Pycraft thinks Dr. Forbes was mistaken in believing the spider lies on its back, and refers to the capture of a Bird-dung Spider in Ceylon by the Hon. N. C. Rothschild, who took the spider, its patch of web, and the leaf, back to England. Pycraft comments :

“In Dr. Forbes’s spider the body, it will be remembered, was said to rest back downwards, and to be held in that position by means of spines on the legs. Mr. Rothschild, on the other hand, found exactly the opposite to be the case in his spider, the body resting on its web in the normal position. And the coloration of the upper surface confirms his notes, if any confirmation were needed, for he held an honoured place among men of science, and his powers of observation were singularly acute. It has been suggested that Dr. Forbes was probably mistaken in regard to the position of the body in the case of his spider. Moreover, the coloration of the body, which has since been examined by experts in the British Museum, shows that the upper surface more suitably effects this disguise than could the under surface. Here, then, is a point which calls for further examination.”

Like McKeown, I have never been able to find *Celænia* on her back, and possibly the fact that the abdomen is hump-shaped and that the spider is able to elevate its legs over its back—I have seen a captive *Celænia* brush a fly off in this manner—has misled some observers, although Rainbow’s belief is difficult to understand. Incidentally, Rainbow has described the mimicry of bird-dung “to a marvellous degree of fidelity” on the part of the little Two-spined Spider.

Does *Celænia* gain any advantage in resembling a bird’s dropping? Spiders are not the only creatures that simulate this appearance, so that the question must be considered on a basis of general principles of coloration. McAtee⁽⁴⁾ quotes a reference by Howes to certain larvæ which mimic the excreta of birds. “I have been completely fooled”, writes Howes, “by these larvæ on more than one occasion. They frequently rest in the centre of a green leaf and while conspicuous, never suggest a living insect to the uninitiated. In colour, the upper and lower portions of the body are dark chocolate brown, banded through the centre with pure white, which suggests the lime so often seen in the excreta of birds. The entire creature is highly glossed, which gives a fresh and moist appearance to the object, which makes no attempt to conceal itself, depending entirely upon its strangely camouflaged body for protection.” McAtee criticizes the protective theory elaborated by Howes. “This comment”, he states, “ignores the fact that a great many birds habitually devour the excreta of their young, even returning to it when accidentally dropped, and the nestling excreta is exactly of the luscious appearance described by Howes.” C. H. D. Carpenter and E. B. Ford,⁽⁵⁾ in turn, rebut McAtee’s argument by pointing out that birds swallow the excreta not for good but for sanitation purposes. They do not go out into the bush to search for excreta, and would be likely to eat any insect resembling bird-dung only when it was very near the nest. G. D. Hale Carpenter⁽⁶⁾ describes certain moths in England which resemble bird-dung; also a small flat bug which mimicked the droppings of geese on an African beach which proved very attractive to certain butterflies. A more remarkable example

quoted by Carpenter is that of some young Acridian grasshoppers which crowd together on a leaf and by virtue of their mass simulate the dropping of a bird. There seems to be evidence, therefore, that this type of coloration has protective value, and it is reasonable to assume it is not without significance in the case of *Celænia*. It is possible, too, that the resemblance to bird-dung may prove attractive to certain species of moth, although the agitated movements of *Celænia* in the presence of the moth seem to discount this theory. In this, as in many other aspects of animal life, it is so easy to make dogmatic statements and so difficult to furnish convincing evidence.

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- (3) "Camouflage in Nature", W. P. Pyecraft.
- (4) "Effectiveness in Nature of the So-called Protective Adaptations in the Animal Kingdom", Smithsonian Miscellaneous Collections, Vol. 85, No. 7.
- (5) "Mimicry", G. D. H. Carpenter and E. B. Ford.
- (6) "A Naturalist on Lake Victoria", G. D. Hale Carpenter.

COLOUR CHANGE IN THE LEAF-CURLING SPIDER (*ARANEUS WAGNERI*).

By N. L. ROBERTS.

In my garden recently were four webs of the leaf-curling spider (*Araneus wagneri*). Three were completely in the shade, and the other in an open, sunny position. I wanted to photograph the spider which had constructed its web and rolled its leafy home where good light was available, and while trying to lure it into a suitable position it fell to the ground and disappeared in a litter of dead leaves. In a second or two I found it, but the creamy mottling that had been so conspicuous a part of its colour scheme had vanished, the general appearance now being one of varying shades of brown that made it difficult for an observer to detect the spider against a background of dead leaves. I induced it to cling to a grass stem and placed it on the web again, where it immediately began to change colour, passing through different phases rapidly, the lighter parts from brown to grey and from grey to the original creamy colour, while the dark brown portions deepened to black. I repeated the experiment, and although the results were not quite so pronounced, there was ample evidence to confirm the previous happening.

Writing to me concerning this observation, Professor V. V. Hickman states: "As far as I know, colour change has not been recorded for this spider before. Rapid colour change is said to be due to a sudden alteration in the slope of the hairs on the body of the spider. It may be compared with the colour change produced in velvet by brushing the material the wrong way. I feel very doubtful whether this is the correct explanation. There are numerous instances of slow changes in colour brought about by alterations in the pigment underlying the skin of the spider. Perhaps the process can be speeded up in some species, so that it takes place instantaneously and is under the control of the animal." I have no doubt that colour change in the Leaf-Curling Spider is due to pigment movements, and is very limited in its scope, for experiments with various colours of cloth as a background failed to reveal any further colour adaptation on the part of the spider. The bright, creamy pattern seems to fade out and return in a few seconds, and possibly has some limited protective value. Conspicuous colours constitute no danger while the spider remains concealed in its leaf, which is an effective "hide" for a species which is chiefly nocturnal, but if it is forced to abandon this retreat in daylight, ability to transform its colour scheme might be a definite advantage in eluding some enemies.

McKeown ("Spider Wonders of Australia") mentions that the St. Andrew's Cross Spider seems to have the power of changing its colour, and that this appears to be brought about "by the raising and depressing of its hairy coat". The little Two-spined Spider is also referred to by him as "one of the few spiders which possess the power of changing their colour at will".

Colour change is well known in frogs, reptiles, fishes and cuttlefishes. A greenish frog will gradually become blackish if placed in a dark moist box in a cold room, but if placed in a white box in a warm, well-lighted room it shows a lemon colour. In the chameleon and "horned toad", Professor J. Arthur Thompson points out that the colour change is due to the up-and-down movement of the pigment granules, while in fishes, such as the plaice and flounder, colour changes are controlled by branches of the sympathetic nervous system. In blind flat fishes the message from the outside world "affects the eye, then the brain, then the sympathetic nervous system". Colour change, therefore, is effected in three different ways in these three classes of animals.

NOTES ON THE MOLOCH HORRIDUS.

By A. S. LE SOUEF, C.M.Z.S.

Quite the most interesting unique reptile found in Australia is the "Devil Lizard" (*Moloch horridus*). The name of this little creature is a misnomer, for a more harmless thing could hardly be found.

Although so curious in appearance, very little indeed is known about the habits of this animal. It is found in the semi-arid country, northward of the east-west line, extending through the central districts to the north-west part of the continent. Its immediate habitat is among the dwarf scrub of this country, wherever indeed the small black ants, on which it exclusively feeds, are to be found.

The lizard has developed an extraordinary mode of protection in a series of sharp spiky thorns on the head and body. It never uses these when handled, and they are evidently an automatic protection against the attacks of snakes. Its very slow jerky walk would not enable it to escape from anything. Its colour, brown markings on a yellow ground, makes a very efficient camouflage for the sandy terrain on which it lives.

Although found in a bright sunlit district, it is unable to stand much exposure to the sun, as in the absence of some shade on a summer's day it soon dies if tethered in the open.

The eggs, six in number as far as has been observed, are laid in a hole in the ground about two inches below the surface. This information was gained from observation of one of several that were turned out in Taronga Park.

Miss Ella McFadyen, whose notes are appended, has given us some very interesting observations on her domesticated specimens. These show an unexpected degree of intelligence in the lizard.

THE MOLOCH HORRIDUS.

FEEDING HABITS AND EVIDENCE OF INTELLIGENCE.

SOME OBSERVATIONS BY ELLA MCFADYEN.

When I set out to acclimatise specimens of the *Moloch horridus* or Horned Dragon, sent to me from Alice Springs, in a North Sydney garden, I was prepared for a task calling for a great deal of thought and watchfulness. I believe my success was largely due to experience already gained with animals in translating the "language," or intelligible system of signals, with which animals can communicate their desires.

The inertia commonly attributed to Horned Dragons in captivity is, being associated with protective colouring, a sign of uneasiness, not content. Proceeding as I would with birds, a careful routine of approach, voice, handling and housing was soon rewarded by marks of friendly preference and reliance. The Molochs were housed by day in a miniature rockery within a large garden-tub, roofed with fine wire. Whenever possible they ran free in the garden or were given a day out in the bush. At night they had a sleeping-box indoors, and as they showed a preference for sleeping with the head raised, tiny pillows were provided. Their habits are extremely cleanly, and the fondness for bathing is remarkable, even for a lizard. Warmth, abundant water, and

protection from aerial enemies are their favourite luxuries, and as all arrangements for their comfort were made, by design, as deliberately as possible, they quickly learned to associate my presence with their welfare, to flee to me when they heard crows crying, or to climb to my shoulder to seek a safe sleeping place.

INTELLIGENCE.

The speed with which the Molochs came to confide in me and to distinguish between their human associates in exact proportion as those associates bestowed kindness argued considerable intelligence. So did the system of signals they soon began to employ; tapping noises to draw attention, patting with the paws to persuade one for favours, and various pantomimic acts with reference to feeding, bathing, etc. The plane of vision is so low one would hardly expect Molochs to distinguish individuals by sight, and they usually did so by hearing, showing a keen perception for a known voice. Not only would they come to me at the sound of my voice, but would approach a known speaker among a group of strangers, on more than one occasion showing they remembered a voice after a lapse of several weeks. Intelligence varies with the individual lizard, as with all animals I have observed—one indicated good powers of recollection, another was heedless and ran into the same difficulty over again. One accepted after a single experiment the fact that glass is impervious, another was always puzzled by the phenomenon. Like all lizards, Molochs are intensely curious, and I allowed mine to explore as much as possible, both indoors and out.

A female Moloch exhibited a very motherly interest in any companion I put in her care. I once took her favourite (a younger female) to the city for a day, and she greeted it eagerly on its return, slept beside it that night and all next day kept a possessive paw across the wanderer's back, as if to prevent a second parting. This younger one went to sleep at the end of April, and the elder, who had developed the habit of warming herself by creeping inside my collar, did not follow until June. July brought heavy rain, and the atmospheric change (to which the tribe is sensitive) woke the elder Moloch. She took her usual refuge on my shoulder and signalled uneasiness of some sort. At length, when I was preparing tepid water for some orchids, she made her little request and was given a saucerful. Into this she got with great enjoyment, drinking through the mouth eagerly, instead of the usual absorption through the skin. In a minute, however, she was out and again making signals, and this time tapped on her companion's sleeping-box. She persisted so long I filled a second saucer and placed the sleeper in it. The warm liquid wakened the creature. The little monitress sat watching attentively, and as soon as she was satisfied that her companion was awake and drinking she returned to her own bath. When, in the following autumn, this younger lizard sloughed and had some trouble in getting rid of a large shell of loose skin from the back, the same watchful little creature approached and deliberately pulled away the troublesome skin.

The sloughing and pigmentary variations are intensely interesting in their evidence of evolutionary changes, but the matter is too intricate to be included in the present notes.

FEEDING HABITS.

Of the numerous ants locally available, only the small black species attracted any notice from the Molochs. Three variants may be roughly classified as follows: The creeping black ant, laying a strong ground scent capable of being followed in wet weather. This was rejected by the lizards, who plainly disliked the strong odour. The running black ant, somewhat larger, lays a lighter ground scent only to be followed on dry ground. This is the staple food. A third ant, found only where the ground is undisturbed by building or cultivation, is somewhat larger and more wiry than the former, lays no ground scent, but follows an air scent. Hence it is very swift, moves each on its own trail, instead of in a line, and is very hard to catch. It was considered palatable by the Molochs when they could catch it.

Molochs feed with darts of the adhesive tongue, almost too fast for the eye to see. They are dainty, and dislike any foreign substance to mix with their food, often cleansing the tongue by licking young green leaves. They will not eat ants carrying any burden save the larvæ of their own species or

grains of sugar. The sugar, though probably mistaken at first for larvæ, is evidently relished for its flavour. I could never persuade my Molochs to pick up any stationary food, not so much as a dropped ant's egg. They would not touch an ant that was not in motion or one that had wings.

They feed voraciously, till the sides become considerably distended, and one thousand ants at a meal is by no means an exceptional number. Molochs cannot for this reason live in large groups, as they would exhaust the food supply. Being exceedingly gentle little creatures towards each other, a hungry Dragon will not displace another from a good feeding place. Indeed, a very small weakly specimen was placed with a number of others, and I noticed a larger lizard sharing an ant-hole with it, for they sometimes feed alternately, each taking an ant in turn as it emerges from the hole. The reason why such large quantities of ants are swallowed at a meal, day after day right through summer, is because the chitinous body-shell and legs of the ants are not digested. The creatures are crushed against the bony mouth-plate of the Moloch (distinct clicks can be heard as the lizards feed) and after the juices have thus been extracted, the ants are expelled almost whole. The Molochs' fondness for moisture, and enjoyment of the steamy earth after a thunderstorm, point to a long-ago habitat in a tropical swamp where a very different food must have been obtainable. For all that, black ants are the only food the tribe can assimilate at present, and any form of artificial feeding appears to end in the death of the reptile.

WILD LIFE PRESERVATION IN OTHER COUNTRIES.

The following letter speaks for itself:

"There has been discussion in the correspondence columns of the American magazine *Time* concerning the Koala. It started with an article about Noel Burnet and Koala Park, and the financial difficulties of the former. Some woman reader promptly sent fifty dollars to be forwarded to Burnet. The Australian Trade Commissioner wrote a sarcastic letter, asking that the money be turned over to the protection of American animals, for the koala is common all over Queensland and New South Wales; also mentioning that if the donor ever visits Australia she will see plenty of wild koalas, kookaburras, etc., exhibiting the arrogance which might be expected of creatures pampered by a generous government and a sentimental people. While Australians are glad to have American money, they want it in exchange for goods, and require no gifts. You, as an Australian interested in wild life, will no doubt be edified to learn that the koala is such a conspicuous inhabitant of the bush! I felt after reading his letter that the Commissioner was something less than enthusiastic about spending good money on the protection of wild animals.

"Did you know that the koala's fate is responsible for a recent alteration in the American laws against traffic in furs and feathers? Nowadays, any creature which is protected by law in the country of origin, even though the law is a dead-letter, becomes contraband, and such traffic is punished by confiscation and heavy fines. This is working very successfully in the case of the fauna of the Galapagos Islands. The Ecuadorean government have declared the islands a protected area; nevertheless, in the absence of wardens, every wealthy yachtsman who passed by has stopped off to kill the giant tortoises, marine iguanas, penguins, etc., bringing back specimens of these unique creatures to sell at a high price in America. But with the removal of any possible profit and the certainty of a fine, people are no longer wasting time in the Galapagos.

"Mexico has adopted tactics even more drastic in protecting the last few elephant-seals on the Tres Marias Islands, their breeding-ground. It is absolutely impossible to get a landing-permit for any purpose, and there is a warden on each of the three islands, with orders to shoot to kill any landing-party. After one or two sad experiences, poachers have come to the conclusion that the islands have a very insalubrious climate."

NOTES ON A COLLECTING TRIP IN NORTHERN NEW SOUTH WALES.

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The study of the Brachyuran fauna of eastern Australia has occupied much of my time during the last sixteen years, and during that period I have been able to collect at sixteen localities, spaced at intervals along the coast from Port Phillip, Victoria, to Cape York and Murray Island, Torres Strait.

The zoogeographical regions into which Iredale and Whitley have divided the coast are upheld by the results of my own studies on crabs. The fauna of the Maugean region is by far the most typical of Australia in spite of the fact that *Leptograpsus variegatus* and *Plagusia chabrus* have been recorded from South Africa and South America; there is also a slight Neo-Zelanic influence, but this appears to be confined to the Bass Strait area. The southern coast of New South Wales is not well known to me except from trawled and dredged material. In the Port Jackson area more than half the littoral species of the Maugean region are represented, though they form only a small part of the rich fauna. Tropical species are frequently found, usually solitary individuals on rocky reefs or small colonies of mangrove and mud-flat types. At Pittwater I collected a small colony of the fiddler crab, *Uca vomeris*, which had a previously known southern limit at Trial Bay, N.S.W.

Only five of the Maugean series extend into southern Queensland, and a large part of the fauna of the Port Jackson area appears to achieve its maximum on the coast between Port Macquarie and Ballina, and it was with the object of studying the distribution of this northern area that my wife and I set off in our car with camping equipment. We visited Port Macquarie, Nambucca Heads and Ballina in New South Wales, Southport in Queensland, and added Trial Bay, N.S.W., to our list on the return journey. I used the fauna of Long Reef, Collaroy, as a criterion for Port Jackson ocean reefs, and Gunnamatta Bay combined with Pittwater for bayside beaches and reefs. Unfortunately dredging could not be indulged in during our northern trip, so we confined ourselves to the intertidal regions.

PORT MACQUARIE, N.S.W.

Good tides favoured our work at Port Macquarie, and five days were spent collecting on rocky reefs at Nobby's Head, Shelly Beach and on the mud-flats lining the river. Small colonies of the fiddler crab, *Uca vomeris*, were found in firm mud near the high-tide level. The other species of mud-flat crabs belonged to species found commonly in similar localities in the Port Jackson area, with the addition of one which appears to be a new species.

The series of crabs inhabiting rocky ocean reefs may be divided into four groups: (1) Those which are hidden under stones; (2) those which bury themselves in the sand under stones; (3) those which move rapidly about in the surf; (4) those found in association with algae.

The number of species hiding under stones is far greater than that found moving about in the open on surf-washed rocks, and naturally confined to reefs where loose stones abound. We found a fine reef at Shelly Beach formed of serpentine which was splitting into large fragments, especially below low-tide mark, where the action of the water was greatly assisted by the destructive activities of large numbers of Siphunculid worms. These burrowed into cracks and crannies, with the result that large masses of rock were easily dislodged with the aid of a small crowbar. What appeared to be solid points

of rock jutting out into the sea resolved themselves into refuges riddled with small caverns in which crabs, anemones, sea-stars and worms were hiding.

Another place of concealment was formed by extensive growths of encrusting worm-tubes which covered rocky surfaces with masses of intimately intertwined tubes. The incrustation was frequently twelve inches thick, and small caverns were formed in which crabs and other invertebrates took refuge. Two types of worms were found responsible for the formation. The larger of the two built its tubes of sand grains cemented together, and the smaller, *Galeolaria caespitosa*, used lime and covered the outside of the growth as a cementing agent. *Galeolaria* is common in Port Jackson, where it is known as Sydney coral, but I have not observed the association in that area with the larger worm, at least not extensively enough to form hiding places for other marine animals. As we progressed northwards we found that this worm-built zone became more highly developed, until at Ballina it had become the most important faunal zone in the region.

Tropical species of crabs were not noticeably more numerous than at Long Reef, Collaroy, though one species, *Eriphia norfolcensis* MacCulloch, was found which was previously known to me from Shellharbour, south of Port Jackson, but not at Port Jackson.

Port Jackson Series.

Rocky Reef.

Paraxanthias atromanus (Haswell).

Ozius deplanatus (White).

Pilumnus rufopunctatus Stimpson.

Leptograpsus variegatus (Fab.)

Plagusia glabra Dana.

Plagusia chabrus (Linn.).

Mud-flat.

Macrophthalmus setosus H.M.Edw.

Macrophthalmus crassipes H.M.Edw.

Heloeccius cordiformis (Latr.).

Sesarma erythrodactyla Hess.

Mycteris longicarpus Latreille.

Tropical Series.

Rocky Reef.

Eriphia norfolcensis MacCulloch.

Xanthias lamarekii (H.M.Edw.).

Leptodius exaratus (H.M.Edw.).

Actaea tomentosa (H.M.Edw.).

Chlorodopsis areolatus (H.M.Edw.).

Pilumnus terraereginae Haswell.

Mud-flat.

Uca vomeris McNeill.

NAMBUCCA HEADS.

From Port Macquarie we drove up to Nambucca Heads, passing the enchanting Trial Bay *en route*. Unfortunately the tides were very poor during the four days we were collecting at Nambucca Heads. We managed to obtain some interesting specimens in the lagoon behind the breakwater, which is only ten years old. The tide rises and falls through the wall, and there is an extensive growth of eel grass (*Zostera*). Large specimens of the flat-rumped sea hare, *Dolabella andersoni*, were observed moving about in the *Zostera*. Where the water flowed through the wall the rocks were covered with dense growths of Sargassum weed, and here we found the tropical swimming crab, *Thalamita stimpsoni*. A second species of this genus, *Thalamita crenata*, occurred under stones on mud. Both are common species on the coast of Queensland.

The outstanding find at Nambucca Heads was a series of cast-up fragments of madreporarian corals. I collected every fragment seen, with the result that half a sugar bag was filled. The local fishermen pointed out the living reef lying about half a mile off shore, and told me that they had given up trying to fish the reef after the first couple of visits, owing to the ease with which their lines were cut by the coral. It is noteworthy that during our stay we only found the fragments on a small beach facing the submerged reef. Four genera of corals were collected, *Pæcillopora*, *Turbinaria* and two massive *Astræids*.

BALLINA.

We set up our camp in East Ballina. The richest collecting ground in this region is at Flat Rock, five miles north of the river mouth, and we visited the reef every day for ten days during the spring low tides. Our camp was situated near the northern breakwater of the river mouth, so that our daily walk was ten miles over surf beaches and two rocky headlands of black basalt. We set out each day at 8 a.m., carrying lunches, collecting bags and crowbars.

The beaches we had to traverse were partly shingle, and the sand was very rich in minerals. Several fossickers were washing for gold, tin and platinum. Our first walk was undertaken during a strong south-easter. The tide-wrack line of the beaches afforded us a fine series of large violet snails, *Ianthina violacea*, in such fresh condition, with their bubble floats attached, that we put them into a billy of water and observed the angle at which the shell floated. The dark colour of the base was directed upward, so that at sea it would blend with the dark blue of the ocean and the pale colouring of the spire would be hard to discern against the surface from a submarine view. Several shells bore clusters of small goose-necked barnacles, *Lepas pectinata*. With the violet snails we obtained the beautiful ram's horn shell, *Spirula peronii*, many of which had clusters of *Lepas pectinata* attached. Associated with these pelagic mollusca we also found *Velella* sp., *Porpita* sp. and large and small specimens of the Portuguese man of war, *Physalia* sp. There were also large numbers of a sand-dwelling compound ascidian about the size of the last joint of my little finger. Apparently these had been torn from their positions by the waves, and each had a long white fleshy stalk. The only species of crab found on this first excursion was the pelagic crab, *Planes minutus*, while none of the specimens found was on the violet snails, the latter were the largest objects cast up, except some of the *Physalia*, and all the crabs collected were various shades of mauve, strikingly like the colour of the shells.

Flat Rock is a small rocky point six hundred feet long by six hundred feet wide, standing without apparent connection to a headland; in fact during the south-east weather the beach connecting it with the shore is washed away and a shallow channel is formed between it and the land. It is reputed to be a single block of basalt which has cracked into tessellated formation; the cracks have become worn into gutters, and in some parts large shallow pools are formed, in which *Hormosira*, *Sargassum* and coralline algae grow.

Four distinct faunal zones are observable: (1) High-tide rocks and pools; (2) Barnacle region; (3) Lais-Red-Algae region; and (4) *Galeolaria-Hormosira* region. There is a small sub-region on the south-eastern side, where Port Jackson species are found under stones.

High-tide Rocks and Pools.

The molluscan fauna of this region includes *Nodilittorina* and *Austrocochlea*, both of which are common in a similar station on the reef at Long Reef, Collaroy. In one of the large pools we found four species of sea urchins taking refuge in crannies and under stones, and one specimen of the beautiful reddish urchin, *Heliocidaris tuberculata*, so common at Long Reef. Three specimens of the tropical *Echinometra mathaei* which is common on the coral reefs of Queensland were found, and several specimens of the common burrowing urchin, *Heliocidaris erythrogramma*; this was the common species, though not by any means as numerous as at Long Reef, Collaroy. One or two individuals had been attempting to burrow into the basalt, but had not been able to make any impression, only succeeding in wearing down their spines.

Only two species of crabs were collected, *Leptograpsus variegatus* and *Pachygrapsus laevis*.

Barnacle Region.

Investigating the distribution of barnacles at Flat Rock occupied much of our time. All the species present belonged to the acorn type, and in tracing them from high water towards the low tide the first to appear was a small white species, *Chamaesipho columna*; this was soon joined by a larger pale brown species, *Tetrachita rosea*, which became so numerous at about half tide that a complete carpet, pale brown in colour, covered the rocks. In the thickest part of this region we found that the original animals were dead and covered with succeeding generations, and in the hollows of the old barnacles were large numbers of a minute bivalve mollusc. This shell could be traced up to the level with *Chamaesipho columna*, but at that high station the shells were compelled to find refuge in crevices of the rocks. At half tide the carpet of barnacles was called the Barnacle Region. This zone was not continuous around the whole of Flat Rock, it appeared to achieve its greatest development at the north-eastern angle.

In one area a few yards square the barnacles were covered with oyster borers, *Morula marginalba*, which clung with extraordinary tenacity to the barnacles. I could not discover any signs of attack on the barnacles by the mollusc. In another nearby area the barnacles were covered with enormous numbers of dog winkles, *Neothais succincta*.

Where the barnacle region was crossed by deep gutters we found the purple barnacle, *Balanus imperator*, amongst the short algæ on the gutter walls; these beautiful barnacles are usually solitary. A large limpet creeps about over the barnacles, and many were observed entirely covered with *Tetractita rosea*.

At the lower edge of the region solitary specimens of *Balanus tintinabulum* make their appearance and become more numerous on the Lais-Red-Algæ Region.

The common crab of this region is *Plagusia glabra*, a swift moving species with powerful walking legs capable of clinging tenaciously to the wave-swept rocks. At low tide it walked about exposed to the air, and when disturbed dived into the gutters and pressed itself into crannies. Several times I saw it leap off the rocks and swim rapidly across wide crevices in the Lais-Red-Algæ Region.

Patiriella calcar was exceedingly common, and the gutters were thickly strewn with them.

Lais-Red-Algæ Region.

This is the extreme intertidal region, and is so called because of the dominant *cunjevoi*, *Lais* sp., and the fine red algæ which cover the rocks. On the south-eastern side of the reef this region is fringed on the seaward side by an extensive growth of *Eklonia*, beneath which is the usual thick growth of mauve and pink coralline weed.

The only crabs of this region were *Plagusia glabra*, *Naxia tumida* and *Plagusia gaimardi*, the latter taking the place of the southern red rock crab, *Plagusia chabrus*.

On the south-eastern side of the reef is a small area where loose stone can be raised, and the underlying fauna is similar to Long Reef, Collaroy. The loricates, crabs and echinoderms all belong to species common at the southern locality, but are comparatively rare at Flat Rock.

Galeolaria-Hormosira Region.

Because of the sanctuary formed by the thick growth of worm-tubes, this region proved to be the richest at Flat Rock. There was also a certain analogy between this and madreporarian reefs, for like them these colonial animals, during the process of their own development, had constructed massive formations in which totally different animals could find shelter. Several species of crabs furnished undeniable evidence that after having taken refuge in a hole amongst the worm-tubes they had enlarged the size of the original hiding place until burrows had been formed which undermined the worm colony. In some instances the worms themselves caused caverns to be formed by encrusting several stones lying together but not filling up the spaces between the stones.

The region does not extend completely around the reef; the most extensive patch is near the shore on the south-eastern side at about half tide. There is a smaller patch in a similar position on the north side.

Sessile barnacles and Galeolarian worm-tubes are found upon the carapaces and limbs of the crabs found in this region; several have one of their eyes covered so as to be useless.

The list of species collected in this region is included in the list which I have compiled in an attempt to show the sources from which the Ballina brachyuran fauna has been derived, and also in comparison with only Port Jackson fauna.

An interesting addition to our knowledge of the life histories of crabs was the discovery of a Pilumnid crab which lays comparatively large eggs, from which the young hatch out as minute replicas of the adult, and consequently have no swimming larval stage. This process has been observed in the Dromiacea of eastern Australia and the large spider crab, *Paranaxia serpulifera*,

of north-west Australia. Our specimens constitute a third instance occurring in a totally different section of the tribe.

- (1) Species common at Port Jackson, but not common at Ballina : *Paraxanthias atromanus* (Haswell), *Pilumnus rufopunctatus* Stimpson, *Ozius deplanatus* (White), *Heteropanope serratifrons* (Kinahan), *Thalamita sima* H.M.Edw., *Helice haswellianus* (Whitelegge), *Naxia tumida* Dana.
 - (1a) Species common in both localities : *Portunus pelagicus* (Linn.), *Sesarma erythrodactyla* Hess., *Leptograpsus variegatus* (Fab.), *Pachygrapsus laevis* Stimpson, *Paragrapsus laevis* (Dana), *Plagusia glabra* Dana, *Hymenicus varius* Dana, *Euplax tridentata* (A.M.Edw.).
 - (1b) Species very common at Ballina but rare in Port Jackson : *Xanthias lamareckii* (H.M.Edw.), *Atergatis ocyroe* (Herbst), *Chlorodopsis areolatus* (H.M.Edw.), *Actaea tomentosa* (H.M.Edw.), *Thalamita admete* (Herbst), *Matula lesueurii* Leach.
 - (1c) Species known at Ballina, not yet recorded from Port Jackson : *Eriphia norfolcensis* MacCulloch, *Eriphia scabricula* Dana, *Ozius truncatus*¹ (H.M.Edw.), *Euxanthus melissa* (Herbst), *Eriphia sebana* (Shaw).
 - (2) Species previously known from the Capricorn Group, Queensland : *Eriphia sebana* (Shaw), *Zoysimus aeneus* (Linn.), *Carpilius convexus* (Forsk.), *Leptodius sanguineus* (H.M.Edw.), *Pilumnus spinicarpus* Grant and MacCulloch, *Metopograpsus messor* (Forsk.), *Atergatis ocyroe* (Herbst), *Plagusia gaimardi* H. M. Edwards.
- This is the most important series of species, because five out of the eight are typical coral reef denizens and are not known to me from the mainland of Queensland. At Ballina all but *Metopograpsus messor* are inhabitants of the Galeolaria-Hormosira region, and all except *Atergatis ocyroe*, *Plagusia gaimardi* and *Eriphia sebana* are recorded from only one specimen of each species, and may therefore be considered as forms which have been brought in their larval forms by the current.
- (3) Species previously known from the mainland of Queensland : *Pilumnus terrae-reginae* Haswell, *Atergatis ocyroe* (Herbst), *Leptodius exaratus* (H.M.Edw.), *Leptodius crassimanus* A.M.Edw., *Pilumnus spinicarpus* Grant and MacCulloch, *Thalamita crenata* Latreille, *Thalamita admete* (Herbst), *Thalamita sima* H.M.Edw., *Charybdis spiniferum* Miers, *Portunus pelagicus* (Linn.).

SOUTHPORT, QUEENSLAND.

The town of Southport lies at the southern extremity of Moreton Bay, on the western shore, and the coast road crosses the bay by a bridge at the southern end of the town. The eastern shore is formed by a low sand-spit extending northward for two and a half miles, and we made our camp near the bridge, so that only a few moments' walk brought us either to the ocean beach or to the placid bayside of the spit. The bayside supported a rich fauna comprised of two series, one of southern and the other of dominant tropical forms.

Sand Dunes.

The central region of the spit was composed of sand dunes, where bleaching mollusc shells and bones lay in the shallow valleys. The ghost crab, *Ocypoda cordimana*, appeared to be the sole crustacean inhabitant of this dreary area ; a much smaller species than *Ocypoda ceratophthalma*, which does not apparently require frequent visits to the ocean. *Ocypoda ceratophthalma* inhabits an area nearer the high-tide line, and the immature individuals of both sexes were found on the bay side, whereas the adults were on the ocean side. I studied them at night and found that those on the bay side preyed upon the colonies of the soldier crabs, *Mycteris longicarpus*, carrying off stray crabs, tearing

¹ It will be observed that I have recorded two species of *Ozius*, and I am convinced after an examination of many specimens that a southern and a northern species exist. De Man has published a figure of the carapace of the type of *O. truncatus*, and the material before me agrees well with that figure. There are constant differences between this material and series of *O. deplanatus* (White) from Port Jackson.

them to pieces and feeding upon them. The adults on the ocean side carried the Ugaries, *Donax deltoides*, from the intertidal flats to a short distance above the high-tide line and fed upon them.

Bay Side Flats.

The intertidal sand flats were inhabited by soldier crabs, *Mycteris longicarpus*, and the sand bubbler, *Scopimera inflata*. Both species were in enormous numbers, though each inhabited different areas of the flats. The soldier crabs were more numerous at the southern end of the locality, and the sand bubbler crabs were in possession of the northern end. In some areas the latter were so numerous that at the end of the low tide the surface of the beach was completely covered with feeding and excavation pellets. The latter pellets are much larger than the feeding pellets, and usually differently coloured, having been brought up from the underlying sand and laid near the mouths of the crabs' burrows.

At the northern extremity of the spit we found a small colony of the Victorian soldier crab, *Mycteris platycheles*, individuals of which were not as large as those collected at Gunnamatta Bay, Port Hacking. In the same area of the spit we collected a series of the dawn crab, *Matuta lesueurii*. This species inhabits the wash line of the beach, where waves spend themselves on the sand, and the crabs move back and forth in the wash of the waves. Two species occur on the coast of northern New South Wales and southern Queensland, the large *Matuta lesueurii* and a smaller species, *Matuta lineifera*; the former is common along the eastern coast of Queensland, and I found no trace of the smaller species at Port Curtis, which is the southernmost locality I have collected in north of Moreton Bay. All the specimens of *Matuta lineifera* collected were immature and of small size.

The copulation of *M. lesueurii* was observed at Lindeman Island, Queensland, and was so interesting that it should be recorded. In all the species I have been able to study, both the immature males and females have the abdomen rigidly adpressed against the undersurface of the sternum, effectually preventing copulation until mature size is achieved. A mature male will seize an immature female by the nipper, and they both bury themselves in the sand until the female casts her shell; immediately this is accomplished she is soft and flabby, and swells to mature size, in one instance from twenty-five millimetres to thirty-three millimetres across the carapace. Copulation takes place while the female is soft; she lies on her back beneath the male, who supports her weight on specially modified pleopods or sexual organs. After copulation the female rights herself, but remains lying beneath the male, who raises his chelæ threateningly, and although usually a timid crab, the male shows great fortitude in protecting his mate during the precarious period through which she has to pass. As the hardening of the female's external skeleton progresses, the vigilant male tests the condition of her back by tapping gently with one of his nippers. The sensory organs and adjacent parts of the body become hard more rapidly than the limbs and the rest of the body. The whole process of ecdysis, copulation and hardening takes about twenty-four hours.

The other invertebrates of the spit at Southport included two species of heart urchins, *Moira stygia* and *Rhyncobryssus hemiasteroides*, which were washed up after a hard north-easter on the bay side. On our daily walks we found many sea stars, *Astropecten rappa*, but only one of the southern species, *Astropecten polyacanthus*. This was not a remarkable occurrence, as I had previously found a fine specimen of this typically southern star on the beach at Lindeman Island in the Whitsunday region.

Six species of sea urchins were collected from the *Zostera*, the largest and commonest being *Tripeustes gratilla*; individuals covered themselves with pieces of *Zostera*, a habit also evinced by the smaller *Salmacis virgulata alexandri* and *Salmacis sphaeroides*. Only one of the beautiful little globular urchin, *Mespilia globulus*, was found, and a single juvenile *Heliocidaris tuberculata*; both species were on the *Zostera*, and had a few blades of the plant attached. A large long-spined urchin, *Centrechinus* sp., was common on the *Zostera* flats, and at times individuals were stranded at low tide. The presence of this urchin made wading a hazardous undertaking, the needle-sharp spines would penetrate through the canvas instep of a sand-shoe. Although the usual coloration was black in the water, occasional ones were

seen in which the spines were transparent or banded with broad black bands, and brilliant ocelli were not observed on the tests.

Two distinct species of large anemones were collected from the *Zostera* flats; both had buried the foot and body wall in the sand without taking a grip on any deeply buried stone or other solid object, as is the habit of the stinging anemone, *Actinodendron plumosum*, an inhabitant of a similar station in the Barrier Reef region.

The larger of the two anemones at Southport spread its disc flat on the sand, and measured about eight inches in diameter; it appears to be a *Stoichactis*, though it differs from the giant anemone, *Stoichactis kenti*, in the minute size of the tentacles with which its disc is covered, and in the way it spreads out its disc. The giant anemone folds the margin of the disc so that the circular outline is lost, the Southport species folds the margins only slightly. The smaller anemone occurred in greater numbers, and was much more brightly coloured in life; the hidden body wall was rusty red, with the disc and tentacles greenish-grey with pale magenta tips. Unlike the *Stoichactis* species, the disc of this species is almost buried in the sand, and the long waving tentacles appear to rise directly from the sand.

The mollusc fauna of the spit was very rich; hercules club shells lay about on and close to the *Zostera* flats, and frequently afforded resting places for clustering oysters. In several instances the oysters had become so numerous upon one club shell as to kill it; small limpets cling to the oysters, and small crabs, *Heteropanope serratifrons*, find refuge wherever the oysters form suitable crannies. Pinna shells occur in large numbers, and add to the difficulties of collecting, their partially visible edges inflict painful wounds upon the incautious foot. The largest gastropod appears to be the hairy oyster borer, *Cymatium australasia*, and several were found laying their eggs in the form of a concave cluster attached to a parchment-like skin. Cowries, *Erronea erronea*, were taken under small masses of sponge amongst the *Zostera*. Occasional specimens of the large Sydney cockle, *Arca trapezia*, were found partially buried in the sand. There appeared to be two distinct species of flat-backed sea hare, *Dolabella*, both of large size. One species buried itself entirely in the sand, and was collected when it was being driven from hiding in search of water. The commoner species inhabited the *Zostera* patches.

Lying on sand flats in a foot or two of water in the upper reaches of the bay we found what at first sight appeared to be a small plumose anemone, pale olive brown in colour. Upon close inspection it resolved itself into a sea jelly, *Medusa*, resting upside down on the sand. When disturbed and an attempt was made to make it swim right side up, which is in the normal position of its kind, it evaded our efforts and returned to its original topsy-turvy posture, with a gently undulating rim of the disc the only movement visible. We soon found that this species of *Medusa* was common, and each one observed was at rest as described, the largest only three to four inches in diameter. It appears to be a characteristically tropical species, for I have seen it on all the sandy shores of bays near estuaries where I have collected on the Queensland coast.

The Hermit Crabs of Southport.

The hermit crabs, *Dardanus setifer*, occurred quite commonly, though in a rather extraordinary manner; all the specimens collected were exposed on the intertidal flats, and they had been killed by the exposure to the air. Each crab inhabited the shell of the hairy oyster borer, *Cymatium australasia*, from which, in most instances, the epithelium had been worn entirely from the surface of the shell.

The commonest species, *Diogenes* sp., was a minute hairy form of gregarious habits; large colonies were to be seen amongst the blades of the *Zostera*, and here and there we found the larger *Clibanarius taeniatus*, usually solitary specimens wandering along at the edge of the tide.

The anemone-bearing hermit, *Dardanus deformis*, was collected with its accompanying group of anemones, *Caliactis meriam*, and it was found that the young of this anemone cling to the blades of the *Zostera*. This association of anemone and crab has also been observed between the large deep-sea hermit, *Clibanarius strigimanus*, from the trawlers, and a large anemone in the aquarium at Taronga Park.

TRIAL BAY, N.S.W.

On our way back to Sydney we visited Trial Bay, the interesting locality at South-West Rocks. We spent our time collecting along the crescent-shaped beach towards the old gaol at Arakoon. A breakwater had been built near the gaol, and during heavy weather rocky reef dwellers are swept from their habitat and cast up on the strand in the lee of the breakwater. In this area we found many sea urchins, *Heliocidaris tuberculata* and *H. erythrogramma*, as well as molluscs and fragments of crabs, *Leptograpsus variegatus*, *Plagusia chabrus* and *Percnon planissimum*; the latter is a typically tropical species.

In one area, where seine nets had been used, we found fragments of the tropical swimming crab, *Portunus sanguinolentus*, and a complete specimen of the interesting swimming crab, *Charybdis natator*, which is credited with a wide range in the Indo-Pacific region. I have seen and collected this species when it was swimming at the surface of the sea four or five miles from land on the coast of Queensland during fine weather when the sea was as still as a mill pond.

At Arakoon we observed a small colony of the sand-dwelling hermit crab, *Diogenes custos*. A solitary individual was wandering over the sand in a shallow pool left by the receding tide; the rest of the colony was found by digging in the floor of the pool, for this remarkable hermit crab has the extraordinary habit of burying itself in the sand. On the beaches at Pittwater I have seen this species being washed back and forth in the wash of small waves and from time to time burying itself completely in the sand; a bait seized by the crab was drawn hastily beneath the surface of the sand so that the fortunate one could feed in seclusion.

In conclusion, I wish to express my thanks to Dr. Hubert Lyman Clark for the identification of the Echinoderms mentioned in the foregoing notes.

BLACK SNAKES IN COMBAT.

By DAVID FLEAY, B.Sc., Dip.Ed.,
Curator, Australian Section, Melbourne Zoological Gardens.

Plates II and III.

Early in September, 1936, I collected in the red gum (*Eucalyptus rostrata*) forest bordering the Murray River near Tocumwal, N.S.W., some very fine specimens of *Pseudechis porphyriacus*, the common black snake.

Destined to be exhibits in the open-air snake yard at the Zoological Gardens, Melbourne, these large reptiles, newly awakened from winter hibernation, averaged between five and six feet in length. In fact one of the forty-five blue-black, red-bellied captives measured seventy-two inches from head to tail, with a girth of eight inches.

During the two previous years similar but smaller black snakes, together with tiger snakes, copperheads and brown snakes, had been exhibited in this "snake pit", and though varied observations were recorded, including the devouring of newly-born young snakes by the frogs (*Hyla aurea*) provided as prey, it was not until the advent of the Tocumwal specimens of *Pseudechis porphyriacus* that truly spectacular revelations were made. Then it was proved beyond doubt that in the mating season there may be a very definite and exceedingly violent rivalry between the males of this species.

Thriving on a plentiful supply of frogs inhabiting the weeds of the water moat, the big black snakes lived side by side in amity with representatives of the other well-known venomous species, *Notechis scutatus*, *Demansia textilis* and *Denisonia superba*. At night they curled up beneath broad sheets of bark, and emerged on bright days to enjoy the warmth of the sun or to swim and hunt with graceful undulating movements in the water.

Unlike *Notechis scutatus*, the tiger snake, and *Denisonia superba*, the copperhead, other frog-loving species, *Pseudechis porphyriacus* readily takes its prey either on or below the water surface.

On the morning of October 12, 1936, an air of excitement and irritability was noticeable for the first time among the black snakes. No sooner did one specimen come into accidental contact with another than both reptiles would shoot swiftly away to cover. In fact it almost seemed that an electric tension held sway among the reptiles. As the day became warmer, two of the largest snakes approached one another and moved along side by side, with heads arched and raised about a foot from the ground. As they moved along their heads swayed slightly from side to side, and their mouths gaped open.

Though for a long time this curious alignment of the two reptiles appeared to be a preliminary to copulation, this was definitely disproved, for the pairing of the male and female is an entirely different and more passive proceeding. Akin to a fencing bout, the "on guard" position, with curved necks and raised heads, lasted just as long as it took one of the rival males to gain the advantage by placing its arched head above that of the other. Having seized the opportunity, the aggressor then twisted its neck about that of its enemy, and continued the twist, with furious writhing movements, until its whole body was entwined about that of its rival. The latter, though at a disadvantage, retaliated in similar fashion to the best of its ability. The general effect was similar to that of a two-stranded rope.

Writhing, hissing and struggling, with both reptiles exerting the greatest possible constriction on each other, and actually rolling slowly over and over *en masse*, the "round", if one may so term it, lasted for perhaps a minute. Then as if by mutual consent they suddenly disengaged completely, and separated, only to line up slowly, with gasping hisses, and repeat the whole

"on guard" position and bewildering twisting motions. And so many times on that first day and during those that followed, providing the weather was sufficiently warm for active movement, the two big snakes continued to struggle in terrific efforts to wear one another down. Occasionally they glided slowly from one end of the "pit" to the other with mouths gaping open, hissing and gasping, before one gained the coveted "neck hold" and precipitated the twisting "rope grip". Not always did they fight with one another, for occasionally a different male was involved with one or the other of these deadly rivals. Smaller males were also observed in combat, and it was noteworthy that they appeared to struggle with snakes approximately their own size. However, the original large combatants persisted in their bitter feud. The scales on both dorsal and ventral surfaces had become frayed and worn painfully thin so that hæmorrhages were visible along both bodies and a general reddish tint could be seen through the scales. So engrossed were the combatants that on several occasions they completely disregarded my presence and continued to struggle even when lifted from the ground!

Doubtless in the wild during the pairing months the stronger male intimidates rivals and drives them away from his "territory", and in support of the fact that these battles are not mere "stadium" events brought about by captive conditions I have several observations to stress.

Firstly, during these two months of October and November, 1936, while rivals fought each other in the "snake pit", copulation also took place, being indulged in at times by the rival males with various females between competitive struggles. When acts of pairing ceased in November, so likewise did all inclination to fight, and peace reigned once more.

Secondly, in the month of November, 1936, Mr. Jack Clark, a keen bushman residing at the interesting Moira Lakes (Victoria), reported to me, quite independently of events in the Zoological Gardens, that he had chanced on two large black snakes in a swamp. They were tightly entwined, rolling about, and struggling so furiously that they ignored his presence. He watched them for five minutes, and then killed both reptiles. Mistakenly, but quite naturally, he considered that they were pairing.

Thirdly, I have observed bitter struggles occurring among other male reptiles, particularly *Tiliqua nigrolutea* (the southern blue-tongued lizard), during the mating months of October and November (in southern Victoria).

In the case of the main feud in the snake yard at the Zoo, following weeks of prolonged struggling, one of the rivals eventually received the worst of the prolonged encounters and with scales torn and bleeding and evidently totally exhausted it retired for several days to rest its battered body. Previous to this respite the encounters had been more than usually bitter, and several observations were made of the rivals actually biting one another savagely.

However, in view of the strong immunity of Australian snakes to their own venom, this was definitely a very futile proceeding, and largely a display of temper. The majority of bushmen adhere very strongly to the belief that the pairing months among snakes are February and March, but my own observations on *Pseudechis porphyriacus* recorded primarily in the wild state, and secondly in captivity, indicate October and November as the true mating months for that species, with a period of pregnancy lasting until the birth of young in February and March.

I have observed *Notechis scutatus*, the tiger snake, and *Denisonia superba*, the copperhead, copulating in March, but such activity may or may not possess special significance.

The actual mating process in *Pseudechis porphyriacus* is quite distinct from the furious "rope-coil" competitive struggles of the male snakes. A male snake exhibits sexual excitement by quick nervous movements. The tongue flickers more rapidly than usual as the snake glides along in the keen alert fashion observed during the hunting of frogs. Occasionally the females are pursued for some distance. Actual copulation occurs with the male lying on—but not coiled about—the female, and heads are not raised above the ground. Curious spasmodic local twitchings and jerkings of each part of the body, from head to tail, are observed, and these gradually attain a climax of excitement. An unusual incident arising from the peculiar temperament of the snakes at this particular time occurred in November, 1936.

One morning I happened to be standing in the centre of the "pit" when two large black snakes shot out from beneath a concrete slab, one being in pursuit of the other. The fugitive, evidently a female, rapidly glided towards my feet, and knowing the advantage of remaining motionless at such a time, I made no attempt to move. However, imagine my sensations when the fugitive shot across the toe of one shoe and sought refuge up my leg *inside* the trouser cuff. With no recourse other than to clasp hands round the leg and obstruct further progress beyond the knee, I endeavoured to maintain the same statuesque pose. Following some nosing and pushing, the snake turned back and glided down again, and I retired, resolving never again to become entangled in the domestic affairs of large black snakes!

OBITUARIES.

THOMAS PHILLIPS AUSTIN.

Portrait, Plate IV.

Born at Hamilton, Victoria, on 4th January, 1874, Austin showed an interest in natural history at an early age, commencing to collect birds' eggs while a boy. In later years, as a grazier on his property, Cobborah Estate, near Gulgong, New South Wales, he developed his early predilection along scientific lines, and set out to compile firstly a representative collection of the eggs of birds breeding within the boundaries of his 8,000-acre property, and secondly to acquire as complete a collection of the eggs of Australian birds as possible. In his first objective he employed his extraordinary talent for tree-climbing, using the aboriginal methods of cutting "toe-notches" and ascending straight trunks with the aid of a tomahawk only; and sometimes adopting a variant, using iron spikes instead of notches. He also used the "hoop" method, employing a length of fencing wire for the hoop. For trees too thick, high, or otherwise inaccessible by these methods he had a 70-foot rope ladder, with catapult, fine line, and guy ropes. Thus equipped, he not only collected eggs, but also took many fine photographs of the nests *in situ*. In *The Australian Zoologist*, Vol. 1, pp. 109-137, he furnished details of 122 species, the eggs of which he had collected on his estate, and illustrated many of their nests. The only other paper he contributed to the Society's Journal was one on "The Flight of a Falcon", *ibid.*, p. 185. He visited North Queensland, the Barrier Reef region, Port Stephens, N.S.W., and other places in furtherance of his second objective, and by means of exchanging his duplicates with collectors elsewhere in the Commonwealth he acquired a representative series of eggs of over 700 Australian species and subspecies of birds. This collection is second only to that of the late H. L. White, who bequeathed it to the National Museum, Melbourne. Austin intended to bequeath his collection to the Australian Museum, Sydney, with a sum for its proper display. However, when the recent embargo was placed on egg-collecting, and several collections were handed to the Museum, Austin's magnificent accumulation, with its cabinets, was also handed in, and he then turned his attention to philately, acquiring a fine collection of the stamps of the Australian States and Commonwealth. He joined this Society as a life member in 1917, and had therefore completed twenty years of membership at the date of his death on 18th June, 1937. He left a widow and daughter.

A.F.B.H.

WALTER WILSON FROGGATT. (1858-1937)

Portrait, Plate V.

On March 18, 1937, there passed away at Croydon, near Sydney, our fellow member and former President, Walter Wilson Froggatt, one-time Government Entomologist of New South Wales.

Born in Melbourne, Victoria, on June 13, 1858, he was educated at the Corporate High School, Bendigo, Victoria. His love of nature commenced early in life, and in 1880 he collected specimens at Mount Brown Goldfield, Grey Ranges, New South Wales, and on the Flinders River, Queensland, in 1882. The material collected was sent to Mr. C. French and Baron von

Mueller. In 1885 he was appointed Assistant Zoologist and Entomologist to the Royal Geographical Society's New Guinea Expedition. In 1886 he was collecting for the Macleay Museum, the private museum of Sir William Macleay, at Cairns, Russell River, Daintree and Mossman Rivers, in North Queensland, and, during 1887-88, he collected for the same institution at North-west Kimberley, Western Australia, and Derby, Barrier Range, Lennard and Fitzroy Rivers.

From 1889-1896 he was attached to the staff of the Sydney Technological Museum as collector and assistant. His first scientific papers appeared during this period, 1890, and from that date until 1933 every year saw some contribution to Australian systematic or economic entomology, a record, and representing 43 years of service.

In 1896 he was appointed Government Entomologist to the Department of Agriculture, New South Wales. He was thus a pioneer in economic entomology in this State, his wide experience gained in the field in all parts of Australia proving of great value to him in elucidating problems confronting the man-on-the-land.

In 1907 appeared his "Australian Insects", a work now out of print, but which was the first general text-book on Australian Entomology. During 1907-08 he made investigations in connection with economic entomology on behalf of the Governments of Victoria, New South Wales, South Australia and Queensland in America, Europe, Africa and Asia. In 1909 he made investigations into coconut pests in the Solomon Islands for Lever's Pacific Plantations. In 1913 he made investigations into the palm leaf beetle in the New Hebrides for the French Planters' Association.

Upon his retirement from the Department of Agriculture in 1923, he was appointed Forest Entomologist to the Forestry Commission of New South Wales, a position he filled for four years. Many articles from his pen on forest insects appeared during this period in the *Australian Forestry Journal*, and these later formed the basis for a work, *Forest Insects and Timber Borers*, which appeared in 1927, and formed a fitting companion to his *Forest Insects of Australia*, which had appeared in 1923.

He was, like so many of the old-time naturalists, an all-round naturalist, an attitude towards nature which was perhaps brought about by the natural development of the science of biology and which of more recent years has given place to specialization in some particular branch of investigation. This general interest is evidenced in his association with so many different scientific societies. Of these mention might be made of the Linnean Society of New South Wales, of which he was President from 1911 to 1913 and a member of its Council up till his death; a member of the Council of this Society, which made him a Fellow in 1931, and it is interesting to note that in 1935 the Society published his popular handbook, *Australian Spiders and their Allies*. He was also a President of the Naturalists' Society of New South Wales, a society in which he took great interest, and he was associated with the Wattle League, Wild Life Preservation Society, and the Gould League of Bird Lovers. He had also been associated with the Australian National Research Council and the Linnean Society of London. During the latter part of his life he displayed a great enthusiasm for horticulture, his garden being utilized for growing various Australian shrubs and trees which he presented to local municipal bodies and people interested.

In 1927 the bulk of his collection of insects was sold to the Australian Commonwealth Government, and is now at Canberra, F.C.T.

To assist in popularizing nature study, he wrote "The Insect Book", which constitutes No. 1 of the Shakespeare Head Australian Nature Books, and which appeared in 1933.

The writer has been acquainted with Mr. Froggatt for a number of years, and since his retirement from the Public Service, his visits to the Australian Museum were made more frequently and members of the staff were thus able to enjoy discussion with him about the animals he had collected in the field and to hear his narratives of the localities he had visited. At his home at Croydon visitors were always welcome, and entomologists from overseas, as well as local residents, will long remember the hospitality of "Bonito", and in which connection grateful acknowledgment must be paid to Mrs. Froggatt.

A. MUSGRAVE.

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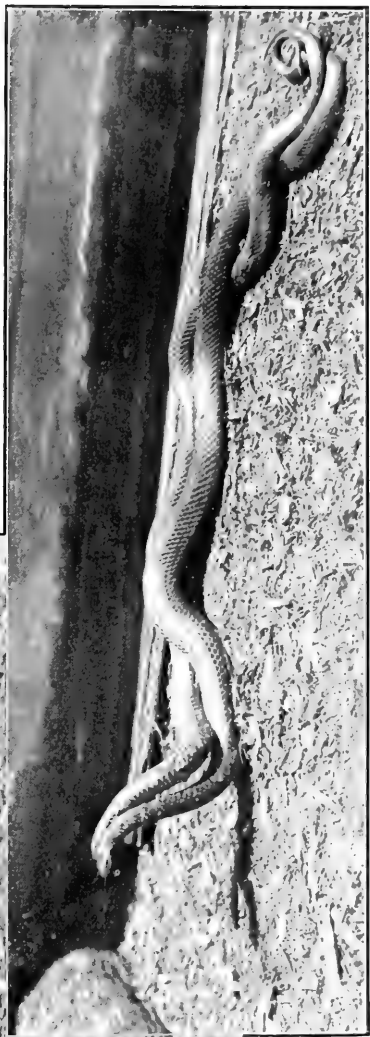
PLATE I.



Female Bird-dung Spider with egg-sacs.

[Photograph by N. L. ROBERTS.]

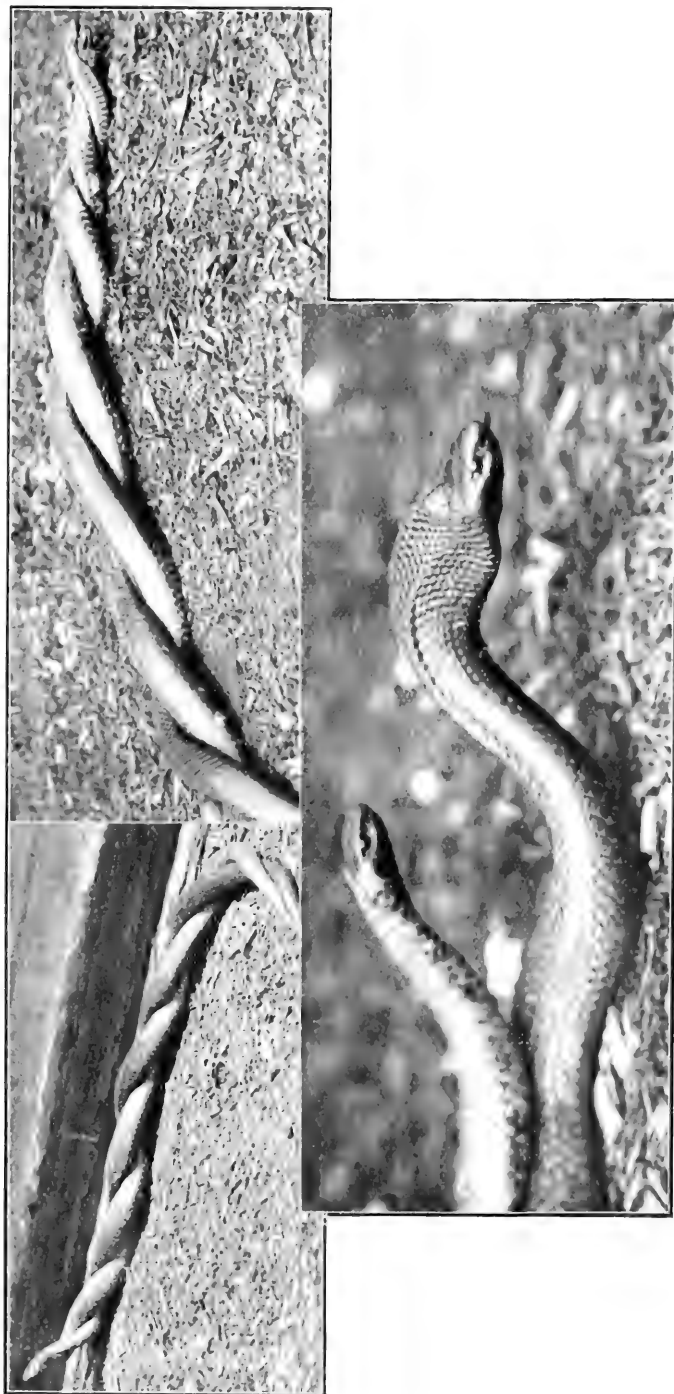
PLATE II.



Black Snakes in Combat : "On Guard."

[Photographs by D. FLEAY.]

PLATE III.

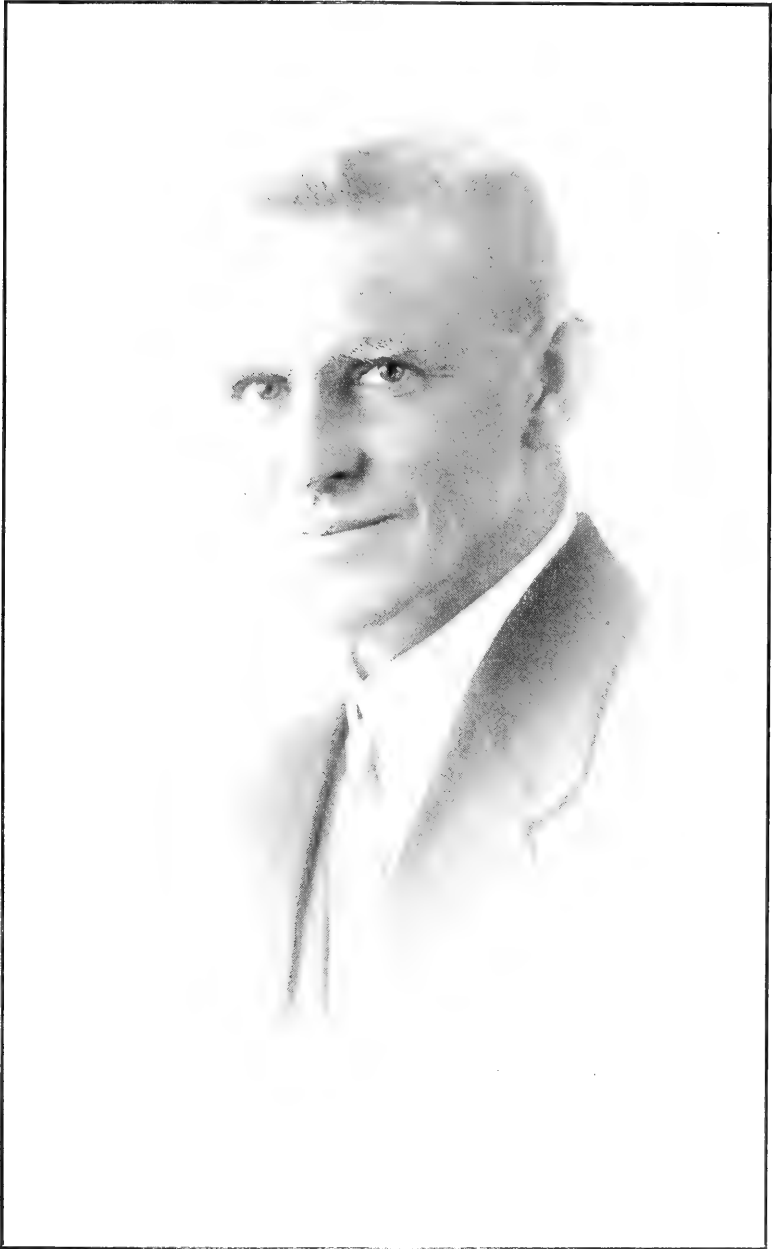


Black Snakes in Combat.

[Photographs by D. FLEAY.]

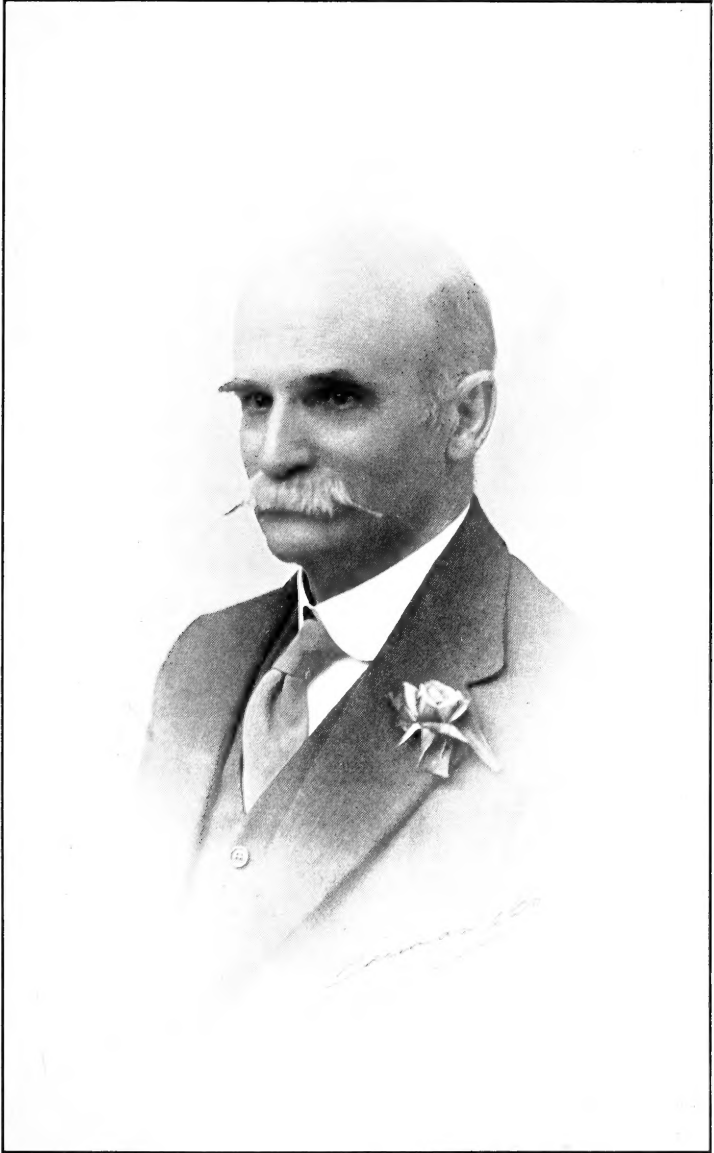


PLATE IV.



Thomas Phillips Austin.

PLATE V.



Walter Wilson Froggatt.

Royal Zoological Society of New South Wales

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