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PROCEEDINGS  
OF THE  
ROYAL ZOOLOGICAL  
SOCIETY  
OF  
NEW SOUTH WALES  
FOR THE YEAR  
1934-5



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# ROYAL ZOOLOGICAL SOCIETY OF NEW SOUTH WALES

(Established 1879.)

Registered under the Companies Act, 1899 (1917).

## PATRONS:

His Excellency the Governor, Sir Alexander Hore-Ruthven, V.C., K.C.M.G., C.B., D.S.O.  
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, 1935-1936.

**President:** Theodore Cleveland Roughley, B.Sc., F.R.Z.S.

**Vice-Presidents:** Ernest J. Bryce, F.R.G.S.; Neville W. Cayley, F.R.Z.S.; Tom Iredale, F.R.Z.S.; and Clifford Coles, C.M.Z.S.

**Honorary Secretary and Editor:** A. F. Basset Hull, C.F.A.O.U., F.R.Z.S.

**Honorary Treasurer:** Phillip Shipway.

**Honorary Librarian:** A. S. Le Souef, C.M.Z.S.

**Members:** A. Spiller Brandon, M.B., B.S.; E. A. D'Ombain, M.B., Ch.M.; W. W. Froggatt, F.R.Z.S.; Aubrey Halloran, B.A., LL.B.; Garnet Halloran, B.Sc., M.D., F.R.A.C.S., F.R.C.S. (Ed.); Keith A. Hindwood; Frank Marshall, C.M.G., D.D.S.; Anthony Musgrave, F.R.Z.S., F.E.S.; E. F. Pollock, J.P., F.R.G.S.; Gilbert Percy Whitley, F.R.Z.S.

**Assistant Honorary Secretary:** Betty French.

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

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### Avicultural Section.

Chairman: Dr. Garnet Halloran.  
Vice-Chairman: W. R. Smith.  
Hon. Secretary: Grantley A. Duncan.  
Assistant Hon. Secretary: J. E. Lehrle.  
Committee: E. Hargreaves, R. J. Murray, W. H. Belton, C. Springall.

### Budgerigar Club.

Chairman: Neville W. Cayley.  
Vice-Chairmen: R. J. Murray, W. H. Relton.  
Hon. Secretary: Ernest W. Jones.  
Assistant Hon. Secretary: V. U. Peters.  
Committee: J. Mackie, S. French, T. McSwiggan, A. Gardiner, R. Duncombe, F. Brennan.

Delegates Representing New South Wales on Australasian Budgerigar Council: Neville W. Cayley, Ernest W. Jones.  
Accredited Representatives in Melbourne: Councillor J. Hocking, T. R. Treloar.

### Marine Zoological Section.

Chairman: F. A. McNeill.  
Vice-Chairman: R. A. Johnson.  
Hon. Secretary: Miss M. Golding.

### Ornithological Section.

Chairman: Neville W. Cayley.  
Vice-Chairman: K. A. Hindwood.  
Hon. Secretary: M. S. R. Sharland.  
Committee: J. S. P. Ramsay, C. Coles, P. A. Gilbert, D. Leithhead, and N. Chaffer.

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# ROYAL ZOOLOGICAL SOCIETY OF NEW SOUTH WALES.

The Annual General Meeting of the Society was held at Science House, Sydney, on Friday, 12th July, 1935, at 8 p.m. One hundred members and visitors were present. The Honorary Secretary (Mr. Basset Hull) read the:

## FIFTY-FIFTH ANNUAL REPORT.

### MEMBERS.

On 30th June, 1935, there were 677 members on the register, divided into the various categories, as follows: Associate benefactors, 3; life members, 27; ordinary members, 300; honorary members, 7; honorary associates, 3; life associates, 23; and associates, 314. Nine members or associates died during the year, 21 resigned, and the names of eight were removed from the register under Article 9. These figures show a net increase over last year of 121 members and associates, the largest increase in any one year since the incorporation of the Society. This gratifying result is due, no doubt, primarily to the return of comparative prosperity; but credit is also due to those members who, in response to an appeal, nominated their friends for election. The thanks of the Society are also due to the firm of Angus and Robertson, Limited, for issuing, at its own expense, a leaflet setting out the advantages of membership of the Society. This leaflet was inserted in natural history books issued by the firm. Publicity given by the Press to the Society and its aims also accounted for additional applications for membership.

### DEATH OF PROMINENT MEMBERS.

Mrs. M. J. Waterhouse, who died on 13th June last, was the widow of Mr. G. J. Waterhouse, a former life member, and mother of Dr. G. A. Waterhouse, the authority on Australian butterflies. Mrs. Waterhouse was a valued supporter of the Society in the early days after its incorporation, when it was struggling for establishment on a sound financial basis. By giving the free use of her room in Bull's Chambers for the Society's meetings, she conferred a very substantial benefit upon the members, and in recognition of her services she was elected an honorary member of the Society. A keen naturalist, she made very interesting collections of shells, particularly cowries, the local varieties having been gathered from the rock pools of Sydney Harbour in her younger days. This collection was presented by her to the Australian Museum, and the other shells to the Teachers' College.

Emeritus Professor Sir Edgeworth David, K.B.E., who died on 28th August, 1934, was for many years a member of the Society, and interested in its aims. His fame as a geologist is, of course, world-wide, and needs no lengthy reference here.

Dr. John Shaw Mackay, who died on 20th November, 1934, was an associate of the Society, and a keen student of the Loricates. He was gassed during the war, and this ultimately caused his untimely

decease. Notwithstanding his disability, he travelled by car along the eastern coast of Australia from Victoria to Northern Queensland, staying for long periods at suitable localities, collecting the objects of his study. He discovered and named several new species, and was appointed honorary conchologist (in Loricata) to the National Museum, Melbourne. His collection was bequeathed to that institution.

#### THE COUNCIL.

Eleven meetings of the Council were held during the year, the average attendance at which was 13.5. Mr. J. R. Kinghorn resigned shortly after the commencement of last financial year, and Dr. G. A. Waterhouse resigned in June, 1934. The two vacancies thus caused were filled at the last annual meeting by the election of Dr. Frank Marshall, C.M.G., and Mr. Gilbert P. Whitley, Ichthyologist at the Australian Museum. During the year Professor W. J. Dakin resigned from the Council, and Dr. A. J. Spiller Brandon was elected to fill the vacancy. Messrs. Bryce and Musgrave were both on leave for part of the year, visiting Europe and other countries. After his return, Mr. Musgrave had a serious breakdown in health.

#### FINANCES.

The balance-sheet shows that the Society's financial position is satisfactorily maintained.

#### SECTIONS.

There has been a steady increase in the attendance of members at the sectional meetings. The Ornithological section has been most active in raising funds by way of dances, *et cetera*, to defray the cost of additions and improvements to the cabin in National Park. The work was carried out by the Park Trust, and the facilities for bird observing have been greatly improved in consequence.

#### AVICULTURAL EXHIBITION.

An exhibition of Budgerigars, open to members only, was held in the grounds of Dr. Frank Marshall's residence, Rose Bay, on 22nd June, 1935. There was a large attendance, and over 70 exhibits. Much interest was evinced in a novel judging competition, in which the "novice judge" whose awards were nearest to those of the official judges, was declared the winner.

#### PUBLICATIONS.

The first number of the Society's *Proceedings* was issued in August last to all members, associates, and exchange correspondents. Only one part of *The Australian Zoologist* was printed, and, owing to delay in preparation of some four-colour plates, it was not posted to subscribers until after the commencement of the new year. A popular handbook, entitled *Australian Spiders and Their Allies*, written by Mr. W. W. Froggatt, a member of Council, was published at the close of the year. The cost was defrayed from the Handbook Publication Fund.

#### JUBILEE OF MEMBERS.

Three of our life members, Messrs. G. J. Cohen, H. Levien, and Dr. J. Foreman, who joined the old Society in 1885, were invited to luncheon at Taronga Park as guests of the President and Council, to celebrate the jubilee of their association with the Society.

#### WIANAMATTA SHALE LANDS.

Further representations were made to the Forestry Department with regard to the preservation of the natural timber on the Londonderry Forest Reserve, and it is hoped that there will be no further denudation in this area.

#### BROUGHTON ISLAND.

The Chief Secretary declined to accede to the Society's request that Broughton Island be declared a sanctuary for the preservation of the sea-birds breeding on the island.

#### LIFE MEMBERS' BADGES.

The Taronga Park Trust having decided to withdraw its passes and to substitute a new form of badge, arrangements were made with the Trust to issue its badges to our life members in lieu of those formerly issued by the Society.

#### PRESENTATION TO SIR PHILIP GAME.

On the retirement of His Excellency the Governor, Sir Philip Game, the Society presented him with two enlarged photographs of the White Egret nesting on the Moree Watercourse.

#### PATRONS.

His Excellency Sir Alexander Hore-Ruthven, Governor of New South Wales, in succession to Sir Philip Game, has accepted the office of Patron of the Society.

#### PHOTOGRAPHIC EXHIBITION.

An International Exhibition of Nature Photography will be held in London during October and November next, sponsored by *Country Life*. The exhibition will be held in a hall of the British Museum of Natural History, and this Society has prepared a selection of twenty photographs by our members, illustrating some of the most beautiful and remarkable Australian birds in their natural environments. These will be despatched as representing the Society's activities in that direction.

#### TRADING IN BIRDS.

Some importations of birds for avicultural purposes were sponsored by the Society, but it was felt that this action was detrimental, and it was decided to take no further action in a direction that might be regarded as trading.

#### COVER FOR *THE AUSTRALIAN ZOOLOGIST*.

Arrangements have been made with a bookbinding firm to bind files of the Society's Journal for members in a uniform and attractive cover. Particulars can be obtained from the Honorary Secretary.

#### CHANGE OF ROOM.

At the suggestion of the proprietor of Bull's Chambers, the Society's office was moved from the ground floor to the third floor of the chambers. The new room is much quieter, lighter, and more comfortable than the former one, and the rental is substantially lower.

The Honorary Treasurer, Mr. Phillip Shipway, being absent through illness, the balance sheet was presented by the Honorary Secretary.

The Honorary Treasurer, Mr. Phillip Shipway, being absent through illness, the balance sheet was presented by the Honorary Secretary.

His Excellency the Lieutenant-Governor, Sir Philip Street, moved the adoption of the report and balance sheet. He disclaimed the possession of any zoological attainments, but assumed that the aim of the scientific zoologist was to ascertain the truth in relation to the subjects studied. He congratulated the Society upon its sound financial position, and the evident earnestness of its members.

The motion was seconded by Mr. Thomas Dunbabin, and carried.

The following members were elected to fill the vacancies caused by the retirement of six members under Article 22: Dr. A. J. Spiller Brandon, Mr. Neville W. Cayley, Mr. Aubrey Halloran, Dr. Garnet R. Halloran, Mr. A. F. Basset Hull, and Mr. Tom Iredale.

The President (Mr. T. C. Roughley) then delivered his address.

(See page 9.)

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**BALANCE SHEET AS AT 30th JUNE, 1935.**

| LIABILITIES.   |       |   |   |             | ASSETS.  |     |    |   |            |
|--|-------|---|---|-------------|--|-----|----|---|------------|
|  |       |   |   |             |  |     |    |   |            |
| £ s. d. £ s. d.  |       |   |   |             | £ s. d. £ s. d.  |     |    |   |            |
| <b>GENERAL ACCOUNT—</b>  |       |   |   |             | <b>GENERAL CAPITAL ACCOUNT—</b>  |     |    |   |            |
| Capital ..   | 1,010 | 0 | 0 |             | Australian Consolidated Inscribed Stock (Face Value) ..                    | 410 | 0  | 0 |            |
| Income ..  | 226   | 4 | 3 |             | Office Furniture and Equipment (at valuation) ..                           | 100 | 0  | 0 |            |
|  |       |   |   |             | Library (at valuation) ..  | 500 | 0  | 0 |            |
|  |       |   |   | 1,236 4 3   |  |     |    |   | 1,010 0 0  |
| <b>HANDBOOK ACCOUNT—</b>   |       |   |   |             | <b>GENERAL INCOME ACCOUNT—</b>   |     |    |   |            |
| Capital ..   | 1,200 | 0 | 0 |             | Commonwealth Savings Bank of Australia ..                                  | 199 | 8  | 2 |            |
| Less Debit Balance Income Account after allowing for adjustment due to General Fund .. | 19    | 1 | 1 |             | Less Outstanding Cheque ..   | 0   | 10 | 6 |            |
|  |       |   |   | 1,180 18 11 |  |     |    |   |            |
|  |       |   |   |             |  | 198 | 17 | 8 |            |
|  |       |   |   |             | Add Cash on Hand   | 0   | 1  | 4 |            |
|  |       |   |   |             | Amount owing by Handbook Fund on adjustment                                | 27  | 5  | 3 |            |
|  |       |   |   |             |  |     |    |   | 226 4 3    |
|  |       |   |   |             | <b>HANDBOOK FUND CAPITAL ACCOUNT—</b>                                      |     |    |   |            |
|  |       |   |   |             | Australian Consolidated Inscribed Stock (Face Value) ..                    | 250 | 0  | 0 |            |
|  |       |   |   |             | Australian Consolidated Treasury Bonds (Face Value) ..                     | 950 | 0  | 0 |            |
|  |       |   |   |             |  |     |    |   | 1,200 0 0  |
|  |       |   |   |             | Including—   |     |    |   |            |
|  |       |   |   |             | Albert Littlejohn Endowment ..   | 100 | 0  | 0 |            |
|  |       |   |   |             | Hume Barbour Endowment   | 106 | 0  | 0 |            |
|  |       |   |   |             | Walter and E. Hall Endowment ..  | 175 | 0  | 0 |            |
|  |       |   |   |             |  |     |    |   | 2,436 4 3  |
|  |       |   |   |             | Less <b>HANDBOOK FUND INCOME ACCOUNT (IN DEBIT)—</b>                       |     |    |   |            |
|  |       |   |   |             | Amount owing by Handbook Fund Income Account to General Fund on Adjustment | 27  | 5  | 3 |            |
|  |       |   |   |             | Less Balance Commonwealth Savings Bank of Australia ..                     | 8   | 4  | 2 |            |
|  |       |   |   |             |  |     |    |   | 19 1 1     |
|  |       |   |   | £2,417 3 2  |  |     |    |   | £2,417 3 2 |

I have examined the books and vouchers of the Royal Zoological Society of New South Wales for the twelve months ended 30th June, 1935, and certify that the above Balance Sheet and accompanying statements are properly drawn up so as to exhibit a true and correct view of the state of the Society's affairs as at 30th June, 1935, and the transactions for the year ended that date respectively as disclosed by the books of the Society and information supplied.

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

(Sgd.) PHILLIP SHIPWAY,  
Hon. Treasurer.

Sydney, 9th July, 1935.

**HANDBOOK FUND INCOME ACCOUNT FOR TWELVE MONTHS  
ENDED 30th JUNE, 1935.**

| RECEIPTS.                      |   |      |    | DISBURSEMENTS. |   |     |    |    |           |
|--------------------------------|---|------|----|----------------|---|-----|----|----|-----------|
|                                |   | £    | s. | d.             |   |     | £  | s. | d.        |
| To Balance at 30th June, 1934— | Commonwealth Savings Bank of Australia..                      | 281  | 11 | 10             | By Reprinting "Fishes" Hand-book .. .. .  | 20  | 5  | 0  |           |
|                                | <i>Less</i> Owing to General Fund on Adjustments ..           | 47   | 2  | 9              | „ On Account Publication Walter W. Froggatt's "Australian Spiders and Their Allies" .. .. . | 76  | 11 | 4  |           |
|                                |   | 234  | 9  | 1              | „ Investment Commonwealth Bonds (Face Value £200)..   | 222 | 0  | 0  |           |
| „ Handbook Sales ..            |   | 11   | 18 | 8              |   |     |    |    |           |
| „ Interest on Investments ..   |   | 46   | 6  | 6              |   |     |    |    |           |
| „ Donation (Sir Kelso King) .. |   | 1    | 1  | 0              |   |     |    |    |           |
| „ Advertising "Fishes" ..      |   | 6    | 0  | 0              |   |     |    |    |           |
| „ Balance at 30th June, 1935—  | Amount owing to General Fund on Adjustments ..                | 27   | 5  | 3              |   |     |    |    |           |
|                                | <i>Less</i> Balance—Commonwealth Savings Bank of Australia .. | 8    | 4  | 2              |   |     |    |    |           |
|                                |   | 19   | 1  | 1              |   |     |    |    |           |
|                                |   | £318 | 16 | 4              |   |     |    |    | £318 16 4 |

**GENERAL INCOME ACCOUNT FOR TWELVE MONTHS  
ENDED 30th JUNE, 1935.**

| RECEIPTS.                              |  |      |    | DISBURSEMENTS.                |  |      |    |    |    |
|--|--|------|----|-------------------------------|--|------|----|----|----|
|  |  | £    | s. | d.                            |  |      | £  | s. | d. |
| To Balance at 30th June, 1934—         | Commonwealth Savings Bank of Australia..         | 95   | 11 | 1                             | By Publication <i>Australian Zoologist</i> , Volume 8, Part II .. .. . | 72   | 8  | 0  |    |
|  | <i>Add</i> Adjustments due from Handbook Fund .. | 47   | 2  | 9                             | „ Office Rent .. .. .  | 169  | 0  | 0  |    |
|  | Cash on Hand ..                                  | 0    | 7  | 6                             | „ Office Printing and Stationery ..                                    | 55   | 4  | 5  |    |
|  |  | 143  | 1  | 4                             | „ Social Functions, Exhibitions, etc. .. .. .                          | 34   | 13 | 0  |    |
| „ Subscriptions—                       |  |      |    |                               | „ Telephone and Electricity ..   | 29   | 8  | 0  |    |
| „ Annual ..                            | 363  | 3    | 7  | „ Insurance (2 years) .. .. . | 5  | 4    | 0  |    |    |
| „ Life .. .. .                         | 22   | 10   | 0  | „ Subscription Refund .. .. . | 1  | 1    | 0  |    |    |
|  |  | 385  | 13 | 7                             | „ Epidiascope Repairs .. .. .  | 2    | 12 | 0  |    |
| „ Sales <i>Australian Zoologist</i> .. |  | 22   | 17 | 9                             | „ Office Furniture .. .. .   | 20   | 4  | 6  |    |
| „ Rent of Office ..                    |  | 21   | 9  | 0                             | „ Equipment and Repairs National Park "Cabin" ..                       | 35   | 5  | 3  |    |
| „ Interest on Investments ..           |  | 21   | 15 | 0                             | „ Petty Cash Expenses .. .. .  | 27   | 0  | 0  |    |
| „ Social Functions, Exhibitions, etc.  |  | 72   | 2  | 10                            | „ Bank Exchange, etc. .. .. .  | 0    | 8  | 1  |    |
| „ Bank Exchange and Postage ..         |  | 0    | 18 | 0                             | „ Balance at 30th June, 1935—  |      |    |    |    |
| „ Telephone .. .. .                    |  | 3    | 11 | 6                             | Commonwealth Savings Bank of Australia ..                              | £199 | 8  | 2  |    |
| „ Publication Sales ..                 |  | 4    | 2  | 0                             | <i>Less</i> Outstanding Cheque ..                                      | 0    | 10 | 6  |    |
| „ Epidiascope Hire ..                  |  | 2    | 10 | 0                             |  | 198  | 17 | 8  |    |
| „ Capitation Fees A.B.C. .. .. .       |  | 0    | 11 | 6                             | <i>Add</i> Cash on Hand ..   | 0    | 1  | 4  |    |
|  |  | £678 | 12 | 6                             | Adjustments due from Handbook Fund Account ..                          | 27   | 5  | 3  |    |
|  |  |      |    |                               |  | 226  | 4  | 3  |    |
|  |  | £678 | 12 | 6                             |  | £678 | 12 | 6  |    |



# Presidential Address

## THE FISHERIES OF AUSTRALIA.

By T. C. ROUGHLEY, B.Sc., F.R.Z.S.

A discussion of so vast a subject as the fisheries of Australia in the short time at my disposal will permit only of a very brief survey; no particular branch of the fisheries can be treated in any but the briefest detail, yet an endeavour will be made to review the salient features of the most important branches of our fisheries, to assess their present importance, and to indicate what possibilities there are for future development.

First let us consider the total production of edible fish from Australian waters. During the years 1927 to 1932 inclusive the average annual value of the fish produced from Australian waters amounted to £1,272,192; yet we imported from overseas, principally from Europe, Canada and the United States of America, during the same period, fish amounting to an average annual value of £1,224,364. Actually from 1922 till 1929 the imports were of considerably greater value than that of the fish produced from our own waters, and it is only since the depression, which so reduced the purchasing power of the people, that the imports, increased in price by an adverse exchange, fell away to such an extent that the local production was of greater value than that of the fish imported. But the reduced imports were not balanced by an increased local production; there was a falling away here, too. The consumption of local fish in 1931 amounted to £273,000 less than in 1929. Clearly, during the depression much less fish was eaten.

Consideration of these figures discloses a serious state of affairs. Are we not capable of producing all the fish Australians require? After all, it does not amount to very much, for we Australians are one of the poorest fish-eating people in the world, the consumption per head annually amounting only to 14 lbs., whereas New Zealand and Canada consume 25 lbs., and Great Britain 40 lbs. per head. Let us therefore examine the position in an effort to discover why we are dependent on such great importations of fish to satisfy the meagre wants of our people.

The capture of our edible fish falls into three main groups: (1) estuarine and river fish; (2) bottom-dwelling or demersal fish offshore; and (3) surface-swimming or pelagic fishes offshore.

In the capture of estuarine and river fish the seine or hauling net and the meshing or gill net are generally employed. By their use such well-known fish as mullet (*Mugil dobula*), blackfish (*Girella tricuspidata*), which is known as luderick in Victoria, black bream (*Roughleyia australis*), dusky flathead (*Planiprora fusca*) and whiting (*Sillago* spp. and *Sillaginodes punctatus*) are captured. The estuaries form the backbone of Australian fisheries, and the majority of the fish marketed come from this source. What, then, are the possibilities of an expansion of this essential source of supply? Actually, our problems here are those of conservation rather than development. In all States it may be said that there has been a steady decline of this class of fish till today we are faced with the problem of maintaining supplies at their present level rather than that of increasing them. Clearly, therefore, we cannot look for a greatly increased production from this branch of our fisheries.

Let us therefore examine the position offshore and investigate the branch of the industry devoted to the capture of bottom-dwelling fish in that region. With the exception of New South Wales all States are dependent on the use of hand-lines and long-lines for the capture of these fish, and with the exception of Queensland, Tasmania and Western Australia, there appears to be little scope for the development of that method of fishing. In New South Wales, however, the great bulk of the demersal fish marketed is captured by trawlers, and, in view of the belief in some quarters that the trawling industry is

capable of great expansion, it is perhaps advisable to examine the position in little more detail. The trawling industry of New South Wales was founded in 1915 after the Commonwealth Investigation Trawler *Endeavour* had carried out a survey of a considerable portion of the Australian coast from 1909 to 1914. The *Endeavour* discovered only two trawling grounds which clearly gave indications of commercial possibilities, one on the eastern Australian coast extending from Port Stephens on the north to Flinders Island on the south, and embracing some 6,000 square miles; the other in the Great Australian Bight and covering an area of about 4,000 square miles. In 1915, then, three trawlers were imported from England under State Government control to work the ground on the east coast. They found a considerable abundance of fish, mostly consisting of tiger flathead (*Neoplatycephalus macrodon*), within easy steaming distance of Sydney. The fleet of three original trawlers was increased in 1920 by four others constructed at the government dockyard at Newcastle (N.S.W.). But in spite of the fact that the hauls remained consistently good, and the demand for trawled fish on the part of the public was satisfactory, a loss of £330,000 resulted from the operations under Government control, and in 1923 all the trawlers were sold to private firms or individuals. In 1928 the fleet had increased to nineteen, and the industry had proved for the most part very profitable, but then the "home" grounds, *i.e.* those situated a couple of days' steaming from Sydney, were found no longer to produce the rich hauls that had characterised them previously, and the trawlers were forced farther afield. In 1929 they explored the grounds situated off Cape Everard and Flinders Island, and found them richly stocked with tiger flathead, the fish most in demand by the public. These grounds were fished rather intensively, and at the end of about two years the supplies were so depleted that they had to be rested; at least, they were visited only occasionally. Since that time the supplies everywhere have been very irregular, with the result that the number of trawlers now operating has been reduced to fourteen. With the longer steaming distance, operating costs increased greatly. Originally the cruises lasted from two to seven days, whereas now they last from nine to twelve days; prior to 1929 ten to fifteen tons of ice were taken on each trip, now twenty-five tons are carried. In addition, of course, there is an added consumption of coal, and a much higher wages bill. Actually, the trawling industry of New South Wales is facing difficult times. Yet the discovery of new grounds can scarcely be hoped for. One company's trawlers have explored the waters of Bass Strait, the east coast of Tasmania, south of South Australia, and the eastern area of the Great Australian Bight without finding fish in payable quantities; indeed, every investigation has only served to confirm the original findings of the Commonwealth trawler *Endeavour*. In 1931 a trawler made two trips to New Zealand, but the results were not considered satisfactory. However, in August, 1934, another trawler was sent to New Zealand, and since then seven trips have been made with satisfactory results. The fish caught in greatest abundance in New Zealand waters is the tarakihi (*Dactylopagrus macropterus*), which is identical with the jackass fish (also called morwong and sea bream in the trade) of New South Wales waters. The cruises to New Zealand occupy twenty-two days, with eight days' actual fishing, and the great length of the trip necessitates the carrying of fifty tons of ice. The keeping qualities of the fish are strained by so long a period on ice, and if there is to be any considerable development of this venture it would appear inevitable that efficient refrigeration will have to be carried out on board the trawlers.

Now there is a widespread impression locally that rich trawling grounds of great extent are available off the coast of New Zealand, but this seems to lack foundation. A. E. Hefford, in the Report on the New Zealand Fisheries for 1934, states that in 1927 six steam trawlers of the North Sea type were in practically continuous commission, but during 1934 it was only for a very short period that as many as two were in operation at the same time, with Auckland as their base, and only one steam trawler worked from Wellington. While expressing regret for the decline, Hefford makes the significant statement that, "on the other hand their fishing power had certainly been such that with a limited area of ground available for exploitation there was some danger of depletion from overfishing".

The great problem facing the New South Wales trawling industry, therefore, is the maintenance of the present limited supplies, and any large-scale

development seems out of the question. When one reflects on the wonderful trawling grounds which have been fished for generations by thousands of European trawlers and which still produce fish of fine edible quality in great abundance, the brief history of Australian trawling, with a maximum number of nineteen trawlers operating at any one time, presents a sorry picture. The only grounds capable of being fished by the trawlers are those situated on the narrow belt of continental shelf bordering the coast, and the whole extent of these grounds from Port Stephens to Flinders Island embraces only about 6,000 square miles. In remarkable contrast are the grounds available to the British trawlers, which embrace an area of 678,000 square miles. The wonderfully productive North Sea alone has an area of 130,000 square miles of rich trawling grounds.

From 1919 till 1922 a trawler built at Newcastle operated on the Queensland coast, but it was found that the grounds which were suitable for trawling rarely yielded satisfactory catches, and most of the bottom was too rough to allow the trawl to be hauled without the loss of much valuable gear.

Later, in September, 1929, a trawler began operations in the waters between Fremantle and Cape Leeuwin, with unsatisfactory results. This trawler, with Albany as its base, then fished in the Great Australian Bight, working portion of the ground discovered by the *Endeavour*, and satisfactory catches appear to have been obtained. However, the venture was a financial failure, and after a few trips the vessel was tied up. Burning coal at 52s. 6d. per ton, as against a price of 26s. per ton which ruled at that time in Sydney, was no doubt one of the contributing causes of the lack of success of this unfortunate venture.

Quite recently the Danish seine net has been introduced into New South Wales to capture the bottom-dwelling fish offshore. In March, 1933, this net was used for the first time in our waters, a small tug being requisitioned for the purpose, and fishing was carried on for the most part off Jervis Bay. This tug operated successfully for about fifteen months, when it foundered. Fishing was continued with other boats, and at the present time there are three employing the Danish seine net. This net has met with varied success; in the hands of some it has captured fish in payable quantities, with others it has failed to yield adequate catches. Fishing with the Danish seine net is considerably more economical than fishing with trawlers; the boats are smaller, usually about fifteen tons, they are generally fitted with diesel engines, and they require a crew of three only. Fishing is usually carried out in depths varying from twenty to fifty fathoms, with sixty fathoms about the limit of operations. The fish are landed on the boat alive, in contrast with the trawl net, where the pressure in the cod end kills the fish. The trips average eight to ten days; each haul takes about one and a half hours, of which time about forty minutes is occupied in the actual hauling of the net. The catch averages from thirty-five to forty boxes of 80 lbs. per trip, the principal fish caught being tiger flathead and sand flathead (*Trudis cœruleopunctatus*). Two tons of ice are carried on each cruise. Most of the fishing is done off Jervis Bay, though grounds off Port Stephens and Crowdy Head are also occasionally fished. The Port Stephens ground frequently yields good hauls of John Dory (*Zeus faber*).

On account of its economy of operation, high hopes were entertained that the introduction of the Danish seine net might lead to an important development in that branch of our fisheries, but these hopes have not been fulfilled. The fish have too frequently been difficult to locate, and the catches have not been consistently good.

With regard to the pelagic fishes, which embrace principally several species of the herring family such as herrings (*Harengula castelnavi*), pilchards (*Sardinia neopilchardus*), sprats (*Hyperlophus vittatus*) and anchovies (*Austroanchovia australis*), none are captured for market to any extent on the Australian coast. At times they have been seen on the eastern Australian coast from Tasmania to Queensland in great shoals, and in the case of the pilchard, in Bass Strait as far west as Port Phillip, but we know little about their movements and whether they occur with seasonal regularity. Most of the records of the occurrence of great quantities of pilchards, for instance, have been made on the New South Wales coast during the winter, and on the southern Queensland coast during late winter or spring. It is conjectured,

therefore, that these fish move from the Tasmanian coast northward during that period, but we do not know whether they are to be found in dense shoals every winter, or even whether they may not pass along our coast at other seasons. We do not know at any specified period just where these fish are likely to be found, and a knowledge of these questions is vital if a successful fishery is to be established for their capture. Recently the Commonwealth Government allotted a sum of £20,000 for the express purpose of investigating the abundance of these pelagic fishes, their seasonal migration, the duration of their occurrence on our coast in shoals sufficiently dense to allow of their capture in great numbers economically, the most efficient methods of capture, the suitability of the fish for canning and conversion into meal and oil, and the probable cost of their capture, treatment and marketing.

For this purpose a boat suitable for the use of drift nets, purse-seine and ring nets is about to be built in Australia. The determination of the regularity of occurrence of these fish will take at least three years, and if at the end of that time they have been found to occur with sufficient regularity, in sufficient numbers, and over a sufficiently long period to warrant their commercial exploitation, there is little doubt that private enterprise will quickly establish an industry devoted to their capture.

At the present time one cannot assess the possibilities of such an industry, but with the inshore fisheries in need of careful conservation, and the trawl fishery facing difficult times, it is clear that if there is to be any large-scale development of Australian fisheries, it can come only from our pelagic fish. And if the forthcoming investigation indicates that the exploitation of these fishes is not a commercial proposition, then it would appear that we shall forever be dependent on heavy imports to satisfy the wants of our people.

There are, however, one or two minor avenues in which considerable development may be expected. An outstanding example is the barracouta fishery of Tasmania. So prolific is this fish for about nine months of the year that with modern methods of capture the supply could be increased very greatly and the surplus not required as food converted into fish meal to form a valuable added diet for cattle, pigs and poultry.

## FRESHWATER FISHERIES.

The freshwater fisheries of Australia, although they include the capture and marketing of the renowned Murray cod, are extremely limited; they account for less than one per cent. of the total fish marketed. Here, also, there has been a serious depletion of the stocks, and the thorough investigation of the resources of our freshwater streams is a matter of pressing importance. The Murray cod is far too valuable a species to allow of its continued depletion.

## THE DISTRIBUTION OF FISH IN AUSTRALIA.

Briefly, the distribution of fish in all the capital cities of Australia follows the same general lines. The fish, packed with ice, is forwarded to the central market in the capital city, where it is sold to retailers, who with few exceptions do a shop trade only. There is little regular house-to-house delivery anywhere in Australia, and meagre supplies only of fresh fish reach the country districts. The whole system of distribution is inefficient and inelastic. If the market is over-supplied, the surplus is placed in an air refrigerator to be placed on sale again the following day. With another heavy supply, a still greater carry-over is refrigerated, and usually the subsequent deterioration leads to a heavy dumping. This can scarcely be avoided with refrigeration as at present practised, but the glutted market should be completely eliminated with the introduction of rapid freezing which will allow of prolonged holding without deterioration, either in appearance or flavour, or the lowering of the keeping qualities after defrosting. This process has already been placed on a commercial basis in Melbourne as a result of which frozen fillets of fish of prime quality are now distributed in cardboard containers to towns as far distant as Jerilderie, Mildura, Deniliquin, Hay, and even as far as Hillston, which is twenty-five hours by rail from Melbourne. The fillets are sent mostly to grocers and general storekeepers, many of whom have installed special refrigerating cabinets to hold the fish. The quick freezing of fish by brine is now well understood, and presents no special

difficulties in practice, but there is room for much research on the storage of the fish after they are frozen.

This Melbourne enterprise is a step in the right direction, and it is to be hoped that it foreshadows similar developments in the other capital cities. Very great quantities of fish are distributed by this means in the United States of America. The great necessity for it in Australia becomes immediately apparent when it is realised that fish is the only foodstuff we eat which cannot be regularly delivered to our doors.

#### FISH SMOKING AND CURING.

In each State the smoking of fish is carried on more or less extensively, but statistical information concerning the amount marketed is not available. Mullet and tailor are the principal species treated, each State contributing its quota ; in addition, blackfish in New South Wales, mackerel in Queensland, barracouta in Victoria and Tasmania, and snapper and sea herring or roughly in Western Australia are all smoked fairly extensively. The products are reasonably good, though, as still obtains in most parts of the world, the methods followed are mostly of a rule-of-thumb nature.

Very little curing (salting) of fish is done in Australia, the public having shown little partiality for fish so treated.

#### FISH CANNING.

Several attempts have been made in the various States to market Australian canned fish, but for various reasons few have succeeded in carrying on for any length of time. In some instances the vagaries of supplies and the unreliability of the fishermen who contracted to supply them have crippled a promising industry, while in others the cost of the fish prevented a sale of the canned product at a competitive price. Sea mullet, the most common estuarine fish in Australian waters, has been canned most extensively, and it cans very well indeed, but there is a certain prejudice in the public mind against the mullet—a prejudice which I consider entirely unwarranted for, fresh from the ocean, it is a fish of excellent quality. However, when sold under its own name the public response has been poor, and little success has attended the efforts of the canners to market it. Some three years ago a firm at Port Stephens, New South Wales, which was already marketing an excellent pack of canned oysters, decided to can sea mullet under the name of "butterfish". Lacking the usual prejudice, the public's response has been very heartening, and this firm's product has held its own on the market.

Tiger flathead and sea garfish (*Reporhamphus australis*) have also been canned commercially in New South Wales ; each was a good product, but the high average cost of both species did not allow a sufficient margin of profit when sold at a price competitive with imported salmon and herrings, and the industry ceased operations.

Other species that have been canned experimentally are the blackfish (*Girella tricuspidata*) and the Australian salmon (*Arripis trutta*), but neither was considered sufficiently attractive to warrant an extension into the commercial sphere. Pilchards obtained from Port Phillip in Victoria were packed in cans experimentally, with excellent results. The sardine is a young pilchard, and the opinion has been expressed that Australian sardines are quite equal to the imported fish. If, then, the projected Commonwealth investigation into the occurrence of this and similar fish paves the way for their successful exploitation, there appears to be little doubt about the quality of the product holding its own in the market. Apart from this problematical development, there does not appear to be much possibility of an extensive canning industry developing in Australia with any species of fish except the sea mullet. The Australian salmon (which, by the way, is in no way related to the salmon imported in such large quantities from overseas) is fairly prolific, but it is not a fish of prime quality, being rather tough and flavourless, nor is its flavour or appearance improved by canning.

A year or two ago an attempt was made to export to the East in a dry state the herrings (*Harengula punctata*) which occur in considerable abundance in the vicinity of Murray Island at the eastern extremity of Torres Strait, but the venture was not a success.

## NEED FOR UNIFORMITY OF VERNACULAR NOMENCLATURE.

There exists, at present, a confusing lack of uniformity in the vernacular names of many Australian fishes in the various States and, in some cases, within a single State. For instance, within the State of New South Wales the freshwater catfish (*Tandanus tandanus*) of the Sydney markets is known almost uniformly throughout the country districts as "jewfish", while the jewfish of the coastal regions is a totally dissimilar fish (*Sciaena antarctica*). Now for trade purposes the term "catfish" is wholly undesirable, for the common estuary catfish is (wrongly, perhaps) held in complete disdain as a food fish by the majority of the people, and any fish known by the name of "catfish" must suffer through this prejudice. The country trade has therefore altered the name. And I consider rightly so. If a food fish of good quality is not acceptable to the people because of some unwarranted prejudice caused through an unattractive appearance of the fish when whole, or through an utterly inappropriate vernacular name, then I am firmly of the opinion that in the interests of the fish trade an alteration of the name is abundantly justified. But in the case of the fish under discussion the choice of the word "jewfish" was unfortunate, because a well-known and important edible fish was already being marketed under that name. There should certainly not be two "jewfishes" in one State.

Such instances might, of course, be multiplied, but the variations are far more numerous throughout the different States. A few examples of common Australian food fishes must suffice. The blackfish (*Girella tricuspidata*) of New South Wales is known as luderick throughout Victoria, and sometimes as black bream in Tasmania. The jewfish (*Sciaena antarctica*) of coastal New South Wales is known as kingfish in Victoria and Western Australia, and butterfish (and sometimes mulloay) in South Australia. The tailor (*Pomatomus pedica*) of New South Wales is known as the skipjack in Victoria and South Australia. The kingfish (*Regificola grandis*) of New South Wales is known as yellowtail in Victoria. And so on. Now this lack of uniformity leads to endless confusion, and it should be remedied without delay. I would suggest, therefore, that a conference representative of each State be held at the earliest opportunity for the purpose of standardising the vernacular names of the fishes throughout the Commonwealth. Recent prosecutions of fish retailers in Sydney for selling fish not of the nature demanded by the customer have helped to focus attention on the necessity for immediate action in this direction.

## THE SHARK INDUSTRY.

Several attempts have been made to develop a shark industry in Australian waters, but up to the present none has met with financial success. This industry had its genesis in 1927 when two companies began operations simultaneously, one at Port Stephens, New South Wales, the other at Carnarvon in Western Australia. The latter may be classed as a "wild cat" venture, and was foredoomed to failure; that at Port Stephens for a time gave considerable promise, though eventually, after three or four years of varying fortune, it closed down. Recently several attempts have been made to revive the industry, and at the present time salted shark hides are being shipped to London from Western Australia and Norfolk Island.

Shark products are of considerable commercial importance; the hide may be converted into a most durable leather of beautiful natural grain; the oil is of value for industrial purposes (it is mainly used in the leather industry); the dried fins are always in demand by the Chinese, who convert them into soup; and the flesh may be dried for export to the East, where there is a demand for it as food, or it may be converted into a valuable meal. There is an active market awaiting the leather, oil and fins, but it is doubtful whether the price obtainable for the dried flesh in the East will warrant the cost of treatment and shipping, and its conversion into meal can only be done economically if supplies are continuous and fairly heavy.

What are the prospects, then, of the development of an extensive shark fishery? There is no doubt about the value of the products, but the whole problem hinges on the regularity of the supply. Fishing with nets in a circumscribed area with a shore base at Port Stephens, the catches, which

were at no time very regular, eventually became very uncertain, in other words the sharks were fished down to an unprofitable limit. The obvious lesson is frequently to change the area of operations over a wide limit, and, theoretically at least, a mother ship suggests itself as a ready solution. But will the returns more than offset the cost of such operations? On the coast of New South Wales, at least, this is very doubtful.

With an active market in London for the salted hides at a price which should be sufficiently remunerative there is no reason why individual fishermen, at times when edible fish are scarce, should not add considerably to their income by catching sharks and shipping the salted hides. The dried fins will add materially to the returns received, but the oil presents a difficulty, for it cannot be marketed at a satisfactory price unless the stearine it contains is extracted at a low temperature. This is scarcely practicable in the hands of fishermen, but if the combined production warranted it there is little doubt that some firm would undertake it. But we have been able to show that the oil from the livers of the whaler and tiger sharks, the former common on the eastern Australian coast, and the latter abundant on all but the southern coast, is about twice as rich in vitamin A as cod liver oil. We do not yet know the vitamin D content, but samples from both species were recently submitted to London for determination. If the vitamin D content proves to be equally rich, a satisfactory market for the oil should at once be available as a medicinal oil at a greatly enhanced price.

#### EDIBLE OYSTERS AND SCALLOPS.

The edible oyster industry of Australia is almost wholly confined to New South Wales and Queensland. The species marketed from these States is the so-called rock oyster (*Ostrea commercialis*) which occurs on the whole of the eastern coast and on the Victorian coast as far as Wangan Inlet. It does not occur elsewhere in Victoria, or, indeed, in any of the other States, its place being taken in Victoria, South Australia, Tasmania, and on the south coast of Western Australia by the so-called mud oyster (*O. angasi*), a species which grows much larger but which is of inferior quality. Commercially, the mud oyster is of little consequence, and it is nowhere cultivated to any extent.

The oyster industry is one of considerable importance, with New South Wales the principal producing State. During the years from 1927 to 1932 inclusive, the average annual production of edible oysters from the whole of Australia amounted to £106,011. Of this amount the value of the New South Wales crop averaged £85,306, or 80 per cent. of the total, Queensland averaged 18 per cent., and the combined output of the other States only 2 per cent. From New South Wales and Queensland, principally the former, oysters are exported to all the other States, including Western Australia.

Cultivation is most intensive in New South Wales, and extends from the Queensland to the Victorian borders. It is mostly confined to the inter-tidal zone, where sandstone, sticks of the black mangrove (*Egiceras majus*), wire-netting platforms or racks, and the natural bottom firmed by the use of dead shells or gravel are the principal methods adopted. Prior to the year 1870 the bulk of the oysters marketed in New South Wales were grown on shelly or gravelly bottom never bared by the tide, and the aggregate area of suitable ground on the many rivers flowing into the east coast was very extensive, and capable of a very heavy production. In that year, however, a worm known as the mud worm (*Polydora ciliata*) killed many of the oysters grown in those situations, and forced cultivation to the foreshores, where the attacks of the worm can be controlled. Gradually the worm spread from river to river, ruining the submerged beds as it advanced, until at the present time few rivers are sufficiently free from it to allow of cultivation below low tide level. The mud worm has proved a great calamity to the oyster industry of Australia.

In Queensland, practically the whole of the oysters are marketed from Moreton Bay, where cultivation consists of laying the oysters out on prepared beds between tide marks or on wire-netting racks. A considerable quantity of immature oysters is transferred from Sandy Straits, where the relatively high salinity impedes rapid growth, to the less saline waters of Moreton Bay, where the oysters grow much more rapidly.

Although a number of rivers in New South Wales are cultivated fairly extensively, the production could be increased considerably if the demand warranted it, while a survey I made of the oyster resources of Queensland in 1928 convinced me that the output from Moreton Bay could be increased very greatly. As far as the southern States are concerned the position is not very promising, for the mud oyster is not nearly so amenable to cultivation as the rock oyster, and the price obtainable for it is considerably less. But I would strongly recommend the transference of New South Wales oysters to suitable areas in Victoria and South Australia in an effort to propagate them in those waters. After a careful consideration of the physical conditions governing the propagation of that species I am inclined to think that such an experiment would meet with reasonable success.

The scallop industry of Tasmania is of considerably more value to that State than the oyster industry. From 1928 to 1932 the average annual production amounted to £5,180. A large proportion of the total catch is exported to Sydney, Melbourne, Adelaide and Fremantle.

#### LOBSTERS.

The lobster industry of Australia is also a rather important one, but I am unable to quote figures for the average annual production because in the Commonwealth statistical returns prawns and crabs are grouped with them. The average annual production in New South Wales, however, from 1928 to 1933 amounted to £23,053. The most prolific lobster-bearing grounds occur amongst the islands of Bass Strait and on the eastern Tasmanian coast and in the region of Geraldton in Western Australia. In Bass Strait and Tasmania the catch is placed in wells situated amidships in the sturdy lobster boats, and the free circulation of water they receive ensures them being landed alive. Most of the lobsters from Bass Strait are conveyed direct to Melbourne, while those landed in Tasmania are cooked for local consumption or for export to New South Wales and Victoria.

Recently lobster meat was packed in glass jars by a firm in Melbourne and by another at Geraldton in Western Australia. Both were attractive and tasty products, and the Western Australian firm is still active, but the Melbourne company suspended operations until such time as they are in a better position to obtain supplies.

There appear to be excellent opportunities for canning lobsters in Tasmania, Victoria, and particularly Western Australia, and the future should hold important developments in store for that industry. An active market awaits the product in Europe.

#### CRABS.

Of considerably less importance is the Australian crab industry. Queensland produces the greatest quantity, the average annual production for the years 1929 to 1934 inclusive amounting to £8,308. During the same period the greatest amount produced in New South Wales was valued at £1,011 in 1931. In other years the production in this State was negligible. Fair quantities are marketed in Western Australia.

#### PRAWNS.

The centre of the prawn industry is situated in New South Wales, where it is an industry of considerable importance, the average annual production from 1925 to 1930 inclusive amounting to £28,970. The principal centres of production are at Tuggerah Lakes, Myall River, Port Jackson and Lake Illawarra. Until the last two or three years the prawns were captured principally by means of fine-meshed seine nets, laboriously hauled by hand over the bottom to a boat moored in the stream, but recently stationary nets known as pocket nets have been used just inside the entrances of Tuggerah Lakes and Lake Illawarra and for some distance along the Myall River from its entrance to the Myall Lakes. These nets are placed across the narrow entrances, and block the progress of the prawns as they make for the sea in dense shoals to complete their development and to spawn. They extend from the surface to the bottom, and are joined end to end, but it is stipulated by regulation that the nets must not extend the whole distance from shore to



shore. These nets are extremely efficient, for the prawns, proceeding to sea on a tide rendered strong by the narrowness of the entrance, are simply carried into them in great numbers, but I am of the opinion that their use will require more rigid regulation because of their efficiency. It must be remembered that the prawns are all undeveloped—they will not spawn in inshore waters—and that they are proceeding to the sea to propagate. If few are allowed access to the ocean, few young will be able to return, and the inshore prawn grounds will suffer rapid depletion. It is true that a certain space must be left on one or both sides of the nets, but here the water is shallow and the run of current is much more sluggish, consequently the prawns occur in far greatest abundance towards the middle of the stream where the current is strong. I am of the opinion that as a precaution against undue depletion one-half of the entrance should remain free for the passage of the prawns to sea. These nets are used exclusively at night during the "darks" following full moon, so there is no chance of the prawns seeing the nets and avoiding them.

The annual production of prawns in New South Wales fluctuates considerably. During normal seasons the quantity produced tends to exceed local requirements and the surplus, or portion of the surplus, is shipped to Victoria and New Zealand. In spite of this export trade the market at times becomes glutted. In an effort to find an outlet for the surplus production I carried out, in February, 1934, with the assistance of the manager of the Port Stephens Canning Company, some experiments in the canning of prawns captured in the Myall River. In these experiments the prawns were wrapped in vegetable parchment and were packed in lacquered cans, both with and without salt water. Both packs were eminently successful, and suffered no deterioration after seventeen months' storage, though the wet pack proved to be of superior flavour. Neither has the delicate flavour of fresh prawns, and on this account and also because of their increased cost it would be difficult to sell them where fresh prawns are obtainable, but they are intended only for use where fresh prawns cannot be procured, and mainly for shipment to Europe, where an extensive market awaits them. It is difficult to determine, however, whether the canning of prawns could be carried out profitably every year. They occur in large quantities only during the summer months, and it is possible that seasons may occur when the supply has difficulty in meeting the demand, and the price ruling for the raw prawns would in this case render the canning of them economically impracticable. However, the production will be watched carefully with the possibilities of canning operations in view.

#### PEARL SHELL AND PEARLS.

The pearl shell industry of northern and north-western Australia is one of this country's major fishing industries, the average annual production for the six years from 1927 to 1932 averaging 1,932 tons, at an average value of £303,271, or £160 per ton. The pearl shells of Australia are gathered essentially for the shells themselves, and not for the pearls as obtains in the Ceylon pearl fisheries. Actually, Australia produces about 85 per cent. of the world's pearl shell. The bulk of it is exported to the United States of America, and a lesser amount to the United Kingdom, the figures for the years 1931-1932 being £161,397 to the United States and £31,978 to Great Britain. It is converted into buttons, buckles, knife handles and similar articles.

Pearl fishing is carried out principally in Torres Strait, with Thursday Island as the distributing centre, and on the west coast with Broome the centre of operations. At Thursday Island there are at present eight companies operating, and all are Australian-owned and controlled.

The fishing season begins early in April, when the luggers proceed on their first "drift" for the year. They remain out for from two to two and a half months, when they return to refit and re-victual. Four such "drifts" are made each year, the season extending over a period of nine months from April to December. During January, February and March, when a strong north-westerly blows almost incessantly, the water is rendered dirty and cyclones are a possibility, consequently the boats are laid up. The luggers are sturdy craft, and average about fourteen tons; each is in charge of a

Japanese, who does practically all the diving. Some of the luggers are provided with air compressors which allow of two divers being over at the same time. The complement of each lugger varies from five to seven, the crews consisting principally of Torres Strait Islanders, Malays, South Sea Islanders and aborigines. Ordinary diving suits are used, and the depth of water fished varies from about four to twenty fathoms. The diver is usually lowered till he is suspended just above the bottom, when the drift of the boat carries him with it; as soon as a bed of shell is located he signals to be lowered, and begins to collect it.

The pearl shell industry is in rather a precarious position at the present time on account of a pronounced slump in the price, which has reached the unprofitable level of £110 to £120 per ton. One of the factors contributing to this low price is the competition throughout the world of casein and synthetic resin plastics, the market for which has developed enormously during recent years on account of improved methods of manufacture and the bright and attractive colours incorporated with them. They are suitable for practically all purposes for which pearl shell was formerly used, and it is difficult to see how pearl shell can regain the market it has held so long.

The manufacture of buttons and fancy goods from Australian pearl shell was begun in Sydney in January, 1931, and the greater part of the Australian market is now supplied from this source. A splendid exhibit showing all the stages of manufacture, with photographs illustrating the actual processes, is to be seen at the Technological Museum, Sydney.

Although this industry is carried on purely for the value of the shell won, a considerable quantity of pearls is obtained, but no reliable estimate of their value can be obtained, for they become the property of the Japanese divers, and accurate returns are not furnished. An estimate which can be taken for what it is worth puts the average annual pearl production for the years 1927 to 1932 at £16,625, but that figure is probably far below the true value.

#### TROCHUS.

The trochus industry of North Queensland is of comparatively recent origin; the shell was first gathered for commercial purposes in 1912. It is used in the manufacture of buttons which are marketed under the name of "pearl" buttons, but which are distinctly inferior both in appearance and wearing qualities to buttons made from the pearl oyster, and from which they are easily distinguished by reddish, brownish or greenish markings on the under surface.

With the discovery that a market was available for this new product the trochus industry rapidly assumed considerable importance, and it was given a great impetus during the World War, when for a time the diving for pearl shell was prohibited. The initial output in 1912 was only thirty-five tons, valued at £637, with an average price of £17 per ton. In 1916 the production had increased to 1,048 tons, valued at £23,499, and the price increased to £22 per ton. Year after year the price rose, till in 1920 it reached the record figure of £90 per ton. The discovery in 1927 of great quantities of trochus on the Swain Reefs near Rockhampton, considerably further south than the fishery had been carried on up to that time, increased the production during that year to 1,080 tons, the greatest amount produced in one year in the history of the trochus fishery. The price at that time was £70 per ton. The average annual production during the six years from 1929 to 1934 amounted to 557 tons, valued at £41,701, or £75 per ton. It will be seen, therefore, that the trochus industry is one of considerable importance.

The companies interested in the gathering and marketing of trochus are all Australian-owned and controlled; the boats (cutters and luggers) are similar to those used in the pearl shell industry, and the grounds worked embrace the islands of Torres Strait and the Great Barrier Reef as far south as the Swain Reefs in the vicinity of Rockhampton, considerably farther south than commercial pearl shell occurs. The shell is mostly obtained by Torres Strait Islanders, who dive naked into the shallow water bordering the islands and reefs, or wade in the shallower water. Practically the whole of the output is sent to Japan, where the buttons are cut from the shells, mostly in the homes of the workers, who receive their supplies from the dealers.

Owing to a gradual diminution of supplies on the Queensland coast it was considered necessary in 1932 to regulate the minimum size of trochus allowed to be gathered. This was fixed at two and a half inches, and it is expected that the production will in the near future increase substantially as the result.

There should not be much difficulty in maintaining the present supply from Queensland waters, though, as in the case of pearl shell, the rivalry of casein and synthetic resins and of freshwater mussels from the United States and China is being severely felt, though possibly not to the same extent as in the case of pearl shell, on account of the lower initial cost of trochus and the cheap labour conditions governing its conversion into buttons.

#### BÊCHE-DE-MER.

An industry of less importance, but of much greater age, is that devoted to the gathering and marketing of bêche-de-mer, unattractive creatures which have been likened to sluggishly animated sausages, but which are converted by the Chinese into a soup much prized by their epicures. Bêche-de-mer occurs widely distributed along the Great Barrier Reef and amongst the islands of Torres Strait, and is gathered at low tide in much the same manner as trochus. Here again the companies are controlled by Australian capital, but the skippers of the boats are usually Japanese, who direct the operations of the crew consisting mostly of Australian aborigines and Torres Strait and South Sea Islanders.

As soon as possible after it is collected the bêche-de-mer is boiled and then gutted, partially dried, and smoked. Thus treated it shrinks greatly, and is even more uninviting than when alive. The main distributing centre is Thursday Island, where Chinese dealers buy their supplies for export, principally to Hong Kong.

The average annual production of bêche-de-mer from 1927 to 1932 was valued at £23,272, the average price per ton being about £90. The peak year was reached in 1920, when £70,898 worth was produced. The production of bêche-de-mer fluctuates very considerably, and is largely governed by the price available.

#### TURTLE.

Several attempts have been made to develop a turtle industry on the Queensland coast. Female green turtles (*Chelone mydas*) come ashore on some of the Barrier Reef Islands such as Heron and North-West Isles in the Capricorn Group in large numbers to breed during November, December and January, when they are easily captured by turning them on their backs. It was during this period that the turtle canneries operated, but each venture met with little success. However, it is perfectly clear that if unrestricted slaughter is allowed to take place at the very time when the life of the animal is so valuable for the propagation of the species, the extermination, or at least the rapid depletion of green turtles, to a limit beyond which it would be unprofitable to fish them would be inevitable, and if any attempts are made in the future to resuscitate this industry, it is imperative that a considerable part of the season during which the turtles come ashore to breed be closed against their capture; otherwise the turtles, and the industry itself, no matter how profitable it may be initially, will certainly be doomed.

A turtle soup cannery has recently been established on the north coast of Western Australia, where the green turtle is particularly abundant, and its operations will be watched with interest.

The tortoise-shell of commerce is derived principally from the hawk's bill turtle (*Chelone imbricata*), which is also commonly found in the Great Barrier Reef area. The industry based on their capture is of minor importance, however, and is subject to great fluctuation. For instance, during the six years from 1915 to 1920 the average annual production yielded only £257; from 1921 to 1926 the annual value rose to £2,630; while during the six years from 1927 to 1932 the annual output amounted to only £1,490. The amount of tortoise-shell marketed is governed largely by the ruling market value, which fluctuates greatly, ranging from 8s. 1d. per pound in 1932 to 18s. 11d. per pound in 1925.

## SPONGES.

No sponges are marketed from Australian waters at the present time, nor do first-grade toilet sponges appear to have been located, but there are three species found on the Great Barrier Reef which may claim to be of some commercial importance. They do not appear to occur anywhere in great abundance, but experiments have shown that they may be cultivated by dividing them into smaller pieces. There are certainly possibilities of a sponge fishery developing on the Queensland coast, though present indications do not appear to warrant anticipation of an industry of any size.

## CONCLUSION.

While certain of our Australian fish industries have been referred to as of considerable importance, this term has been used only in its relation to other branches of Australian fisheries. Actually, our fishing grounds and our production of fish are in no way comparable with those of Great Britain, the United States of America, or Japan. Nor do they promise ever to compare favourably with the fisheries of those countries. The main problems that face us are the maintaining of supplies at their present levels, low though they are. And even this can scarcely be done without sound scientific investigation. A heavy duty therefore devolves upon every fishery department in Australia to see that this is done. Yet, up to the present not a single department in any of the States appears to have come to a realisation of the importance of such work. Not a single State department in Australia has a full-time scientific investigator attached to the staff. Of course, there are some researches, such as that about to be undertaken into the pelagic fishes, the study of which is clearly a function of the Commonwealth Government, but there are many that are peculiar to one or two of the States, and the expenditure of Commonwealth revenue on their investigation can scarcely be justified. It is sincerely to be hoped that the great obligations of the States towards this important question will in the future be more fully realised, and that an earnest endeavour will be made to tackle the problems of conservation in a manner worthy of the industries involved. Our fisheries are not entirely our own property; posterity has as much right to a full utilisation of them as the present generation has, and we are under a definite obligation to see that they are adequately conserved for the use of the people who are to follow us.

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## REPORTS OF SECTIONS.

### AVICULTURAL SECTION.

#### *Annual Report.*

The year opened with Mr. Clifford Coles as Chairman of the Section until the return from abroad of Dr. Garnet Halloran in October, when Mr. Coles vacated the chair in favour of Dr. Halloran.

The average monthly attendance for the year was 44, with a maximum of 60 members at the October meeting, and the Section was responsible for 12 nominations of new members.

During the year the following interesting and instructive lectures were given:

- "Some of the Dangers in Exotic Birds", by Cliff. Coles.
- "Bird Life", by Cliff. Coles.
- "Walks in the North", by Price Conigrave.
- "Sea Birds", by Tom Iredale.
- "Birds and Their Habits", by A. S. Le Souef.
- "Birds of Prey", by Neville Cayley.
- "Agapornis", by Cliff. Coles.
- "Bird Transport", by Chas. Camp.
- "The Aquarium", by Chas. Camp.
- "My Experience in Building Aviaries", by Jack Murray.
- "Some Aspects of Parasitism after Helminths, with special reference to Eye Worms of Avian Stock", by Fielding.

In most cases the lectures were supported by lantern slides.

Numerous matters relating to Aviculture generally were discussed and aviary notes of interest recorded.

The Committee held five meetings during the year, and a special Sub-Committee was appointed by the Section to advise the Chief Secretary on points relative to the suggested amendment of the Birds and Animals Protection Acts, 1918 and 1930.

The Section extended its patronage to several kindred societies, and submitted a list of capable judges to adjudicate at the respective bird shows of the year.

The Section delegated to Mr. McSwiggan the duties of Publicity Officer to record matters of importance to be forwarded on to the General Secretary for publication.

Due to the efforts of the Chairman a pleasant afternoon was spent at Taronga Park as a termination of the year's activities.

G. A. DUNCAN,  
Hon. Secretary.

### BUDGERIGAR CLUB.

#### *Annual Report.*

The third year of activities of the Budgerigar Club having just closed, it is very gratifying to report that during the past twelve months much progress has been made.

The monthly meetings have always been well attended, and at all times members have shown a keen desire to further the production of better budgerigars in this State of the Commonwealth.

I am pleased to be in a position to report that finality has been reached in the compilation of an Australian Standard of Perfection and Colour Classification, and that arrangements for the publication of this are in the capable hands of the hon. secretary of the Australian and New Zealand Budgerigar Council. It is regretted that the adoption of our standard was not quite unanimous, as the representatives of one State saw fit to disagree and subsequently withdraw from further participation in Council affairs.

Those of our members who have followed the budgerigars from an exhibition standpoint must have surely noticed their marked improvement and rise in popularity during the life of this Club. Three years ago comparatively few were to be seen on the show benches, whilst at shows now held under the patronage of this Club they have become the leading feature

and are to be seen in hundreds. Whilst progress has been very satisfactory in this respect, so also has been the improvement in the type, perfection of colour and all round quality of the exhibits and the manner in which they are displayed.

These improvements have been brought about by the diligence and care displayed by the members of this Club in their earnest desire to keep pace with breeders in other parts of the world.

I feel in duty bound to refer to two wonderful displays of budgerigars I had the pleasure of viewing during the year just closed, *viz.*, the All-Australian Bird Show held in Melbourne during the Centenary celebrations in that city, and the show just brought to a close under the management of the Ornithological Association of New South Wales. At both fixtures there were on view, and splendidly displayed, many budgerigars that I feel sure would favourably compare with those shown in the largest exhibitions in the world. At both these exhibitions this Club had the honour of providing judges, and it is pleasing to report that on both occasions the premier prizes were won by members of this Club. At the former Mr. H. E. Peir had the honour of breeding and exhibiting the best budgerigar in the show, and a similar honour fell to the lot of Mr. J. W. Catt in the latter. Mr. Catt was also the owner of the best bird of opposite sex to his champion. To these gentlemen the Club's congratulations are extended.

It is regrettable that circumstances would not permit of this Club holding an annual show, and arrangements are to be made that will compensate for that in the near future.

With a view to fostering a social spirit amongst members, and at the same time to provide opportunities for enlightenment on the standard of perfection, it has been decided to organize a series of half-day parade shows, the first of which will take place on 22nd June,\* and with the co-operation of members there is no reason why these outings should not be brought to a successful issue.

Our thanks are due to Mr. Neville Cayley and Messrs. C. Coles, T. C. Roughley and K. A. Hindwood, who have entertained us by delivering instructive lectures during the year, and their efforts were appreciated by all.

Your Committee has had a very strenuous term, but it looks back with satisfaction on its work for the past year, and that its successors may make further progress in their endeavours to popularise the breeding and exhibiting of still better budgerigars in Australia is the earnest prayer of every member of your Committee on the eve of their retirement.

ERNEST W. JONES,  
Hon. Secretary.

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## MARINE ZOOLOGICAL SECTION.

### *Ninth Annual Report.*

The Committee of the Marine Section has much pleasure in presenting to its members the Ninth Annual Report.

The attendance at meetings has been disappointing, and this is regrettable in view of the high educational standard set. Those who came regularly showed great interest and enthusiasm.

Successful field excursions were held throughout the year to Grotto Point (Middle Harbour), Long Reef and Bottle and Glass, whilst some of our members made two expeditions to Five Islands.

Miss G. Charter-Smith, while Secretary of the Section, established a "Documentary" Library, which is available for the use of members.

Lantern lectures have been an important feature of the monthly meetings. The syllabus for the year embraced a series of lectures which maintained the standard and provided the audience with both instruction and entertainment.

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\* This exhibition was duly held, and proved most successful (*vide* Annual Report of the Society).

The following is a list of the lectures delivered during the year :

1934—

- July : " A Recent Trip to Hayman Island ", by F. A. McNeill.  
August : " Fisheries Developments during the Past Few Years ", by  
T. C. Roughley.  
September : " A Visit to the Ballarat Trout Hatchery ", by Dr. Spiller  
Brandon.  
October : " Destructive Organisms ", by R. A. Johnson.  
November : " Wild Fishes and their Domestic Habits in the Aquarium ",  
by A. K. Carter.  
December : " The Lure of the Loricata ", by A. F. B. Hull.

1935—

- February : " How Shells Look After Themselves ", by Miss Joyce Allan.  
March : " The Fishes of New Zealand ", by G. P. Whitley.  
April : " Lindeman Island ", by Melbourne Ward.  
May : " The Romance of Sea-bird Migration ", by Tom Iredale.  
June : " Adaptations among Crustaceans ", by F. A. McNeill.

F. A. MCNEILL,  
Chairman.

G. CHARTER-SMITH,  
Hon. Secretary, July-Nov.  
MAISIE GOLDING,  
Hon. Secretary, Dec.-June.

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#### APPEAL TO MEMBERS OF THE ROYAL ZOOLOGICAL SOCIETY OF NEW SOUTH WALES.

The commencement of a new syllabus is a fitting time to bring forward new ideas. Let us suggest, therefore, that the lectures arranged for the Marine Section be appreciated by larger audiences.

That we have in Sydney a large circle thirsting for information on biological subjects is a fact, and is only normal in a community which lives by the sea and round such a wonderful harbour.

It was with the intention of disseminating knowledge, promoting discussion and encouraging observation that the Marine Section was formed, and all persons interested are invited to be present on the first Monday of each month (except on Public Holidays); in that case, on the first Tuesday, in the room of the Society, Third Floor, Bull's Chambers, Martin Place, at 8 p.m.

R. A. JOHNSON,  
Chairman.

MAISIE GOLDING,  
Hon. Secretary.

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#### ORNITHOLOGICAL SECTION.

##### *Annual Report.*

The past year has been marked by greater enthusiasm among members generally. There has been a series of instructive lectures and a continuance of the high standard of work which in recent years has placed some of our members in the forefront of ornithology and distinguished them as leaders in bird photography.

The average attendance at the Section's meetings throughout the period under review was 45, this being an increase of two for each meeting during the previous twelve months. The Christmas party took the place of the monthly meeting in December, and the lectures delivered at the other meetings have been as follows :

1934—

- July 20th : Norman Chaffer : " Cinema films of birds."  
August 17th : N. W. Cayley : " Pigeons and Doves."  
September 21st : Professor J. Macdonald Holmes : " Bird Mapping and  
Distribution."  
October 19th : Clifford Coles : " Aviculture and Ornithology."  
November 16th : P. A. Gilbert : " Birds of the Coolah Valley."

1935—

January 18th : C. F. Laseron : " Birds of the Antarctic."

February 15th : C. Price Conigrave : " Birds of Houtman's Abrolhos."

March 15th : J. S. P. Ramsay : " Bird Photography with a Miniature Camera."

April 26th : K. A. Hindwood : " Bird Behaviour."

May 17th : M. S. R. Sharland : " The Lyrebird."

June 21st : N. W. Cayley : " Sidelights of Ornithology."

It is difficult to single out any one of these for special mention, because all proved of considerable interest, and each lecturer imparted much information concerning his subject, though one may be permitted to refer to the address by Professor J. Macdonald Holmes, for the subject of bird-mapping was new to the Section. The lecturer referred to the magnitude of the task of mapping the range of even the common birds, but pointed to the valuable information which would be available when the maps were completed. The lecture served to indicate one activity of the Gould League of Bird-Lovers of New South Wales, an organisation which this Section recognises as playing an important part in protecting birds, and with which members are associated in an official capacity and assist its objects by their interest and co-operation.

No report of the Section would be complete without reference to the Society's biological station at National Park, which is generally referred to as the "cabin". The Section was responsible for extensive improvements here during the year, having spent approximately £35 on replacements to equipment, renovations, and a new fireplace and chimney, the amenities generally have been vastly improved, and its popularity among members is increasing, so much so, in fact, that reservations are often necessary several weeks ahead.

For the first time during some years the Section, on behalf of the Society, submitted to the National Park Trust a report setting out the activities associated with the cabin and, in addition to emphasising the important part which it played as a base for nature-study in the Park, supplied a comprehensive list of references to articles and scientific papers which had been compiled partly or entirely from observations made by members using the cabin. It is intended that similar reports shall be submitted to the Trust each year. The committee believes that the report justified the Society's claim to the continued occupancy of the cabin, a subject which was raised this year by the National Park Trust, but it appears that the matter has been satisfactorily adjusted and that the Society can continue to enjoy the benefits of the cabin for some years to come. It is considered that closer association with the National Park Trust would be beneficial to the Society, and during the coming year it is intended that steps shall be taken to put such a policy into effect.

Special reference must be made to the efforts of the committee which had charge of the arrangements for the Section's party in December, by which the cabin funds benefited to the extent of £25. The function was eminently successful, and the thanks of the Section were extended to the members of the committee for their splendid services. The following figures indicate how the money was spent:

#### RECEIPTS.

|                                     | £          | s.        | d.       |
|-------------------------------------|------------|-----------|----------|
| Proceeds of Christmas Party .. .. . | 25         | 15        | 4        |
| Grant from R.Z.S. Council .. .. .   | 10         | 0         | 0        |
| <b>Total .. .. .</b>                | <b>£35</b> | <b>15</b> | <b>4</b> |

#### EXPENDITURE.

|  | £          | s.       | d.       |
|--|------------|----------|----------|
| Cutlery, Crockery, Pillows, etc. .. .. .       | 5          | 0        | 0        |
| Mattresses, Bedding, etc. .. .. .              | 11         | 11       | 8        |
| Fireplace and Chimney and Whitewashing .. .. . | 10         | 15       | 0        |
| Two Cupboards .. .. .                          | 7          | 19       | 6        |
| <b>Total .. .. .</b>                           | <b>£35</b> | <b>6</b> | <b>2</b> |



The thanks of the Section are also extended to those members who generously donated articles to the cabin equipment. Efforts will be resumed during the coming year to raise money further to improve the cabin, and in the meanwhile a fund is accumulating from the contributions of 1/- a head which members of the Society are now asked to pay upon booking the cabin for week-ends. This charge was authorised by the Council in the Rules which, at the instigation of this Section, were passed during the year for the management of the cabin.

The field excursions have not been a strong part of the Section's activities during the year. Indeed, these have been allowed to lapse. There appears to be some difficulty in obtaining leaders, and it is questionable whether much advantage is derived from such outings. Evidently it is for these reasons that most members seem to prefer solitary or individual observation and excursions in small companies.

A. H. Chisholm's book "Bird Wonders of Australia" was a notable addition during the year to the literature dealing with Australian birds. The author is still a member of the Society, and the congratulations of the Section were extended to him for his latest work.

"The Emu", the journal of the Royal Australasian Ornithologists' Union, again has reflected the good work of members of this Section, the standard of both articles and illustrations comparing favourably with those from other States. Papers and articles deserving of special mention include P. A. Gilbert's "Seasonal Movement and Migrations of Birds in Eastern New South Wales", R. Gannon's "Association of Small Insectivorous Birds", and K. A. Hindwood's "Painted Honeyeater" and "Mangrove Birds", and there have been several others of interest.

It is a matter for regret that members do not appear to be able to support the Royal Australasian Ornithologists' Union in the matter of its annual congresses and camps when these are held in other States. The camp last year was abandoned on account of lack of numbers, but it is hoped that this failure of one of the Union's activities will not be allowed to recur, though it must be remembered that this lack of support has by no means been confined to New South Wales, but owing no doubt to economic stringency has been common to all States.

Organised camps have become an established feature of the Section, and the camp which was held near Wamberal last October proved most successful, more than 70 species of birds being observed, several of which were nesting. The selection of a site for a camp in the forthcoming spring will be one of the matters for consideration in the coming year. An invitation to the next camp has been extended to the Council of the Royal Australasian Ornithologists' Union, and it is hoped that interstate members will be included in the party.

Much interesting material has been supplied by members of the Section in the "observations", which form a by no means unimportant part of the monthly meetings. These are to be collated and summarised for publication in the Proceedings of the Society, so as to form a permanent record. The Section may justly be proud of its progress during the last twelve months, particularly in its achievements regarding the National Park cabin, which have benefited the Society as a whole, and the members may look forward with confidence to a continuance of its successful activities in the coming year.

M. S. R. SHARLAND,  
Hon. Secretary.

## SYLLABUS OF SECTIONAL MEETINGS.

July, 1935, to June, 1936.

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

1935.

July 8.—“Genetics”, by Dr. I. Clunies Ross, D.V.Sc.

August 12.—“Some Problems in our Struggle against Disease”, by Dr. W. C. Sawers.

September 9.—“Birds I have Kept and Some of Their Ailments”, by J. Ward.

October 14.—“The Experimental Embryology of Birds and its Bearing on Human Affairs”, by A. N. Colefax, B.Sc.

November 11.—“Australian Birds”, by T. Iredale.

December 9.—“Items of Interest at Taronga Park”, by C. Camp.

1936.

January 13.—“Bird Parasites”, by K. A. Hindwood.

February 10.—“Taxidermy”, by Clifford Coles.

March 9.—“Vitamins in Relation to the Food of Birds”, by Professor Priestley.

April 14 (Tuesday).—“Pigeons and Doves”, by Neville W. Cayley.

May 11.—“Further Observations in Relation to Zoological Societies Abroad”, by Dr. Garnet Halloran.

June 9 (Tuesday).—Annual Meeting.

BUDGERIGAR CLUB (Third Tuesday in the Month)—

1935.

July 16.—“Neophema Parrots”, by Neville W. Cayley.

August 20.—“Common Diseases of Parrots”, by Dr. Garnet Halloran.

September 17.—“A Naturalist in Tropic Isles”, by G. P. Whitley.

October 15.—“Birds of Lord Howe Island”, by Tom Iredale.

November 19.—“The Lyretail”, by M. S. R. Sharland.

December 17.—“Bird Psychology”, by A. S. Le Souef.

1936.

January 21.—“Colour Factors in Budgerigars”, by T. J. McSwiggan.

February 18.—“Bush Birds”, by K. A. Hindwood.

March 17.—“Aviaries and Their Management”, by Clifford Coles.

April 21.—“Genetics”, by Dr. I. Clunies Ross.

May 19.—“Bird Photography”, by J. S. P. Ramsay.

June 16.—Annual Meeting. Chairman’s Address.

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

1935.

July 1.—“Fantastic Fishes”, by G. P. Whitley.

August 6 (Tuesday).—“Fish Habits”, by A. S. Le Souef.

September 2.—“The Story of a Pearl”, by Joyce K. Allan.

October 8 (Tuesday).—“Planktonic Creatures”, by Professor W. J. Dakin. (This meeting will be held in the Zoology Department, Sydney University.)

November 4.—“Remarkable Associations in the Animal Kingdom”, by A. N. Colefax.

December 2.—“Marine Life of Antarctica”, by C. F. Laseron.

1936.

February 3.—“The Life of a Barnacle”, by F. A. McNeill.

March 2.—“Ten Months on the Kermadecs”, by Tom Iredale.

April 6.—

May 4.—“Sea-faring Mammals”, by E. L. Troughton.

June 9 (Tuesday).—Chairman’s Address, by R. A. Johnson.

ORNITHOLOGICAL SECTION (Third Friday in the Month)—

1935.

July 19.—“New Zealand Birds”, by Tom Iredale.

August 16.—“Some Sea Birds”, by M. S. R. Sharland.

September 20.—“Biological Regions”, by Professor J. Macdonald Holmes.

October 18.—Review of Camp and Bird Notes, by members.

November 15.—“Birds and their Nests”, by P. A. Gilbert.

December 20.—“In Search of the Blue Bird of Paradise” (Cinema),  
by J. E. Ward.

December.—Christmas Party (date to be fixed).

1936.

January 17.—“Work of Zoological Societies Abroad”, by Dr. Garnet Halloran.

February 21.—“North Australia”, by G. Price Conigrave.

March 20.—“Bird Studies with a Movie Camera”, by Norman Chaffer.

April 17.—“Bird Parasites”, by K. A. Hindwood.

May 15.—“A Scientist Abroad”, by Anthony Musgrave.

June 19.—Chairman’s Address, by N. W. Cayley.

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## NATURE NOTES.

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Several interesting notes regarding birds were made by members of the Ornithological Section in the course of "observations" at the meetings during the year. Some of these are as follows:

Albino birds.—Mr. N. W. Cayley reported the occurrence of a white starling and a white kookaburra. Mr. Leithhead also reported having seen a white kookaburra on the North Coast. The honorary secretary said that he had seen a white English blackbird in a park in Melbourne. Mr. Gannon reported having seen a partial albino whistling thrush at Paddy's River, the bird having the lower part of its wings white.

White-eared Honeyeater.—There were several observations concerning this bird of the heathlands. Mr. Bryce saw one picking hairs from the skin of a dead rabbit to line its nest. Mr. Hindwood reported that the bird also made use of hairs from deer, fur from wallabies and bandicoots, and bristles from a pig for lining material.

Lyrebird.—Mr. Hindwood recorded an early instance of nesting by the lyrebird, a nest with an egg having been found at Lovett's Bay on May 26, 1934. The other extreme was recorded by Mr. Rhodes, who said that he found a nest with a comparatively fresh egg on August 28. Several members reported that nests at National Park had been robbed, the eggs having disappeared and the lining having been disturbed.

White-backed Swallow.—Mr. Gannon and Mr. Emerson reported having seen the white-backed swallow entering a nesting hole in the bank of the Macquarie River near Wellington.

Black Duck.—The honorary secretary reported having found a nest and nine eggs of this bird at Kellyville.

Birds in the City.—Mr. Hindwood reported a rufous fantail in an office in Kent Street. Mr. Emerson and the honorary secretary, kestrels over city buildings.

Welcome Swallow.—The honorary secretary said that a pair of welcome swallows had young birds in a nest at Mosman on June 4—a late record.

Mr. Hindwood gave an account of a visit which he paid to Lion Island, at the mouth of the Hawkesbury River, in May, when he said that there were still a few mutton-birds in their burrows—young ones, well grown. There was also evidence of little penguins having nested on the island.

Double-banded dotterels were reported by Mr. Hindwood at Cronulla early in May.

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## A SEPARATE FACTOR FOR MARKINGS ON BUDGERIGARS.

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By T. J. McSWIGGAN.

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The researches of Dr. Duncker and General-Consul Cremer have been responsible for the separation of certain known colour factors in Budgerigars. These factors are described by Cyril Rogers, F.Z.S., in his book "Budgerigars", as follows:

"The yellow factor is called "F" and gives the bird a green or yellow appearance. The oxydase factor "O" causes the blue and white effect and also controls the depth of the undulations on wings, neck and back of head. . . The "B" or brown factor works quite independently of other factors controlling only the depth of shade of colour. Birds that possess "F" and "O" factors appear green. If the "O" is missing leaving only the "F" the bird is yellow, and with the factor "F" absent also, white. With the "O" only we get blue . . ."

It appears, then, in the light of knowledge available from breeding experiments, that there existed a single determiner which was responsible for the blue and white effect and which also controlled the depth of undulations on wings, neck and head. This was evident when the "O" (oxydase) was separated from the "F" factor, and the undulations on the resultant blue bird underwent a slight variation. It was further evident in the dilution

of the markings on mauve-white, cobalt-white, and sky-white. However, since the production of these birds other varieties have been evolved in Australia, and in the knowledge of later breeding experiments there is reason to believe that a factor distinct from the oxydase factor influences the depth of undulations on wings, neck and head of budgerigars.

The varieties evolved in Australia which will be used to support the theory that a factor distinct from the "O" (oxydase) factor influences the depth of undulations on wings, etc., are :

1. *Yellow-wings*, comprising yellow-wing olive, yellow-wing dark green, and yellow-wing light green.
2. *White-wings*, comprising white-wing mauve, white-wing cobalt, and white-wing sky blue.
3. *Grey-wing Yellow*, a pure rich yellow bird with definite dark grey markings.

The coloration of the body in any of the varieties mentioned in group 1 is equally as intense as the body colour of the normal green. Both normal green and yellow-wing greens possess "F" and "O" (oxydase) factors, but whereas the normal green is identified with full depth of undulations on wings there is an absence of markings on the yellow-wing greens, and the wings are clear yellow. Thus we have two varieties possessing the same "O" factor, but in one there are heavy undulations on the wings, and on the other a total absence of markings.

In contrast to yellow-wing greens and normal greens, which contain "F" and "O" factors, there are the normal blues and the white-wing blues. The "F" factor has been eliminated, leaving only the "O" (oxydase) factor, which causes the blue and white effect and, it is said, controls the depth of undulations on wings, etc. Here there are two varieties, with coloration of bodies equal in intensity, possessing the same known colour factors, yet the wings of one variety bear heavy undulations whilst the other is characterised by white wings with almost total absence of markings.

An illustration of the grey-wing yellow seems to add further evidence to the theory that a separate factor other than the oxydase influences the depth of undulations on the wings. This variety possesses "F" factor only the "O" factor having been eliminated, yet the depth of the markings on wings, etc., is equally as definite, and in some cases more so, than the varieties which claim the "O" (oxydase) factor.

#### CONCLUSION.

There seems to be evidence to support the theory that a separate factor controls the depth of markings :

- (a) Normal marked greens and yellow-wing greens possess "F" and "O" factors. The wings of the normal variety have heavy and definite undulations, but the yellow-wing green is distinguished by absence of markings on the wings, which are clear yellow.
- (b) Normal marked blues and white-wing blues have the same intensity of coloration on the bodies, and although both possess the "O" factor only, one is distinguished by definite heavy markings, and the other by an almost clear white wing.
- (c) In the grey-wing yellow the "O" factor has been eliminated, leaving only the "F" factor. There are, however, definite dark grey markings on wings, neck and head.
- (d) As far as can be ascertained all new varieties mentioned breed true, but further breeding experiments will be necessary definitely to establish that a separate factor controls the depth of undulations on wings, neck and head. The results of these experiments will be watched with interest.

## THE WORK OF ZOOLOGICAL SOCIETIES ABROAD.\*

By GARNET HALLORAN, B.Sc., M.D., F.R.A.C.S., F.R.C.S. (Ed.).

The question "is it justifiable to keep animals in captivity?" has been answered in almost all countries by the establishment of zoological gardens, usually in association with zoological societies. Such animal collections, however, are merely the external evidence to the lay public of the societies' activities, whereas the enormous amount of scientific work going on, behind the scenes, is presented usually in the form of papers read before scientific societies. Broadly speaking, such animal collections come into three categories, namely:

- (1) The travelling circus.
- (2) The menagerie (for the display, exchange or sale of animals).
- (3) The modern zoo, in whose laboratories whole-time research workers are engaged.

The status of any modern zoo may be based on the answers given to a questionnaire, e.g.:

- (1) How many different species?
- (2) What is the total number of stock?
- (3) What research work have you published this year?
- (4) What innovation is incorporated in this zoo?

It will be obvious that (1) is more important than (2). London and Berlin, for example, concentrate on species. (3) "Research work" has assumed tremendous importance in some zoos, and is absent in others. (4) "Innovations" may pertain to such matters as:

- (1) *Architectural design*, as at *Hagenbeck's Zoo*.
- (2) *Ethnological studies*, as at *Stockholm*.
- (3) *Industrial displays* indicating the economic importance of certain forms of animal life in industry, as in *Paris Zoo*.
- (4) Spacious isolated breeding parks, as at *Whipsnade, England*.
- (5) *Administrative changes*, such as the appointment of two *medical men* to key positions in *London Zoo*, or appointment of two *veterinarians* to key positions in *New York Zoo*.
- (6) Financing whole-time research workers within a zoo.
- (7) Inclusion of insect houses, tropical houses and innovations in aquaria, etc.

The Zoological Society of London may fittingly be dealt with first. It was founded in 1826 for the advancement of zoology and animal physiology and for the introduction of new and curious subjects of the animal kingdom.

About 8,000 Fellows subscribe to this Society.

It is now regarded as the most important zoological institution in the world.

The Society administers both Regents Park Zoo, of 34 acres, and Whipsnade, 500 acres; and here the Society energetically carries out the scientific work imposed on it by its Royal Charter. Answers to the routine questionnaire show that it is the world's largest zoo, both in varieties and total numbers of stock. A census of animals of all kinds (excluding fish and invertebrates) on December 31st, 1933, totalled 3,759, and Whipsnade 926, total 4,685. About 6,000 passed through its hands in the year. Regents Park has outgrown itself, and necessarily æsthetic effects (gardens, etc.) have made way for the housing of such a magnificent collection. Time does not permit of any detailed description of the collection, but coming to question (3) *Research*. In this, London seems to lead the world. Constructive works in this department are:

- (1) Large output of research literature.
- (2) It maintains a laboratory table at the marine biological station at Plymouth.
- (3) Maintains a prosectorium and pays a whole-time pathologists' staff.
- (4) Distributes material and specimens to other scientific institutions.
- (5) Maintains an anatomical research fellowship.
- (6) Maintains an aquarium research fellowship.

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\* Read before the Rotary Club of Sydney, 9th July, 1935.

The work of this Society in the zoo Prosectorium and Pathology Department is indeed unique, and (in my opinion) should be copied everywhere. The procedure varies in different countries. Whereas some do no research on their stock, others shifted the responsibility to the universities by passing on to them such specimens as the zoo thought might be of importance. Valuable material was thus lost to science, or fell into disinterested hands, and at any rate there was a lack of co-ordination in the research effort where so many different laboratories, people and departments never even met on common ground. Unfortunately many zoos have never evolved beyond this stage, but London, New York and others have grappled with the problem and brought the "mountain to Mahomet", *i.e.* financed whole-time research workers and laboratories within the zoo itself, where every minute thing is *post mortem* and nothing, however small, is lost to science. The minute details published in voluminous annual reports outrival those of our university hospitals; indeed a very similar system is used. It is obvious that the Society is liberal in its interpretation of its original charter, and is keeping pace with the rapid advance of the scientific specialities, zoopathology, parasitology, etc. Such a system costs money, but is one of the things which, above all others, justifies the existence of a zoo and the keeping of animals in captivity—even each tiny thing after death giving its small contribution to the sum total of common knowledge for the good of the animal kingdom—man included. A pathologist, a graduate of medicine at a salary of £1,000 a year, directs this prosectorium. An eminent honorary consulting staff of medical graduates and veterinarians collaborates. In addition to these intramural research activities, help from outside learned institutions is fully availed of. The superintendent is also a medical graduate of known administrative ability, and under him come four curators, each well versed in his speciality.

*Staff.*—It is evident that the Society believes in the axiom that an institution cannot rise any higher than the staff it appoints, and it is gratifying that universities have supplied such a large percentage of their technical officers, including the chief executive officer and the superintendent. The same tendency to appoint university graduates is found in the zoos of Berlin, Paris, New York and others.

*Library.*—1,076 volumes were borrowed from the society library in 1933. With so much original investigation going on, it is essential that access should be available to the most modern literature, and the Society provides it generously.

The educational value to the public of the Insect House is shown by the following quotation from the Society's report: "A feature during the coming summer will be an exhibition of insect pests of rose trees. It is proposed to place on view, in their various seasons, some of the major pests, and in conjunction with them, the beneficial insects that prey upon them. Details regarding control by means of sprays, etc., will also be displayed."

*Whipsnade Zoo*, 500 acres, was opened in 1931, and is also owned by the London Zoological Society. The aim is to supply almost natural freedom and a retreat in natural wooded surroundings from the masses of prying people. Here tension is relaxed and breeding is favoured. Such an immense project could only pay its way in a densely populated country, for it must be far away from big cities, which fact might lessen its gate receipts, and the cost of road construction is high, to say nothing of the initial outlay. Bison can here be given the large tracts of country necessary to their natural existence, and lions and tigers accommodated in large roomy chalk pits overgrown with rough scrub. It was in one of these pits that a man fell and was mauled last year while rescuing a hat for a small bet. So, as finances permit, this great sanctuary is being developed and, to quote Sir Peter Chalmers Mitchell, "Ultimately every possible wild plant, tree, shrub or flower will flourish. Every British wild bird, resident or migrant, that the district suits will find itself in sanctuary, and the animals introduced from other countries will live and breed in almost natural freedom."

The London Zoological Society has also lent a helping hand by giving grants to other scientific bodies and trusts, and has actively boosted the Society for the Preservation of the Fauna of the Empire. There are few parts of the world in which modern firearms, modern facilities for travel, the

spread of civilisation and the extension of agriculture are not reducing the numbers, and even endangering the existence of wild animals. The objects of the Fauna Society are to collect information on and to stimulate interest in the preservation of wild animals directly in the British Empire and by co-operation with similar societies, in other countries.

Time will not permit me to dilate further on the constructive work of this Society, which entertains 2,000,000 persons annually. A dissection of its balance sheet shows it to be in a healthy condition. Yet in over a century of its existence it has received no aid from any public funds; they have had to pay rent and rates precisely as if they were an institution run for private profit. I know no adequate method of estimating the immense amount of good which it has returned to the community through its multifarious activities.

#### NEW YORK ZOOLOGICAL SOCIETY.

When measured up by its answers to our questionnaire, New York Zoological Society ranks very highly. Here we find a park of 264 acres with 1,010 species and a total of 2,715 specimens and a world-renowned aquarium visited annually by 3,000,000 persons. I will touch only on new ideas and salient features. The Heads and Horns Museum is inscribed "In memory of the vanishing big game of the world". This order of hoofed animals is of supreme economic importance to man, and this fact is fittingly commemorated in such a collection. Here in one hall is found every mammalian horned and hoofed species in the world.

Great praise is due to the New York Society for its interest in the buffalo or bison. The story is a sad one. The opening of the first transcontinental railway in 1867 cut the western herd, numbering millions, in halves. The southern herd was exterminated by skin hunters within seven years, and the northern herd almost exterminated within another ten years. The name of Buffalo Bill was gained in 1867 when he contracted to furnish fresh buffalo meat to the labourers laying the track of the Kansas Pacific Railway. He killed over 4,800 buffaloes that year, his highest record being sixty in one day.

Within the Zoo are thirty-four buffaloes grazing over twenty acres of meadow and breeding as readily as domestic cattle.

In 1906 this Society presented fifteen to the United States Government, and in 1924 they had multiplied to 147. They graze over a reserve of twelve square miles. With the nuclei of old herds found here and there, much has been done, and with the governments of both U.S.A. and Canada fully alive to the situation, it is now known that there are 14,369 head in the whole of North America.

*European Bison.*—This story is far more tragic, however, as in 1925 a census showed that there remained alive in the whole world only sixty-two of this species. Of the 727 head in Russia in 1914, the Bolshevik armies destroyed almost all, one large herd and its keepers being slain in one day in 1917. By the efforts of the European Bison Society, it is now hoped they will be bred up and rescued from oblivion.

Coming to the aquarium run by this Society, the spirit of education and scientific investigation is paramount. In the aquarium library are 1,000 volumes on aquatic life, in addition to a large and valuable collection of pamphlets. Many original publications are made per year. The director was engaged on a sea-diving expedition off Bermuda at the time of my visit. Actually he descended in the New York Zoological Society's spherical diving apparatus known as the "bathysphere" to 2,510 feet. Here he described the fish as "equipped with headlights". On the administrative side note that here the director, Dr. Blair, and also the head of the Prosectory and Pathology Department, are both veterinarians. The latter, at 4,300 dollars a year, has a veterinary science degree. There is a Director of Tropical Research, and an assistant directing educational activities. As in London, the Society regards the Prosectory and Pathology Department as of immense importance. A whole-time staff is working therein, all *post mortems* being done on the premises. Research is progressing not only in zoology, but in allied subjects, e.g. physiology, parasitology, ape psychology, growth of



antlers, etc. Specimens were distributed to Columbia University and to Dr. Crile for ductless gland study. To quote from the work of a research fellow engaged in parasitology: "Parasitism as a biological phenomenon has long been recognised. It is not only important from the standpoint of human disease, but equally important from a domestic and agricultural standpoint. The Zoo offers excellent opportunities for the development of a biological research laboratory within its own boundary."

From the foregoing it is evident that New York regards it as a duty to finance such research within the Zoo itself.

It is also estimated that twenty million interested people are educated by its wild animal lore annually through the Press, screen, platform and the air.

#### BERLIN.

Time permits me to say little of Berlin, which comes up to the same high standard as the last.

Our questionnaire reveals it as the world's second zoo for numbers (4,000), but it prides itself on its number of different (1,400) species and its research is carried out with Teutonic thoroughness. Its insect and tropical jungle house alone surpasses all others seen. The hand of depression is upon it, hampering architectural development. Again the director and assistant director are university graduates, the former being Dr. Heck. We are indebted to his father for naming our Heck's finch, a long-tailed grassfinch of our Northern Territory.

Items of interest noted were:

- (1) A lion which came from Nairobi by air in fifty-two hours. The other passengers are not stated.
- (2) A flamingo laid an egg for the first time anywhere in Germany since 1845. It was infertile.
- (3) On each enclosure of animals from captured German colonies was a plaque or wreath in memory of their former colony, thereby keeping evergreen its memory and with it the natural desire for their return.

These three items illustrate very well the thoroughness in detail and determination of the Teutonic mind.

#### STOCKHOLM.

Stockholm presents an interesting innovation. Primarily this Zoo may be regarded as an open-air museum depicting the evolution of the Scandinavian people, their early customs, homes and dress. For example, a group of living Laplanders is brought down from the far north, their homes (iglu), reindeer and sledges all complete. Meandering along pathways between houses of former centuries, the attendants therein dressed in the costume of the period, performing the domestic routine of former days in rooms furnished accurately with the original equipment, was a unique educational experience. Thus the busy commercial capital of Sweden has ethnological studies of Northern Scandinavia brought to its city dwellers, who otherwise were as far removed therefrom as is Sydney from a full-blooded corroboree at Wyndham. With its wealth of anthropological data, Australia is indeed favoured from the ethnological point of view.

#### PARIS.

The new zoo in Paris, which was only opened a year ago, regardless of expense has incorporated almost all the advanced ideas of other countries, but goes further: at its door is the huge building The Colonial Museum, containing aquarium, reptile and tropical house, etc., and therein also is "*an exhibition of the commercial products associated with the industries of her colonies*".

On the one hand is the live specimen. On the other is the tinned or bottled article as sold on the market. The visitor is taught its importance in the economic fabric of the nation.

Briefly, this zoo commenced with an outlay of £468,000, and it will take another five years to complete. It is built strictly on Hagenbeck's ideas of architecture. Its director, Professor Urbain, is again a university graduate,

who was able to hand me many of his own research publications. Its prosectory work and zoo-pathology are being done on the premises.

It bids fair to outrival the other great zoos of the world as a highly scientific and educational centre, satisfying not only academic circles, but the ordinary taxpayer who foots the bill.

#### CONCLUSION.

Finally, to those of us who habitually think of zoos in terms of wild animals, I would take you to the opposite extreme. Let us think of the tiniest bird in the world, the Humming Bird, whose weight is that of a three-penny piece. He always packs up and leaves for his southern vacation on September 15th. His speed has been clocked electrically at 300 miles an hour, and he crosses the Caribbean Sea in four hours. Without calendar, weather report or direction-finder, his speed, endurance and dependability are the envy and despair of our airmen. Can you as a superior genus offer any explanation of how the feat is accomplished? Yet in London Zoo even this tiny mite was investigated after death, thereby enriching the research records.

The motto of such zoological societies may aptly be described as "service" to the animal kingdom, including man, and any zoo aspiring to greatness should quote not only its box office receipts, but should quote also to the taxpayer the list of its contributions to scientific literature each year.

The former is an indication of its ability merely to interest and amuse the public—but the latter is the only permanent monument to its efforts to enrich our knowledge of zoology.

#### SUMMARY.

The work of zoological societies abroad is justified by its educational value to the public and the accumulation of scientific knowledge.

Modern zoos have engaged on an intensive scheme of scientific research for the benefit of the animal kingdom, including man. Scientific staffs and laboratories have been installed within the zoos themselves.

Whole-time research staffs are well paid to work within such zoo laboratories.

The status of any zoo may be gauged by its annual contributions to scientific literature.

Zoological societies also finance other scientific and research fellowships, etc., as enumerated.

They stimulate interest in other societies, *e.g.* The Empire Fauna Society.

They collect and endow large libraries.

They appoint university graduates to key positions.

They educate the public in the economic importance of certain forms of animal life in industry.

They bring ethnological studies before the public.

They constantly educate the general public in all phases of animal lore.

All these services are regarded as generous dividends to the taxpaying public.

**THE BLACK SNAKE**  
**(Pseudechis porphyriacus, Shaw).**

By P. A. GILBERT.

Observing snakes is not a popular aspect of field zoology. Indeed, to the uninterested person it appears more like insanity than reason, especially when such an aggressive form as the tiger snake is taken into consideration. Further, it is impossible to write about venomous snakes with the same enthusiasm as with birds, or other innocuous forms of life. Yet they have to be watched if we are to learn anything of their ways. There is a peculiar fascination in watching the deadly black snake, for instance, which is by no means as offensive as the brown or tiger. It has its excitement, however, which differs from and is much less dangerous than hunting them. An observer can stand off at a respectful distance, and when his knees begin to tremble he can quit the locality, but in hunting them the fun begins after the snake has been disturbed from its hiding place, or in the open, during summer, and is about to be captured, the brown and tiger very often testing the skill of the most experienced hunter.

My first interest in reptiles on a scientific basis dates back to the time when Gerald Krefft, a son of J. L. G. Krefft, the one-time Australian Museum Curator, and author of a classic on snakes, and A. R. McCulloch were respectively interested in snakes and lizards. Krefft and I spent many a week end searching the swamps between Maroubra and La Perouse during the late summer and early autumn for the more lethal members which he was studying. Almost needless to say Krefft, a wonderful manipulator, did the hunting, while I stood off at a safe distance to watch operations. McCulloch was the lizard man, and what little association I had with him convinced me that a wealth of interest lies wrapped up beneath the scaly covering of a lizard.

But let us return to the black snake. As a knowledge of the movements of this venomous snake is very important to the welfare of man, in view of the present-day frequency of bush-walking, or "hiking" as it is sportingly termed, a few notes as to its distribution and movements may restore this branch of ecology to something like comparative respectability. E. R. Waite, in his "Australian Snakes", says: "This is our commonest venomous species, and is generally found throughout eastern, western and southern Australia". Personally I have observed it in southern Queensland and throughout the whole of the coastal areas of New South Wales, as well as inland beyond the Blue Mountains. It is nowhere more plentiful than between Newcastle and Kangaroo Valley, being more frequently met with than either the brown, tiger, or death adder, although I think the brown is much the commoner on the Wianamatta shale.

The black snake is essentially a frequenter of fresh-water rivers, creeks and swamps in warm weather, delighting in the shallows where water weeds thrive. It also lurks in tangles of undergrowth, or debris which has accumulated along river beds during floods. It is very risky, therefore, to frequent these places carelessly in summer. Bush-walkers like to cool their feet in creeks and rivers during their rambles, and it is at this time of the year that the black snake is actively hunting frogs, lizards, and even fish. I once saw a four-foot black snake pursuing Galaxias, but these slim finny members were too quick; no doubt gudgeons and gobies would be easy game. The snake rose every now and then to breathe. H. A. Longman, in the *Australian Encyclopædia*, says: "The common black snake, although a land form, is a good swimmer, and can remain below the surface for at least twenty minutes". Ticks often attach themselves to this snake between the ventral plates.

This snake is not as aggressive as the tiger or brown, and years of observation have convinced me that it does not attack unless trodden on, or is accidentally handled. Every field naturalist has his experiences with snakes. I have had many myself, some of which may be briefly mentioned. In National Park this snake is plentiful during summer. In Bola Creek I was lying down on a flat rock in its bed near a heap of debris, and fell off to sleep.

I suddenly awoke to find that a small black snake about two feet long was just passing over my legs to get to the debris from the water. At Maroubra I was photographing the nest of a Land Rail. I was standing in about six inches of water, and every now and then I could hear a peculiar snorting noise, and looked down to see a fat black snake wallowing in the warm water at my feet. I quickly drew back, the snake shooting along the surface of the water as I did so. On another occasion I was standing on a log observing the Yellow-throated Scrub-wren near the mouth of Bola Creek, when I heard, for the moment, what sounded like a shower of rain. Looking in the direction of the noise I saw a large black snake between five and six feet long with its head raised about six inches from the ground, racing over grass and leaves to get to the water. The day was intensely hot. A friend and I were walking along Lady Carrington Drive, National Park, near the Upper Peach Tree, when we simultaneously observed a black snake in the middle of the road with its head raised twelve inches from the ground. It was evidently travelling in the opposite direction, keeping our moving forms in view. As usual no sticks were about, so we started pelting it with stones. As the stones hit the ground it waved its head to and fro, finally gliding into the scrub on the roadside.

The black snake appears to have a daily programme of movements, to which it works accordingly. It more or less has a territorial hunting ground in which it encompasses watercourses and swamps in its beat. Much of its food is procured in or around fresh water, and in fact no other snake is so partial to water excepting, of course, seasnakes. But it does not live an entirely aquatic life, for it seems to enjoy a glide over grassy slopes and forest litter. When on an excursion it seems to have an objective, gliding along with a full knowledge of its location. Here is another adventure in the vicinity of Bola Creek. On one November morning I was observing a Satin Bowerbird carrying material into a clump of Mistletoe, sixty feet up in a Turpentine (*Syncarpia*) tree. I stood gazing into the tree to watch the operations of the satin bird for some considerable time, when my attention was attracted by a puffing noise similar to that made by a human being out of breath. Looking round I saw, immediately at the back of me, a black snake between four and five feet long, with its head raised six inches from the ground. My first impulse was to look about for a stick, but the ground was clear, being clothed with grass cropped short by grazing stock. I was unable to take the offensive, so decided to watch the reptile. A few seconds' observations convinced me that I stood in its path, as I felt positive that it was not there five minutes before, owing to my walking backwards and forwards, this way and that, while watching the satin bird. I slowly moved aside. After I had withdrawn ten yards or so the snake raised its head to a foot or so from the ground, and waving its head from one side to the other as if to gain direction, began to move over the grassy patch on which I had been standing. As it seemed to have no interest in me I decided to follow it. I soon discovered from its ways that it had some other intention, and under such circumstances is non-aggressive if unmolested. It glided round tufts of grass, across open patches strewn with leaves, and under shrubs with a rhythm that was thrilling to watch. As it passed over dead leaves the movements of the ventral plates or shields created a noise like trickling water. Several times I stamped my foot, which seemed to bring it to a momentary halt, then I threw a small stone at it, and as the stone hit the ground its head promptly went up. This seemed to hasten its progression. Up till now we had been moving along at a quick walking pace, when the snake made a turn at almost a right angle, which brought us to the head of a small valley, down the southern side of which our movements were accelerated. After going through some short undergrowth we came out on another clear patch on which stood the dead trunk of a tree with several holes at its base, where fire had eaten out its decayed roots. The snake glided into one of these after I had been following it about for fully four hundred yards. There is no knowing how far it had travelled before I fell in with it.

These disconnected narratives about the ways of a snake are more or less commonplace, but they have supplied me with material for thought. Often I had asked myself "what is the nature of the black snake's vision?" I perused what literature there was available, without finding any reference

to it ; and yet I feel that an observer somewhere in the world has had something to say about it. My own conclusions, based on field observations, however, are these : that the vision of the black snake is long-sighted, with a very narrow field of view ; that different positions of head and different elevations from the ground give it different fields of view ; that raising the head six to twelve inches from the ground and swaying it about results in periscopic surveys of the surroundings ; that the head flat on the ground limits the scope of vision.

The ventral plates also are sensitive to earth vibrations, in other words they convey earth tremors to the nervous system. There is not the slightest indication that the black snake has the wide field of vision of a bird. A bushman once related to me how, when he had come upon a black snake unexpectedly he threw his hat in front of the snake, which steadily watched it while he procured a stick. I looked upon this as a joke until I began to study the black snake's sense of sight. This species has also been recorded as finding its way into water jugs in bedrooms of country homes during dry times. I have noticed that when I have confronted this snake it is alert and ready for action, frequently flattening its head in preparation for defence, but if it has been approached side on it seems less conscious of an intruder, and similarly from the back. The safest way to approach this snake to kill it is side on.

I have observed the black snake pairing during December at National Park. E. R. Waite says : " Fifteen to twenty young are produced about March ", this species being viviparous. The black snake, at this rate of increase, must have many natural enemies, as unrestricted multiplication would result in millions in the course of a few years. The diminutive forms, however, are easy prey for large lizards and birds, the kookaburra being a celebrated devourer. The shortest young I have observed were nine inches long, usually about February or March, this fitting in with Waite's observations. These are generally observable about heaps of debris along watercourses, or bush tracks. Their modes of living appear to resemble that of the small skinks, which move slowly in the sunshine catching flies and other insects. In October I have noticed that the small snakes are usually about fifteen to eighteen inches long, which permits me to make a tentative deduction that its length is doubled in about nine months. According to observations in other parts of the world the yearly increase in length lessens as the snake becomes older, so that one could conjecture that a six feet snake would be about ten years old. In America, Blanchard and Finster have marked snakes by cutting off one or more of the ventral plates with a pair of sharp scissors, leaving permanent scars after the wounds have healed. One snake recovered was five miles from the point of liberation.

It is a mistaken notion to suppose that venomous snakes hibernate continuously throughout the winter. Certainly their movements are restricted to places which provide protection from cold. The black snake is observed to make a direct seasonal change of location. Many of the larger specimens in particular resort to the sandstone ridges and sandy hills. They are met with from eleven o'clock in the morning till two in the afternoon, usually conveniently near a hole in the ground, a hollow log, or crevice under a sandstone rock, either of which they can creep into if disturbed. They frequent these sites from May till August. So far as the black snake is concerned it is much safer to traverse these ridges and hills in summer than it is in winter, as invariably this reptile creeps from its hibernating lair to bask in the life-giving rays of the noonday sun of an occasional mild and bright day of winter. This it could not do if it hibernated in the cold gullies and sunless watercourses, which are, furthermore, often flooded during autumn and winter. This snake usually returns to the watercourses and swamps during the warm days of September and October. The smaller specimens under three feet long do not appear to reach the hills, and probably carry out a more complete hibernation under vegetable debris in suitable localities, the fermentation of which may supply a modicum of warmth. It would be dangerous to dogmatise about these differences in size, and it is advisable for pedestrians to be on the alert during warm days. E. R. Waite, H. A. Longman and J. R. Kinghorn have each dealt exhaustively with the treatment of snake bite in their books and contributions.

## LIST OF MEMBERS

As on 31st August, 1935.

*Note.*—Unless otherwise specified, members are residents of the State of New South Wales.

Members will oblige by notifying the Honorary Secretary of any change of address.

### PATRONS.

His Excellency the Governor, Sir Alexander Hore-Ruthven, V.C., K.C.M.G., C.B., D.S.O.

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

### ASSOCIATE BENEFACTORS.

Albert Littlejohn, 9 Young Street, Sydney.

Walter and Eliza Hall Trust, 117 Pitt Street, Sydney.

Gustavus Athol Waterhouse, D.Sc., B.E., 39 Stanhope Road, Killara.

### FELLOWS.

Burrell, Harry, "Tallawalla", 129 Darley Road, Randwick.

Carter, Herbert James, B.A., F.E.S., "Garrawilla", Kintore Street, Wahroonga.

Cayley, Neville W., 42 Newcastle Street, Rose Bay, Sydney.

Chisholm, A. H., *The Argus* Office, Melbourne.

Dakin, Professor William John, The University, Sydney.

Froggatt, Walter Wilson, 24 Young Street, Croydon.

Hull, Arthur Francis Basset, C.F.A.O.U., Box 704, G.P.O., Sydney.

Iredale, Tom, "Solander", Queenscliff Road, Manly.

Mathews, Gregory Macalister, Meadway, St. Cross, Winchester, England.

Musgrave, Anthony, Australian Museum, Sydney.

Roughley, Theodore Cleveland, Technological Museum, Sydney.

Tillyard, Robin John, D.Sc., F.R.S., Division of Economic Entomology, Canberra, F.C.T.

Turner, Dr. A. Jefferis, Dauphin Terrace, South Brisbane, Queensland.

Ward, Melbourne, Lindeman Island, North Queensland.

Waterhouse, Gustavus Athol, D.Sc., Stanhope Road, Killara.

Whitley, Gilbert Percy, Australian Museum, Sydney.

### HONORARY MEMBERS.

Buchanan, Robert, National Park, Audley.

Dunbabin, Thomas, *Sun* Office, Sydney.

Hull, A. F. B. (see Fellows).

Johnston, Professor T. Harvey, The University, Adelaide, South Australia.

Le Souef, E. A., Margaret River, South West, Western Australia.

Lyell, George, Gisborne, Victoria.

Sherborn, Dr. Charles Davies, British Museum (Natural History), Cromwell Road, London.

Stiffe, R. J., 350 George Street, Sydney.

### LIFE MEMBERS.

Austin, Thos. P., "Talbragar", Kuringai Chase Avenue, Turramurra.

Buckle, Frank, 104 Hunter Street, Sydney.

Cohen, George Judah, Bond Street, Sydney.

Coles, Clifford, Bancroft Avenue, Roseville.

Crommelin, Miss Minard F., 9 Upper Avenue Road, Mosman.

Dangar, R. H., "Turee", Coolah.

Dellow, Walter Joseph, 32 Alibone Street, Ashfield.

Dixon, Robert Craig, J.P., 33 Hunter Street.

Dixon, William, Gordon Road, Killara.

Foreman, Dr. Joseph, "The Astor", Sydney.

Gurney, W. B., Department of Agriculture, Box 36A, G.P.O., Sydney.

Halloran, Aubrey, B.A., LL.B., Bull's Chambers, 28 Martin Place, Sydney.

Hordern, Mrs. Nora Ebsworth, 36A Darling Point Road, Darling Point, Edgecliff.

Hordern, Sir Samuel, "Babworth House", Darling Point, Edgecliff.  
 King, Sir Kelso, K.B., Mercantile Mutual Insurance Co., 117 Pitt Street,  
 Sydney.  
 Levien, Robert Henry, 49 Wycombe Road, Neutral Bay.  
 Minell, Mrs. Dorothy Ebsworth, 15 Wyuna Road, Point Piper.  
 Monticone, Dr. Charles Albert, Box 2058, G.P.O., Sydney.  
 Murray, C. Stuart, 30 Milner Street, Mosman.  
 Musgrave, Anthony (see Fellows).  
 Nash, Albert Edward, 8 Alt Street, Waverley.  
 Spain, Col. Alfred, V.D., 16 Spring Street, Sydney.  
 Spring, Robert Alexander, "Woodford", St. Elmo Street, Mosman.  
 Todman, R. G., "Merdin", 328 Edgecliff Road, Edgecliff.  
 Troughton, Ellis Le Geyt, Australian Museum, Sydney.  
 Turner, W. H., 476 Pitt Street, Sydney.  
 White, Alfred Henry, Belltrees, Scene.  
 Whitley, Gilbert P. (see Fellows).

#### ORDINARY MEMBERS.

Abbott, Mrs. A. L., Violet Hill, Dungog.  
 Adams, Thomas S., 19 Macquarie Road, Undercliffe.  
 Adey, A. R., 107 Castlereagh Street, Sydney.  
 Alexander, I. A., 34 Coolong Road, Vaucluse.  
 Allan, Miss Joyce K., Australian Museum, Sydney.  
 Alt, J., 9 Whiting Beach Road, Mosman.  
 Anderson, Dr. Charles, Australian Museum, Sydney.  
 Andrews, Ernest Clayton, 4 Belle Vista, 32 Benelong Crescent, Bellevue Hill.  
 Archer, H. R. Walter, 14 Buena Vista Avenue, Mosman.  
 Arnott, Frank, Colonial Sugar Refining Co., O'Connell Street, Sydney.  
 Arnott, R. B., "Orara", Carlotta Avenue, Gordon.  
 Ashton-Hansen, A. B., "Zuleika", 71 Bayview Avenue, Undercliffe.  
 Baass, Otto Hermann, 18 Bridge Street, Sydney.  
 Baker, H. H., 9-13 Bligh Street, Sydney.  
 Barker, A. F., Blair Street, Bondi.  
 Barling, Miss S. M., "St. Adrian's", 130 Raglan Street, Mosman.  
 Barnett, Marcus S., Colonial Sugar Refining Co., O'Connell Street, Sydney.  
 Baron, George, Sydney Safe Deposit, Ash Street, Sydney.  
 Barrett, F. W., 17 Bridge Street, Sydney.  
 Barrie, W., 15 Blair Street, Bondi.  
 Bartlett, Miss Violet Artah, 98 Prince Albert Street, Mosman.  
 Beeman, J. W., 378 Pitt Street, Sydney.  
 Bernardini, Most Rev. Philip, 40 Edward Street, North Sydney.  
 Beswick, G. H., 107 Elizabeth Street, Sydney.  
 Blanchard, Miss M. E.  
 Blaxland, Dr. F. J., "The Raymond", Elizabeth Bay, Sydney.  
 Blenkarn, G. G., Phillip House, Phillip Street, Sydney.  
 Bloch, Eugen, "Helvetia", Burrawong Avenue, Mosman.  
 Blow, Walter Russell, 11 Silex Road, Mosman.  
 Boden, E. M., Abbott Street, Cairns, Queensland.  
 Booth, Frank Holroyd, Victoria Arcade, Sydney.  
 Boyle, W., 27 Bass Road, Undercliffe.  
 Brandon, Dr. A. J. Spiller, 9 Rosemont Avenue, Woollahra.  
 Brierley, E. A., 5 Henry Street, Ashfield.  
 Brodziak, A. A., 8 Spring Street, Sydney.  
 Bryce, Ernest J., Box 375, G.P.O., Sydney.  
 Bryce, F. H., c.o. Safe Deposit, Bank of N.S.W., Sydney.  
 Buckland, Sir Thomas, "Lyndhurst", Hunter's Hill.  
 Buggy, Raymond, 37 Middle Head Road, Mosman.  
 Burkitt, Professor Arthur Neville, Medical School, The University, Sydney.  
 Burrell, Harry (see Fellows).  
 Burrell, Mrs. Emily, 129 Darley Road, Randwick.  
 Burton, A., 55 Homebush St., Undercliffe.  
 Cable, Dr. W. G. H., "Chelsea", 461 Darling Street, Balmain.  
 Campbell, Thomas G., Box 109, P.O., Canberra.  
 Campe, A. C., 50 Sydney Arcade, King Street, Sydney.

Campion, F. J., 375 George Street, Sydney.  
 Carter, H. J. (see Fellows).  
 Catchlove, Frederic S. L., 18 Prince Albert Street, Mosman.  
 Catchlove, Rex, 18 Prince Albert Street, Mosman.  
 Catt, J. W., "Tomah", Church Street, Carlingford.  
 Cayley, N. W. (see Fellows).  
 Clark, Dr. Ernest D., 749 Military Road, Mosman.  
 Clark, Roland C., "Girraween", 33 Kardinia Road, Mosman.  
 Clarke, C. F. V., Commonwealth Bank, Sydney.  
 Clayton, Charles, 60 Albert Road, Homebush.  
 Cleburne, E. W., 41 McIntosh Street, Gordon.  
 Cleburne, Mrs. A. F., 41 McIntosh Street, Gordon.  
 Coghlan, F. A., 18 Bannerman Street, Cremorne.  
 Collins, H. N., 67 Castlereagh Street, Sydney.  
 Colquhoun, Percy Brereton, Muston Street, Mosman.  
 Comins, Francis, 48 Prince Albert Street, Mosman.  
 Comtesse, D. L., Tug *Hydra*, Goat Island.  
 Conacher, C. W. D., "Crona", Turrumurra.  
 Cornford, William Henry, "Greyfells", Queenscliff Road, Manly.  
 Cousins, W. G., Angus & Robertson Ltd., Sydney.  
 Cox, A. P., 23 Chelmsford Avenue, Croydon.  
 Cunningham, Harold Joseph, Legal Branch, Public Works Department, Sydney.  
 Curran, W. J., 335 George Street, Sydney.  
 Curtis, Louis A., Room 618, Govt. Savings Bank, Castlereagh Street, Sydney.

Dakin, Professor W. J. (see Fellows).  
 Dalgleish, William James, 7 Thompson Street, Mosman.  
 Dallen, R. A., 4 Cecil Court, Cecil Street, Ashfield.  
 Davis, J. M., 52 Muston Street, Mosman.  
 Debert, Jack, "Braemar", Balmoral Beach.  
 Desmarchelier, Theo., "Foch", 13 Prince Albert Street, Mosman.  
 Dewhurst, Norman, National Mutual Life Ass., 85 Pitt Street, Sydney.  
 Dick, R. L., 12 Buena Vista Avenue, Clifton Gardens.  
 Dickson, Dr. J. S., 50 Bradley's Head Road, Mosman.  
 Doak, Dr. Frank Wiseman, 114 Belmont Road, Mosman.  
 D'Ombraim, Dr. Ernest Arthur, 193 Macquarie Street, Sydney.  
 Donaldson, James A., 26 Ryrie Street, Mosman.  
 Dovey, John Whitsed, "Lynwood", Roseville.  
 Dowling, B., N.S.W. Bookstall, 112 Castlereagh Street, Sydney.  
 Dufty, J. H., 22 Rawson Street, Haberfield.  
 Duncan, Grantley A., Alexandra Street, Hunter's Hill.  
 Dunster, Miss C. A., 48 Stanhope Road, Killara.

Eccles, Alfred Edward, 31 Prince Albert Street, Mosman.  
 Eipper, Miss E. M., 28 Thompson Street, Mosman.  
 Elliott, N. G., c.o. Pitt, Son & Badgery Ltd., Sydney.  
 Evans, Dacre Fitzherbert, 5 Silex Street, Mosman.  
 Evans, Joshua, "Edenglassie", 2 Thompson Street, Mosman.  
 Evans, Mrs. J., "Edenglassie", 2 Thompson Street, Mosman.  
 Everitt, T. A., 36 Letitia Street, Oatley.

Fairfax, J. H., "Elaine", Edgecliff.  
 Fairfax, John Hubert, "Elaine", Edgecliff.  
 Fairfax, John, & Sons Ltd., Hunter Street, Sydney.  
 Faviell, M. C., Perpetual Trustee Chambers, 33 Hunter Street, Sydney.  
 Fels, Mrs. Dora, 8 St. Elmo Street, Mosman.  
 Finn, Mrs. Eileen Christina, 193 Merrylands Road, Merrylands.  
 Fish, A. L., "Melita", Milton Avenue, Mosman.  
 Fitzhardinge, Miss Julie G., "Redhill", Pennant Hills.  
 FitzPatrick, George, Box 939 G.G., G.P.O., Sydney.  
 French, Miss Betty, Bull's Chambers, Sydney.  
 Froggatt, W. W. (see Fellows).

Gatliff, H. E., "Myall", Pretoria Avenue, Mosman.  
 George, Dr. C. W., 2 Edwards Bay Road, Mosman.



George, Miss S., "Brooklyn", Cardinia Road, Mosman.  
 Gibb, C. A., 6 Hunter Street, Sydney.  
 Gilet, Gerard, 25 Bradley's Head Road, Mosman.  
 Gilet, Maurice L., 47 Prince Albert Street, Mosman.  
 Golding, Miss M., 2 Broderick Street, Balmain.  
 Gould, Henry, Simpson Street, Mosman.  
 Greenland, H., "Halcyon", 82 Homebush Road, Strathfield.  
 Hall, Thomas E., 565 George Street, Sydney.  
 Halloran, Dr. Garnet, 143 Macquarie Street, Sydney.  
 Hallstrom, J., 26 Ryan's Road, Willoughby.  
 Hanson, William B., 128 Alt Street, Ashfield.  
 Harrison, Frank, Hoskins Buildings, 3 Spring Street, Sydney.  
 Harrison, Frederick Illingworth Wright, 15 Bent Street, Sydney.  
 Harrop, G. H., 46 Matilda Street, Bondi.  
 Hart, Lavington B., Box 2646 EE, G.P.O., Sydney.  
 Hawke, Douglas Osborn, "Bronte", Ruby Street, Mosman.  
 Hawley, John, 85 Surrey Street, Darlinghurst.  
 Hawley, Joseph William, Springdale Road, Killara.  
 Henderson, E., 24 Prince Albert Street, Mosman.  
 Henderson, James, 4 Bradley's Head Road, Mosman.  
 Henderson, John Alexander, "Yeronga", 18 Prince Albert Street, Mosman.  
 Herbert, Major M. J., V.D., Moorook, South Australia.  
 Higgs, Reginald Francis, 297 Castlereagh Street, Sydney.  
 Hill, A. C. W., Dalton House, 115 Pitt Street, Sydney.  
 Hill, C. F., "Kyeema", Bickell Road, Mosman.  
 Hindwood, K. A., 56 Sydney Street, Willoughby.  
 Hockings, A. T., Box 1761, G.P.O., Sydney.  
 Hodge, Miss Bessie I., 5 York Road, Waverley.  
 Holmes, Alexander, No. 6 Martin Hall, Farrell Avenue, King's Cross, Sydney.  
 Hooke, R. W., 34 Thompson Street, Mosman.  
 Hordern, Anthony, 12 Spring Street, Sydney.  
 Hull, William George, Bank of New South Wales, George Street, Sydney.  
 Hunt, Miss Mary, 61 Chiltern Avenue, Willoughby.  
 Iredale, Tom (see Fellows).  
 Jarvis, R. O., 22 Prince Street, Mosman.  
 Johnston, Claude, 3 Major Street, Mosman.  
 Johnston, Cyril D., 10 Little Street, Mosman.  
 Jones, Edward E., 48 Bradley's Head Road, Mosman.  
 Jones, Ernest W., 8 Culwulla Street, Hurstville.  
 Jones, Lindsay Lucas, 52 Cambridge Street, Penshurst.  
 Judd, Everard, 24 Bradley's Head Road, Mosman.  
 Keighley, A. W., "Blair Athol", Burrawong Avenue, Mosman.  
 Kelly, T. H., 39 Hunter Street, Sydney.  
 Kent, Milton, 19 O'Connor Street, Haberfield.  
 King, Ambrose, 116 Croydon Road, Croydon.  
 King, Miss Alice, 24 Thompson Street, Mosman.  
 King, Norman, 70 Church Street, Ashfield.  
 King, Walter, "Bobra", 24 Thompson Street, Mosman.  
 Kirwan, W. T., Angus & Robertson Ltd., Sydney.  
 Lawson, Albert Augustus, Harden Road, Artarmon.  
 Lawson, David, 30 Thompson Street, Mosman.  
 Leahy, Mrs. Ellen, Military and Avenue Roads, Mosman.  
 Leithhead, David, 9 Royal Street, Maroubra.  
 Le Quesne, Mrs. W. J., "Waipa", 6 St. Elmo Street, Mosman.  
 Le Souef, Albert Sherbourne, C.M.Z.S., Taronga Park, Mosman.  
 Lewis, George Owens, c.o. Tooth & Co. Ltd., Kent Brewery, Sydney.  
 Littlejohn, Dr. Edward Sydney, 2 Malvern Avenue, Croydon.  
 Llewellyn, William H., "Ashley", 20 Prince Albert Street, Mosman.  
 Lloyd, Benjamin R., "Peradeniya", 2 Queen Street, Mosman.  
 Lovett, Percy Walter, 3 Kahibah Road, Mosman.  
 Lowe, Mrs. Norman, 56 Bradley's Head Road, Mosman.  
 Lynch, David W., "Vandroya", 16 David Street, Mosman.  
 Lyne, Miss C., 10 Lennox Street, Mosman.  
 Lyne, Miss L., 4 Simpson Street, Mosman.

Macansh, Miss L. L., 11 Cremorne Road, Cremorne.  
 MacCulloch, Dr. H. T. C., "Hillcrest", 76 Boulevard, Lewisham.  
 Macdonald, John Eldridge, Orange Grove, Woy Woy.  
 Mackillop, F. C., "Cumbrae", Ellamotta Avenue, Mosman.  
 Mackillop, J. A., F.R.G.S., "Carberwill", 7 Kareela Road, Mosman.  
 McDonald, Clive Leslie, "Tekoa", Union Street, Mosman.  
 McDonald, Frank J., "Tekoa", Union Street, Mosman.  
 McMahon, Henry Francis, 6 Milton Avenue, Mosman.  
 McMichael, H. J., c.o. McIlwraith, McEachern Ltd., 19 Bridge Street, Sydney.  
 McNeill, F. A., Australian Museum, College Street, Sydney.  
 McPhee, G. J., 9 Prince Albert Street, Mosman.  
 McRobert, Miss H., 61 Bradley's Head Road, Mosman.  
 Magrath, S., St. Elmo Street, Mosman.  
 Maguire, Dr. F. A., Hengrove Hall, 193 Macquarie Street, Sydney.  
 Maher, James, 47 Bradley's Head Road, Mosman.  
 Maides, Miss D., 35 Station Street, Crow's Nest.  
 Marchant, W. R., 35 Fifth Street, Ashbury.  
 Marks, Frederick William, 173 Elizabeth Street, Sydney.  
 Marks, L. W., 34 Bradley's Head Road, Mosman.  
 Marks, Percy, 5 Hunter Street, Sydney.  
 Marsh, Dr. H. Seaward, "Beanbah", 235 Macquarie Street, Sydney.  
 Marshall, A. J., 152 Penshurst Street, Penshurst.  
 Marshall, Dr. F., C.M.G., "Harley", Macquarie Street, Sydney.  
 Martin, E. J., Bacon & Co. Ltd., 31A Pitt Street, Sydney.  
 Martin, Mrs. R. J., Macintosh Street, Gordon.  
 Mawhiney, Hugh Arthur, "Thornby", St. George, Queensland.  
 Mellor, Walter L., "Stamford", Forest Road, Penshurst.  
 Menzies, L. F., "Koyong", 3 Cobbittee Street, Mosman.  
 Michaelis, George I., 3 Wentworth Street, Point Piper.  
 Middleton, James Thomas, 15 Thompson Street, Mosman.  
 Mills, G. N., 14 City Road, Sydney.  
 Mitchell, Karl A., Yorkshire House, 14 Spring Street, Sydney.  
 Moore, Miss Wilga, 81 Beauchamp Street, West Murrickville.  
 Moore, William Robert, 81 Beauchamp Street, West Murrickville.  
 Morgan, Frederick E., Snow Elliott Pty., Ltd., 73 York Street, Sydney.  
 Mort, H. S., 13 Milner Street, Mosman.  
 Murphy, Rev. Peter J., 59 Bradley's Head Road, Mosman.  
 Murray, R. J., 34 Thornley Street, Murrickville.  
 Muston, H. J., 13 O'Connell Street, Sydney.  
 Napier, S. Elliott, *Sydney Morning Herald* Office, Hunter Street, Sydney.  
 Nathan, Albert H., Box 502 AA, G.P.O., Sydney.  
 Neale, A. H., Bank of Australasia, 85 Pitt Street, Sydney.  
 Nichols, A. E., 47 Burlington Road, Homebush.  
 Niel, G. J., 32 Boolong Road, Vacluse.  
 Packer, Lewis, "Melita", Milton Avenue, Mosman.  
 Palmer, Joseph Smith, 19 Brady Street, Croydon.  
 Parer, Dr. J. I., 8 Carlton Street, Granville.  
 Parkes, George A., 10 Royal Exchange Buildings, Bridge Street, Sydney.  
 Patrick, Captain James Robert, David Street, Mosman.  
 Patrick, Mrs. J. R., David Street, Mosman.  
 Patterson, W., Kardinia Road, Mosman.  
 Peall, Mrs. Oscar, Oare Pennings, Wilts., England.  
 Peir, H. E., 110 Bathurst Street, Sydney.  
 Peir, Mrs. H. E., 110 Bathurst Street, Sydney.  
 Perier, A. J., Kodak Limited, 379 George Street, Sydney.  
 Perry, Frederick S., 6 Burrawong Avenue, Mosman.  
 Perry, L. J., 16 Bradley's Head Road, Mosman.  
 Phillips, R., King Street, Gloucester.  
 Pike, Edwin Deacon, "Whangaroa", Bradley's Head Road, Mosman.  
 Pockley, Dr. Eric, Pioneers' Club, Phillip Street, Sydney.  
 Pollock, Ernest Frederick, J.P., "Te Whare", Carrington Avenue, Strathfield.  
 Pomroy, Richard Osborne, "Cooinoo", Turramurra.  
 Powell, John, 17 Thurlow Street, Redfern.  
 Pratt, Frederic W., 7 St. Elmo Street, Mosman.  
 Preston, H. D., "The Glen", Booth Street, Camperdown.

Prior, Mrs. S. H., "Dundoo", Bradley's Head Road, Mosman.  
Prior, H. K., 44 Bradley's Head Road, Mosman.  
Purser, Dr. Cecil, "Craignish", 185 Macquarie Street, Sydney.

Radford, P., S.C.E.G.S., Blue Street, North Sydney.  
Raves, Victor Sydney, Wharf Road, Mosman.  
Reeve, Richard E., "Kia Ora", Pope's Lane, Woonona.  
Relton, W., 52 Victoria Street, Waverley.  
Robinson, Miss Hilda A., 74 Murdoch Street, Cremorne.  
Roberts, Noel J., Cathcart House, 11 Castlereagh Street, Sydney.  
Robertson, Mrs. George, "Moana", 61 East Crescent Street, McMahon's Pt.  
Rogers, C. S., 55 Ramsgate Avenue, Bondi.  
Rohu, Sylvester E., 143 Elizabeth Street, Sydney.  
Ross, Miss Jean, 5 Stanton Road, Haberfield.  
Ross, William Lyle, 4 Fairlight Crescent, Manly.  
Roughley, T. C. (see Fellows).  
Rouse, J. J., "Kardinia", Darling Point.

Sands, Col. R. S., c.o. John Sands, Ltd., 374 George Street, Sydney.  
Scammell, George V., 7 David Street, Mosman.  
Scheffer, H. M., "Wapello", Bradley's Head Road, Mosman.  
Scott, Hector McDonald, 36 Killarney Street, Mosman.  
Scott, Mrs., 36 Killarney Street, Mosman.  
Sharland, Michael S. R., *Sydney Morning Herald* Office, Hunter Street, Sydney.  
Shipway, Phillip, 133 Pitt Street, Sydney.  
Shirley, Miss D., 47 Wolseley Road, Mosman.  
Simpson, W. H., 2 Effingham Street, Mosman.  
Sims, Albert, 58 Pitt Street, Sydney.  
Smith, Ernest A., 15 Castlereagh Street, Sydney.  
Smith, Mrs. G., Munni, Dungog.  
Smith, R. Dundas, "Galandene", Bradley's Head Road, Mosman.  
Smith, W. R., 38 Tindale Road, Artarmon.  
Sorenson, Edward S., 66 Sydenham Road, Marrickville.  
Spain, I. A. H., 170 Kurraba Road, Neutral Bay.  
Spiegel, Michael, "Athol", Whiting Beach Road, Mosman.  
Spring, David A. H., St. Elmo Street, Mosman.  
Spring, Henry Langdon, St. Elmo Street, Mosman.  
Stevenson, James, "Eversley", Silex Road, Mosman.  
Stewart, Robert, 34 Middle Head Road, Mosman.  
Storey, Alec Graham, 7 Lennox Street, Mosman.  
Storey, Mrs. Alec Graham, 7 Lennox Street, Mosman.  
Stuart, William, "Glenhurst", Yarranabee Road, Edgecliff.  
Stubbs, H., 32 Gould Avenue, Petersham.

Tait, George Edward, "Marchmont", 35 Moruben Road, Mosman.  
Talbot, Langley, 25 Wattle Street, Killara.  
Tanner, Harald, Consul for Finland, 249 George Street, Sydney.  
Taylor, Frank Henry, School of Public Health, The University, Sydney.  
Thomas, John, Shellharbour.  
Thomson, Judge Alexander, "Marsaili", 48 Muston Street, Mosman.  
Tibbits, Walter, 42 Prince Albert Street, Mosman.  
Tollow, Alfred Charles, 125 Burwood Road, Burwood.  
Tomalin, J. H., 38 Burrawong Avenue, Mosman.  
Tomkins, E., Mitchell Street, Enfield.  
Toose, S. V., University Chambers, Phillip Street, Sydney.  
Turkington, A. J., "Kingston", 10 Carrington Road, Randwick.

Vickers, Edward Russell, F.R.G.S., 9 The Corsc, Manly.  
Von Drehnen, Carl, 7 Milton Avenue, Mosman.  
Von Drehnen, Otto, "Wyuna", Buena Vista Avenue, Mosman.

Walker, A. Leslie, 8 Burrawong Avenue, Mosman.  
Wallace, John R., "Dundonald", 14 Arbutus Street, Mosman.  
Ward, Melbourne (see Fellows).  
Warren, John Donald, 56 Redan Street, Mosman.

Watkins, Arthur, 74 Bancroft Avenue, Roseville.  
 Watson, A. B., 60 Grove Street, Earlwood.  
 Weaver, Charles Herbert, "Bulyamba", 21 David Street, Mosman.  
 Webb, Sydney Douglas, 93 Middle Harbour Road, Lindfield.  
 Webb, S. W., 19 Hargrave Street, Sydney.  
 Weymark, John N., "Kenilworth", 26 David Street, Mosman.  
 Wheelwright, A. H., "Rosedale", Narrawa, Crookwell.  
 Whitaker, Charles Edward, 34 Bradley's Head Road, Mosman.  
 White, Judge Cecil Alban, "Winbourne", Ian Street, Rose Bay.  
 Whitley, P. N., 9 Dundas Street, Coogee.  
 Whitley, Mrs. P. N., 9 Dundas Street, Coogee.  
 Whyte, George, 57 Oakes Avenue, Dee Why.  
 Wiburd, James Carvosso, 16 Moruben Road, Mosman.  
 Wilcox, Arthur Crawshaw, 3 Prince Albert Street, Mosman.  
 Williams, William John, 5 Effingham Street, Mosman.  
 Willis, Thomas Charles, "Araluen", Bay View Avenue, Mosman.  
 Winkworth, L. H., 337 George Street, Sydney.  
 Witney, Joseph John, "Doreen", 165 Pacific Highway, Roseville.  
 Wood, P., Isaac Street, Peakhurst.  
 Wootton, Leonard James, Box 931 GG, G.P.O., Sydney.  
 Wright, Harold J., Box 9, P.O., Auburn.

#### HONORARY ASSOCIATE MEMBERS.

Dodd, F. P., Kuranda, Queensland.  
 Malloch, Dr. J. R., Bureau of Biological Survey, U.S. Department of  
 Agriculture, Washington, D.C., U.S.A.  
 Mathews, Gregory M. (see Fellows).

#### LIFE ASSOCIATE MEMBERS.

Agar, Professor W. E., The University, Melbourne, Victoria.  
 Ashby, Edwin, "Wittunga", Blackwood, South Australia.  
 Barkley, William Henry, Raglan Street, Mosman.  
 Berney, F. L., "Barcarolle", Longreach, Queensland.  
 Cameron, Lindsay Duncan, Hilly Street, Mortlake.  
 Campbell, John Honeyford, M.B.E., Royal Mint, Ottawa, Canada.  
 Director, Dominion Museum, Wellington, New Zealand.  
 Ellis, Ralph, junior, 2420 Ridge Road, Berkeley, Calif., U.S.A.  
 Finlay, Dr. Harold John, 14 Pine Hill Terrace, Dunedin, New Zealand.  
 Hardwick, Dr. F. G., "Wyoming", 175 Macquarie Street, Sydney.  
 Hardy, G. H. H., The University, Brisbane, Queensland.  
 Hill, Gerald F., Box 109, G.P.O., Canberra, F.C.T.  
 Hopkinson, Dr. Emilius, C.M.G., Balcombe, Sussex, England.  
 Jackson, Sidney William, c.o. J. S. P. Ramsay, 55 George Street North,  
 Sydney.  
 Moss-Robinson, Leslie H., Exon Vale, Narara.  
 Nathan, Sir Matthew, K.C.M.G., West Coker, Yeovil, England.  
 Thackway, A. E. J., "Wyoming", Albyn Road, Strathfield.  
 Thomas, Andrew David, 12 Clifton Avenue, Burwood.  
 West, Alfred E. P., 35 Helena Street, Guildford, Western Australia.  
 Wilkinson, John Wrixon, Wood Street, Warwick, Queensland.  
 Williams, Godfrey Herbert, Aberpergwyn, South Wales.  
 Wilson, Professor James Thomas, 31 Grange Road, Cambridge, England.  
 Wright, Phillip A., "Walamumbi", Armidale.  
 Zeck, Emil H., Box 36A, G.P.O., Sydney.

#### ASSOCIATE MEMBERS.

Adey, John Stanford, 107 Castlereagh Street, Sydney.  
 Adnam, Miss Gieta, Holland Street, Chatswood.  
 Aguilar, Miss Grace, The Block, 428 George Street, Sydney.  
 Allatt, W., Union Bank of Australia, Bondi.  
 Andrews, J. W., 38 Tudor Street, Belmore.  
 Aslin, G., Baker Street, Temora.  
 Ayling, S., 5 Beatrice Street, Ashfield.

Barker, Miss G. W., 124 Kurraba Road, Neutral Bay.  
 Barnett, H., 14 Duncan Street, Arncliffe.

Barnett, Percival E. B., "Bescot", The Crescent, Chatswood.  
 Barrett, Charles, "Maralena", Maysbury Avenue, Elsternwick, Victoria.  
 Barrett, Sir James, 105 Collins Street, Melbourne, Victoria.  
 Batchelor, R., 37 Wilga Street, Burwood.  
 Bearup, A. J., School of Tropical Medicine, University, Sydney.  
 Beggs, R., Douglas Park.  
 Bell, W. J., 497 Riley Street, Sydney.  
 Bellamy, C., 12 Park Street, Flemington.  
 Bernard, H. J., 7 Bernard Avenue, Gladesville.  
 Betts, Mrs. F. A., 4 Reid Street, Croydon.  
 Blacket, Ralph C., "Biskra", Wyuna Avenue, Harbord, Manly.  
 Blaxland, Mrs. F. J., "The Raymond", Elizabeth Bay.  
 Boardman, W., Australian Museum, Sydney.  
 Bonder, A. J., 8 Redmyre Road, Strathfield.  
 Bourner, Desmond, 11 Pine Street, North Sydney.  
 Brain, A. H., 28 Alibone Street, Ashfield.  
 Brazenor, C. W., National Museum, Melbourne.  
 Brennan, Frank, 22 Collingwood Avenue, Earlwood.  
 Bromhead, L., Denison Road, Dulwich Hill.  
 Brookes, Albert E., Okauia, Matamata, Waikato, New Zealand.  
 Brown, Bob, 34 Swete Street, Lidcombe.  
 Brown, Dr. Reginald, Newcastle.  
 Brown, J. H., 59 Alma Road, St. Kilda, Victoria.  
 Brown, W. R., "Ocean View", Robertson.  
 Browne, R. B., 113 Pacific Highway, Hornsby.  
 Browne, Mrs. R. B., 113 Pacific Highway, Hornsby.  
 Bryce, Mrs. E. J., 47 Nelson Road, Lindfield.  
 Buchan, William A., 220 Carrington Road, Coogee.  
 Burgis, B., 19 Henson Street, Penshurst.  
 Buring, Miss B., 51 Cremorne Road, Cremorne.  
 Burnet, Noel, "Koala Park", Castle Hill Road, West Pennant Hills.  
 Burns, T. E., 10 Elswick Street, Leichhardt.  
 Butters, Miss E., 28 Toxteth Street, Glebe.  
 Burton, S., Railway Parade, Mortdale.

Camp, Charles, 7 Heydon Street, Mosman.  
 Carey, Ross, 4 Marion Street, Enmore.  
 Cayley, Neville C., 42 Newcastle Street, Rose Bay.  
 Chaffer, Norman, 90 Boundary Street, Roseville.  
 Chambers, A. H. G., Trinity Grammar School, Summer Hill.  
 Chenery, Dr. Arthur, Wentworth.  
 Cherniayeff, Boris V., Jerseyville, Macleay River.  
 Cherry, G., 12 Mars Street, Gladesville.  
 Chisholm, Dr. E. C., 30 Cliff Street, Manly.  
 Clampitt, G., "Lota", Oxford Street, Lidcombe.  
 Clark, J., 34 Campbell Grove, Hawthorn, Victoria.  
 Clarke, A. E., 4 Elsham Road, Auburn.  
 Clarke, F. O., 41 Crump Street, Mortdale.  
 Clarke, J., 41 Crump Street, Mortdale.  
 Cleland, Professor J. Burton, The University, Adelaide, South Australia.  
 Clifford, S., "St. Leonard's", First Avenue, Maroubra.  
 Clinton, K. J., School of Tropical Medicine, University, Sydney.  
 Cook, J. S., Geelong C. of E. Grammar School, Corio, Victoria.  
 Cooksey, Dr. T., Calypso Avenue, Mosman.  
 Cooksey, Mrs. T., Calypso Avenue, Mosman.  
 Cooper, Miss Jean, 37 King Street, Waverton.  
 Cooper, Roy P., 22 Dangar Street, Randwick.  
 Crawford, Miss M., "Berrylea", Cremorne Road, Cremorne.  
 Creevey, J., 74 Houston Road, South Kensington.  
 Cridland, Frank, O.B.E., 10 Barrack Street, Sydney.

Davison, Frank Dalby, 2 Douglas Avenue, Willoughby.  
 De Lestang, Albert, Adel's Grove, via Burketown, North Queensland.  
 Dine, T. R., 24 Vivian Street, Bexley.  
 Dingeldei, W. L., 75 Stacey Street, Bankstown.

Dodd, Alan P., Prickly Pear Laboratory, Sherwood, Queensland.  
Dummett, George, 7 Wellington Street, Arncliffe.  
Dummett, Stephen, 7 Wellington Street, Arncliffe.  
Dunbar, H. R., Gordon Road, Roseville.  
Duncombe, R., 100 Gloucester Road, Hurstville.  
Dunlop, J., 213 Canterbury Road, Campsie.  
Dunphy, Miss C., "Breadalbane", Birriga Road, Bellevue Hill.  
Durbidge, Ashley, 12 Gladstone Street, Kogarah.

Earl, Miss G., 115 Victoria Street, Potts Point.  
Emerson, Robert, 13 First Avenue, Willoughby.  
English, Miss K. M. I., March Street, Yass.  
Enright, W. J., West Maitland.  
Esplin, Thos. D., 28 Bond Street, Sydney.

Faulder, J. R., Merrylands Road, Merrylands.  
Ferguson, Mrs. C. A., "Glen Fergus", Cooma.  
Ferguson, Thomas L., "Rancliff", Ocean Street, Woollahra.  
Filewood, E. S., 1 First Avenue, Campsie.  
Flynn, T., 1 Rose Street, Chatswood.  
Forbes, Dr. A. D., Nynghan.  
Forwood, J., 66 Milsop Street, Bexley.  
Fountain, Miss Enid, 17 Huntley's Point Road, Huntley's Point.  
French, S., 33 Premier Street, Marrickville.  
Friedländer, R., 11 Karlstrasse, Berlin, N.W.6, Germany.  
Friend, H. L., Bank of N.S.W., Head Office, Sydney.  
Friend, Mrs. H. L., Bank of N.S.W., Head Office, Sydney.  
Fuller, Miss M., Box 109, Post Office, Canberra.

Gairns, J. A., 9 Falconer Street, West Ryde.  
Gannon, Gilbert Roscoe, 168 Hampden Road, Artarmon.  
Gardiner, A., 21 Kingsland Road, Strathfield.  
Garraway, A. K., 21 Graham Street, Auburn.  
Geering, Gerald Williams, 134 Sydney Street, Willoughby.  
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Gilbert, P. A., "Dacelo", Coin Street, Lakemba.  
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Goodwin, Dr. C. R., 185 Elizabeth Street, Sydney.  
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Graham, D. H., 718 King Street, Dunedin, New Zealand.  
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Gray, A. D., 49 Vaughan Street, Lidcombe.  
Greaves, T., Box 109, P.O., Canberra.  
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Hargreaves, E., 9 Addington Avenue, Ryde.  
Hargreaves, H., 9 Addington Avenue, Ryde.  
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Haynes, John, 2 Cobar Street, Dulwich Hill.  
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Hinder, Miss B. J., Doone College, 81 Darling Point Road, Sydney.  
Hinder, Miss J. L., Doone College, 81 Darling Point Road, Sydney.  
Hollingsworth, W. S., 9 Saville Street, Gore Hill.  
Horn, E. J., 20 Old South Head Road, Vacluse.  
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Ings, Keith Richard, 9 Gould Street, Campsie.

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Jardine, Walter J., 34 Strickland Avenue, Lindfield.  
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Jones, Miss Vidie, 12 Etham Avenue, Darling Point.  
Jopling, Miss, Public Library, Sydney.

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Laird, Miss M., 3 Clarewill Court, Bream Street, Coogee.  
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Lavender, Roy, 13 Goulburn Street, Sydney.  
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McCarthy, F. D., Australian Museum, Sydney.  
McClelland, Hugh, 46 Calthorpe Road, Edgbaston, Birmingham, England.  
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McDonagh, E., 3 Eve Street, Arncliffe.  
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MacPherson, Dr. John, "Wyoming", 175 Macquarie Street, Sydney.  
MacPherson, R., Weston Street, East Hills.  
McRowan, R., 66 Milsop Street, Bexley.  
McSwiggan, T. J., 26A Railway Parade, Penshurst.  
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Napier, H., 4 Nandemar Avenue, Flemington.  
 Narme, David, 27 Wyatt Avenue, Burwood.  
 Nattey, L., Marrickville Road, Dulwich Hill.  
 Nicholas, E., 19 Edinburgh Road, Willoughby.  
 Nicholas, H. T., Box 45, Scone.  
 Nicholson, Dr. A. J., Bureau of Economic Entomology, Canberra, F.C.T.  
 Nock, G. S., 188 George Street, Sydney.  
 Northmore, Sir John, Judge's Chambers, Supreme Court, Perth, W.A.  
 Nubling, Erwin, Flat 2, 23 Hughes Street, Potts Point.

O'Brien, B., 541 King Street, Newtown.  
 O'Brien, N., 525 King Street, Newtown.  
 Oliver, Arthur W. L., Custom House, Shanghai, China.  
 Oliver, Dr. W. R. Brooks, Dominion Museum, Wellington, New Zealand.  
 Ormsby, Anthony Irwin, 17 Castlereagh Street, Sydney.  
 Owens, H., 88 Sproule Street, Lakemba.

Paine, Mervyn, Seaforth Crescent, Manly.  
 Patterson, E., Woodford Street, Northwood.  
 Paul, H. G., c.o. H. Jockel, Mathews Chambers, The Corso, Manly.  
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 Peterson, Miss Jean, 97 Lyons Road, Drummoyne.  
 Phelps, J., 75 Ben Boyd Road, Neutral Bay.  
 Phillips, G., 732 Military Road, Mosman.  
 Poacher, Herbert, 459 Liverpool Road, Croydon.  
 Pocock, H. W., c.o. Nock & Kirby, Ltd., 188 George Street, Sydney.  
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 Probsthain, Arthur, 4 Great Russell Street, London, W.C.1.  
 Puffet, S., "Glenalva", 6 Cobden Street, Belmore.

Quaife, P. L., 33 Spencer Road, Mosman.  
 Quiney, H. R., 16 Clovelly Road, Randwick.

Ramsay, J. S. P., 55 George Street North, Sydney.  
 Relton, H., junior, 19 Village High Road, Vaucluse.  
 Reynolds, J. W., 87 Fairview Street, Arncliffe.  
 Rhodin, C., Kyle Parade, Blakehurst.  
 Richardson, A., Piggott Street, Dulwich Hill.  
 Ridley, D. M., Vale Avenue, Dee Why.  
 Risby, Miss D., 26 Cremorne Road, Cremorne.  
 Robinson, A., 4 Hurlstone Avenue, Hurlstone Park.  
 Ross, C. S., 36 Harnett Street, Marrickville.  
 Royal Zoological and Acclimatization Society of Victoria, Royal Park,  
 Melbourne.



Salmon, Horace, 86 Charles Street, Ryde.  
 Sands, F. W., 37 Duncan Street, Arncliffe.  
 Sandoz, S. E., "Croissy", Ferry Street, Hunter's Hill.  
 Scott, Cecil Baliol, Whitton.  
 Scott, J. F., Bank of Australasia, Martin Place, Sydney.  
 Sears, Miss C., 40 Towns Road, Rose Bay.  
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 Sharp, J. H., 1 Moore Street, Campsie.  
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 Sheridan, Miss Helen, 36 Stuart Street, Longueville.  
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 Smith, Miss Vera Irwin, 13 Upper Cliff Road, Northwood.  
 Smythe, S., 19 Gelling Avenue, Strathfield.  
 Snelson, W. H., 43 Dean Street, Enfield.  
 Springall, C. W., 478 Mowbray Road, West Lane Cove.  
 Springall, K. W., 478 Mowbray Road, West Lane Cove.  
 Stacey, T. D., 27 Watson Street, Bondi.  
 Stach, Leo W., 78 Herbert Street, Albert Park, Victoria.  
 Steeles, C. E., 70 Bayview Street, Undercliffe.  
 Stewart, A., 443 Parramatta Road, Leichhardt.  
 Stowar, A., Sheffield Street, Auburn.  
 Sullivan, Noel, 69 Duntroon Avenue, Roseville.  
 Sutton, John Dimond, 17 Dundas Street, Coogee.

Tancred, P. H., 10 Hardy Street, South Ashfield.  
 Taylor, H. W., 27 Bathurst Street, Woollahra.  
 Teasdale, J., 132 Elizabeth Street, Ashfield.  
 Thomas, J. F., Tenterfield.  
 Thomson, Dr. R. M., Chapel Road, Bankstown.  
 Thurman, A. J., 13 Anthony Street, Croydon.  
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 Thurman, W. A., 254 George's River Road, Croydon Park.  
 Tillyard, Dr. Robin J. (see Fellows).  
 Tipper, J. D., 72 Midson Road, Epping.  
 Tomlin, Miss M. N., 148 Blue's Point Road, McMahon's Point.  
 Trewartha, F. J., Lane & Trewartha Ltd., 108 Hunter Street, Newcastle.  
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Vaughan, O., 29 Highland Avenue, Gordon.

Wachsmann, A. C. W. de B., Beecroft.  
 Walsh, J., 39 Third Avenue, Carlingford.  
 Ward, James, 167 Victoria Street, Dulwich Hill.  
 Ward, J. E., 10 Ewenton Street, Balmain East.  
 Warner, Miss E. M., Box 1595, G.P.O., Sydney.  
 Watkins, G. W., *Sydney Morning Herald* Office, Sydney.  
 Watson, Eric Dean, Rural Bank of N.S.W., Box 41A, G.P.O., Sydney.  
 Webster, Mrs. T., 20 Park Road, Kogarah.  
 Webster, T. E., 20 Park Road, Kogarah.  
 Weeding, Rev. Benjamin J., Box 22, Booleroo Centre, South Australia.  
 White, F., 33 Short Street, Homebush.  
 Whitehouse, N. V., 183 George Street, Brisbane, Queensland.  
 Whiteley, A., 17 East Crescent, Hurstville.  
 Wilks, E. F., 42 Beach Street, Coogee.  
 Wilks, H. O., 124 Castlereagh Street, Sydney.  
 Williams, Amos E., Wyoming, Berridale, via Cooma.  
 Williams, George Richard, 34 Rowe Street, Eastwood.  
 Williams, Miss G. M., Oomabah Private Hospital, Dungog.  
 Williamson, James Robert, 48 Ocean Street, Penshurst.  
 Wills, J. R., 49 Ross Street, Parramatta.  
 Wise, Miss Mary I., P.O. Box 53, Sale, Victoria.

Withers, Miss N. J., 9 St. John's Avenue, Gordon.  
Worth, G., 14 Renwick Street, Marrickville.  
Woods, C. W., 30 Jome Street, Pyrmont.  
Woods, R. F., 81 Grasmere Road, Cremorne.  
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Yardley, H., 37 Renwick Street, Leichhardt.  
Youngmann, H., 13 School Parade, Marrickville.

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