The South Australian Naturalist

The Journal of the Field Naturalists' Section of the Royal Society of South Australia and of the South Australian Aquarium Society.

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CONTENTS.

The authors of papers are responsible for the facts recorded and opinions expressed.

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The South Australian Naturalist.

VOL. XI. NOVEMBER, 1929. No. 1.

NOTES ON THE BOTANY OF SOUTH AUSTRALIA. PART I.

By J. Burton Cleland, M.D.

The expedition, organised by the Board of Anthropological Research of the University of Adelaide, to Alice Springs and Hermannsburg during August, 1929, coincided unfortunately with a period of long drought which had lasted for five years. The consequence was that, except here and there where a few points of rain had fallen, the country was remarkably dry and mostly waterless and only those plants had survived which were peculiarly fitted for eremian (desert) conditions. The notes here submitted attempt to give an indication of the plants to be found under such conditions, which must form a striking contrast to the wealth of grass and herbage after a soaking rain.

The members of the expedition, eight in number, left Adelaide on August 4th to study various aspects of the aboriginals, journeyed to Stuart (Alice Springs) by the first passenger train to open the new line from Oodnadatta, arrived there early in the afternoon of August 6th, left for Hermannsburg Mission Station *via* the Jay River (about 90 miles) next morning, and commenced to retrace their steps on August 20th, 1929.

The country in the McDonnell Ranges and their neighbourhood consists of bold and precipitous mountain masses, with lower outliers, mostly running east and west, the plains being flat or slightly undulating. The mountains average about 3,000 feet in height, but some of the taller peaks reach 5,000 feet. The plains themselves are some 2,000 feet above sea-level. Cutting through the ranges and running more or less at right-angles to these, are a number of watercourses, dry except for pools in sheltered places, unless after heavy rains. The gaps through which these cut their way are sometimes only ten yards or so wide, sometimes a chain or more, and the immediate sides, rising perhaps for 500 feet before opening out in a V fashion, are often unscalable from their precipitous nature and projecting rock masses. The length of the gaps through the ridges may be not more than 200 yards. On

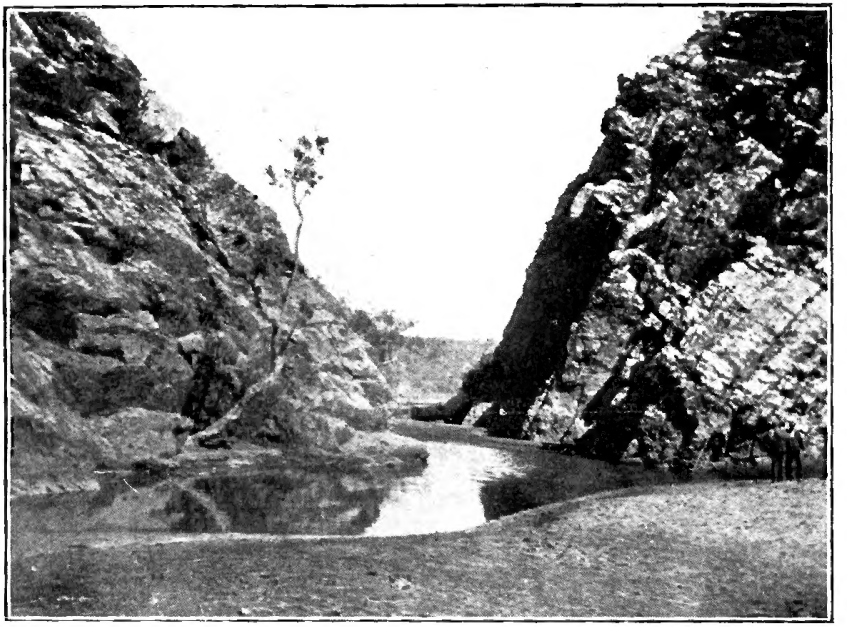
such places, partially protected from evaporation by the shade, pools of water twelve or more feet deep may remain for years, occupying the deep holes scoured out by the torrential rush of waters that at rare intervals sweep through from the mountainous surroundings. Passage through such narrow gaps may be barred by these refreshing waterholes, as for example at Emily Gap, Simpson's Gap and Glen Helen.

The MacDonnells themselves consist of a series of more or less separate ranges running east and west, separated by valleys which are very narrow or a few miles wide and to which the various gaps are exits, giving escape also to the watercourses. To the south of the MacDonnell Ranges lie the lower James Ranges separated by the Missionaries Plains, some 10 to 15 miles wide. The Krichauff Range is that part of the James Ranges immediately west of the Finke Gorge where that broad and usually dry sandy watercourse cuts its way through at the foot of Hermann's Berg. Close by is the Hermannsburg Mission Station, beside the river, some 85 miles south of west of Alice Springs.

From the botanical point of view, the district may be divided broadly into the following divisions:—(1) The plains and broad valleys, (2) the foothills, mountains and gorges, and (3) the watercourses and their pools.

(1) THE PLAINS AND VALLEYS. These in most parts consist of a sandy loam, though in places more clayey so that they here readily become waterlogged and boggy and form small clay-pans, in places covered with loose stones when in proximity to weathered hills thus forming a kind of gibber, in places showing sand ridges and in still other others when near watercourses forming part of flood-plains.

Most of the direct road to Hermannsburg from Alice Springs runs over the Missionaries Plains. In drought time, the chief, almost the entire, vegetation, vegetation is shrubby, and the predominant shrubs are acacias. Of these, the mulga *(Acacia aneura)* is in places dominant, and in other parts another Acacia, a spreading shrub up to about 10 feet high with rather broad but short multistriate phyllodes and neither in flower or fruit at the time of our visit. The mulgas as now growing are rarely so close together as to prevent a motor car from being driven between them, and often they are widely spaced. Mr. Johansson, a local resident, tells me that he recognises three kinds, one a shrub only, the other two, one narrow-leafed, one a little broader, growing into small, rather shapely trees with upright phyllodes. In passing across the plains, the young mulgas are clothed with branches



[Photo—J. B. Cleland, M.D.

(1) Emily Gap, Macdonnell Ranges.

[Photo—J. B. Cleland, M.D.

(2) Mulga trees *(Acacia aneura)* and "Desert Spinifex" *(Triodia irritans)*.

nearly to the ground passing out almost horizontally—perhaps these represent its shrubby form. When grown into a tree, the stem is free from branches. The Ironwood *(Ac. estrophiolata,* plate 1) is a taller tree, with pendant narrow phyllodes giving it a willow like appearance, and with a dark furrowed stem. It is widely distributed but much less abundant than the mulga and the trees are a pleasing feature in the landscape. The prickly Dead Finish *(Acacia tetragonophylla)* with sharp-pointed phyllodes occurs as occasional bushes, some being in flower during our visit and presenting quite a pretty appearance. A grey-leaved *Loranthus* was seen on the mulga and ironwood. This was probably the same as one *(L. gibberulus)* with terete grey-hoary leaves which was found in flower on another *Acacia* (or perhaps on *Cassia eremophila* which was collected at the same time). *L. gibberulus* usually infests species of *Grevillea* (as was seen at Glen Helen) or *Hakea.* Three species of *Hakea* occur on the plains or valleys, two of which, both corkwoods, are small trees. These latter are met with usually in little colonies and both may be seen round Stuart and on the track to Emily Gap. They often grow on the higher ground near watercourses. *Hakea intermedia* has terete leaves which fork several times in a rather zig-zag way and have a total length of about 3½ to 4½ inches; the flowers are greenish, in dense racemes, the fruits in thick clusters and readily opening in the tree; it grew in the Missionaries Plains near the Hugh and on the flood-plains of the Finke to the south of Glen Helen as well as near, or actually in, Stuart. In *Hakea lorea* the leaves are also terete but considerably longer (8 or more inches) and divide into only two or three bunches; the flowers and fruits resemble those of *H. intermedia*; the corky bark may project as ridges more than an inch deep; it grew near Stuart and on the higher plain-land to the west of the Finke at Hermannsburg. The third *Hakea* is the Needle-bush *(H. leucoptera),* usually a rather fan-shaped shrub 6 or 8 feet high, readily recognisable by the presence of numerous unopened ovate-lanceolate basally swollen woody fruits. This species was widely but sparsely distributed on the plains between the mulga. The Beef-wood *(Grevillea striata),* a small tree, was similarly widely and sparsely dispersed; it grew amongst other places with *H. lorea* to the west of the Finke at Hermannsburg; the leaves are long (up to 10 inches), narrow (¼ inch wide) and multistriate and the fruits are nearly disc-shaped and thin like those of other Grevilleas. Here and there were a few *Cassia* bushes belonging to two species, the two leaflets being terete in one species *(C. eremophila),* the several leaflets broad in the other (probably *C. Sturtii).* In the sand ridges grew another *Cassia (C. pleurocarpa)* with distantly separated

broad leaflets. Amongst other shrubs were occasional examples of *Acacia ligulata,* of an *Enemophila,* of an acacia-like shrub with a few prickles and small berries but not in flower, of a *Dodonaea (D. attenuata)* with narrow leaves, and Bullock-bush *(Heterodendron oleifolium).* Porcupine grass *(Triodia sp.)* was occasional.

When, as near Alice Springs, we came to patches where a little rain had fallen, the bare spaces under and between the perennial shrubs above-mentioned were clothed with annuals such as composites (Everlastings, etc.), Chenopodiaceae (saltbushes, etc., especially where there had been more moisture as near runnels), Amarantaccae, Malvaceae and a few grasses *(Aristida, Eragrostis, etc.).*

(To be continued.)

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SHELL COLLECTORS' COMMITTEE.

This club met on twenty-two evenings during the year, with an average attendance of fourteen members. Interest in the aims and objects of the club has been well maintained throughout, resulting in members having now a good working knowledge of the various shell families under review. Twenty-seven distinct families of Bivalve Mollusca were studied in the order now generally placed by modern Conchologists. A majority of the many species coming under these families, collected by members from various points on our coast line, was exhibited. Without facilities for dredging in deep water members of the club have had little chance of discovering new species in beach collecting and thus adding to the excellent tabulated list now in hands of members, but much work still remains in the way of uncovering the habits and life history of many of our common species, which should prove of practical value. This aspect has been fully dealt with at every meeting.

At the Annual Native Wild Flower Show the club exhibited a typical collection of South Australian shells, which was favourably commented on by visitors.

W. J. KIMBER, Chairman.
F. TRIGG, Hon. Sec.

AUSTRALIAN BOTANICAL NOMENCLATURE.

The Committee appointed in 1924 by the Australasian Association for the Advancement of Science to deal with this subject came to a decision regarding certain generic names in 1925 and again in 1929. The Committee recommended that, in order to ensure stability of nomenclature, several names should be placed on the list of *nomina conservanda* and the synonyms on the list of *nomina rejicienda*. These will form an addition to the list of such names adopted at the Vienna Congress of 1905, and they will be presented to the International Botanical Congress to be held at Cambridge (England) in August, 1930. The full list of Australian names is as follows:—

NOMINA CONSERVANDA.	*NOMINA REJICIENDA.*
ORCHIDACEAE.	
Corysanthes, R. Br. (1810).	*Corybas,* Salisb. (1807).
Goodyera, R. Br. (1813).	*Epipactis,* Boehm. (1760).
	Peramium, Salisb, (1812).
POLYGONACEAE.	
Muehlenbeckia, Meisn. (1840).	*Calacinum,* Rafin. (1836).
	Karkinetron, Rafin. (1836).
	Sarcogonum, G. Don (1839).
LEGUMINOSAE.	
Dichrostachys, Wight et Arn. (1834).	*Cailliea,* Guillem et Perr. (1833).
CELASTRACEAE.	
Denhamia, Meisn. (1837).	*Leucocarpum,* A. Rich. (1834).
UMBELLIFERAE.	
Oreomyrrhis, Endl. (1839).	*Caldasia,* Lag. (1821).
EPACRIDACEAE.	
Leucopogon, R. Br. (1810).	*Perojoa,* Cav. (1797).
STYLIDIACEAE.	
Stylidium, Swartz. (1805).	*Stylidium,* Lour. (1790).
COMPOSITAE.	
Angianthus, Wendl. (1809).	*Siloxerus,* Labill. (1806).
Olearia, Moench. (1802).	*Shawia,* Forst. et f. (1776).
Cassinia, R. Br. (1817).	*Cassinia,* R. Br. (1813).

The Committee also considered certain other generic names which have already the right of priority in their favour, but which have been replaced by later names in several important works dealing with the Australian flora, and it was decided to oppose any proposal which might be made at the Congress to displace the earlier names. These generic names are:—

Themeda, Forsk. (1775) as against *Anthistiria,* L. f. (1779). —*Gramineae.*

Stenophyllus, Rafin. (1825) as against *Bulbostylis* (Kunth) C. B. Clarke (1893).—*Cyperaceae.*

Stemona, Lour. (1790) as against *Roxburghia,* Banks (1795).

Lomandra, Labill. (1804) as against *Xerotes,* R. Br. (1810).

Corymborchis, Thou. (1809) as against *Corymbis,* Thou. (1822).

Lindernia, All. (1762-65) as against *Bandellia,* L. (1767).—*Scrophulariaceae.*

The personnel of the Australian Committee was as follows:—

J. W. Audas, F.L.S., Curator, Victorian National Herbarium.

J. M. Black, Hon. Lecturer in Botany, Adelaide University, and Hon. Secretary of the Committee.

R. A. Black, Botanist of Agricultural Dept., Tasmania (1925).

W. M. Carne, Government Botanist, Western Australia (1925).

E. Cheel, Curator, New South Wales National Herbarium.

G. P. Darnell-Smith, D.Sc., Director, Botanic Gardens, Sydney (1929).

A. J. Ewart, D.Sc., F.R.S., F.L.S., Professor of Botany, University of Melbourne.

C. A. Gardner, Government Botanist, Western Australia (1929).

E. J. Goddard, B.A., D.Sc., Professor of Biology, University of Brisbane.

T. Harvey Johnston, M.A., D.Sc., Hon. Professor of Botany, University of Adelaide (1929).

W. Laidlaw, Government Botanist, Victoria (1925).

A. A. Lawson, D.Sc., Professor of Botany, University of Sydney (1925).

J. H. Maiden, I.S.O., F.R.S., F.L.S., late Government Botanist of New South Wales (1925).

T. G. B. Osborn, D.Sc., Professor of Botany, University of Sydney (1929).

F. J. Rae, B.A., B.Sc., Government Botanist, Victoria.

L. Rodway, C.M.G., Government Botanist, Tasmania.

R. S. Rogers, M.A., M.D., Adelaide (1929).

C. T. White, F.L.S., Government Botanist, Queensland.

J. G. Wood, M.Sc., Lecturer in Botany, University of Adelaide (1929).

FORTY-SIXTH ANNUAL REPORT OF THE FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY.

Year Ending 31st August, 1929.

The work of the Section has been well maintained for the last twelve months, and the following report is presented for the information of members.

MEMBERSHIP. Last year's membership was 188, and of this total 118 were financial. The figures this year are 150 members, of which number 110 are financial. While 17 new members were admitted, the losses were two by resignation and two by death.

EXCURSIONS. Outings in the field have been arranged to many points, and the leaders are to be thanked for the time devoted to the enlightenment of the members. Trips have been made to coast, plains, foothills, river, forest, and the Gulf, whilst visits to the Museum, Botanic and private gardens provided much instruction. A more intense concentration of the study of wild life in the field, the source, after all, of our knowledge of Natural History, is desired. It is there that we may solve the secrets of nature, which she guards very jealously from the merely curious, but reveals unreservedly in all their infinite variety and beauty to the patient and zealous investigator. The Committee would like to see better attendances at the excursions and more members taking up a definite line of study.

LECTURES. Our standard of lectures has been well maintained, and we have been favoured with excellent lantern lectures by the following:—

Dr. A. E. V. Richardson, on "Nature Notes and Scenes in Japan and Java."

Mr. N. B. Tindale, on "Aborigines of the West Coast."

Mr. R. W. Segnit, B.Sc., on "The Oxford University Expedition to Spitzbergen."

Rev. A. M. Trengove, on "Some Critical Aspects of Aus-Inland."

Dr. H. Basedow, M.P., on "Some Critical Aspects of Australian Anthropology."

Mr. H. M. Hale, on "Mosquitoes," etc.

Others who assisted with papers or lecturettes were:—

Mr. W. Champion Hackett, on "The Protection of Our Fauna and Flora."

Prof. J. B. Cleland, M.D., a paper on "The Original Flora of the Adelaide Plains," and lecturettes on "Our Herbarium" and "Botanical Notes on a Trip North of Port Augusta, and Bird Observing."

Mr. E. H. Ising, on "Herbarium Work," on "Native Plants at Mile End, near Adelaide," on "Botanical Notes on Alligator Creek and Mount Remarkable."

Mr. B. B. Beck, on "A Trip to Alligator Creek."

Mr. W. Ham, on "Geological Specimens from Kingscote, K.I."

Mr. J. F. Bailey gave a lecturette on "Some Australian Flowers."

Messrs. W. J. Kimber, F. Trigg, Broadbent, H. Williams, Misses V. Taylor, Moore, J. Murray, and R. E. Kentish showed specimens in connection with the Shell Committee.

Mr. F. B. Collins, on "Insect Pests of the Dried Fruit Industry."

EXHIBITS. Many members contributed to this important part of our programme, and the members are thanked for their interest in bringing objects of Natural History. Every exhibit brought to the meetings has created a certain amount of interest; members are urged to foster this interest by bringing specimens and giving observations concerning them.

THE "SOUTH AUSTRALIAN NATURALIST." Our Journal has been published regularly each quarter under the editorship of Mr. W. Ham. The part to be issued this month (No. 4) will complete Volume X.

The subject of Botany has been dealt with by Prof. J. B. Cleland and Mr. E. H. Ising, Aboriginal Rock Carvings by Mr. H. M. Hale, Fresh Water Fishes by Mr. C. Blewett, and Shell Studies by Mr. F. Trigg. The Committee hope to enlarge and further illustrate the Journal, and the Editor will be pleased to receive contributions of original Natural History observations, with illustrations. We have received £5/15/- from the Royal Society for this purpose.

WILD FLOWER SHOW. 1928 Annual Show was held on October 12th and 13th in the Adelaide Town Hall, which was made available by the kindness of the Lord Mayor. The exhibition was up to the usual standard, and flowers were contributed by schools, mutual clubs, friends and members. Many branches of Natural History were represented, including shells, microscope subjects, botany (pressed specimens and native timbers), aquatic life (prepared by the S.A. Aquarium Society and the Education Department through Mr. Machell), entomology—an exhibit of butterflies, beetles, etc., from the Museum—wild flower paintings, etc.

The show proved successful, and £33/10/- profit was made.

HERBARIUM. The work in the Herbarium has been continued under the able direction of Professor J. B. Cleland and Mr. J. G. Wood, M.Sc. Increased numbers of specimens have been drafted into their orders and filed into cardboard boxes. The painting of specimens with a poisonous mixture and mounting of specimens has proceeded a further stage. Lists of plants in the Morialta, Waterfall Gully and Belair National Park Reserves have been prepared and are ready for publishing when funds permit. There is a large amount of work to be done and more helpers are needed. The work is engaged in on certain Mondays from 5 to 6 p.m.

OBITUARY. By the death of Mr. Walter Gill, F.L.S., F.R.H.S., we have lost one of our oldest and best members. Mr. Gill was best known for his many lectures on forestry and forest trees and for his particularly fine lantern slides all made from views taken by himself in various parts of the State. Mr. Gill's store of forestry information was almost unlimited, and he had the valuable asset of being able to impart his knowledge to others in a fluent, pleasing and instructive way. Mr. Gill will always be known, at least in the forestry world, for his planting of pines which he was able to cut into merchantable timber in his own life time. His keenness and zeal in all forestry matters were well known.

Mr. T. P. Bellchambers, that noted and wonderful naturalist, an honorary member, passed away in July, and was buried in the Sanctuary at Humbug Scrub, which he, almost unaided, had created in the heart of the hills near One Tree Hill. This great nature lover will always be known for his unselfish and untiring efforts to preserve our native wild life, especially the fast disappearing fauna of our State. Perhaps his best work, and it is really famous, was in connection with the Mallee Fowl. A pair of these birds he had kept in captivity for more than fourteen years and as they bred freely, he was able to observe their habits and learn their life history in a way that was incomparable. His observations are recorded in "Nature, our Mother," and also by a fine series of lantern slides taken by himself of his birds.

Mr. Bellchambers also secured specimens of kangaroos, wallabies, emus, Mallee fowl, ducks, etc., and provided them with a secure and permanent home in natural surroundings. Among the very numerous visitors to the Sanctuary were Sir Arthur Conan Doyle, Commonwealth Governors-General, State Governors, and many prominent South Australians. It is a pleasure to learn that Mr. Bellchambers' sons will carry on the good work.

HERBERT M. HALE, Chairman.
ERNEST H. ISING, Hon. Sec.

THE TENTH ANNUAL WILD FLOWER AND NATURAL HISTORY EXHIBITION.

October 10 and 11, 1929.

The tenth annual fixture of the Section was held in the Adelaide Town Hall on Thursday and Friday, 10th and 11th October, and proved very successful from all points of view. A good rain fell in the Mount Lofty Range several weeks before the Show, and the flowers from the hills were exceedingly good as a result of it. School teachers and scholars from many country centres contributed the bulk of flowers from this State, while Field Naturalists' Clubs and friends supplied the interstate flowers. These latter were sent by the following:—

West Australia—Field Naturalists' Club, flowers from near Perth, per Lt.-Col. B. T. Goadby, Hon. Sec.; Mr. R. B. Ackland, Wongon Hills; Mr. R. T. Stubbs, a large and extensive collection from Brunswick Junction.

Victoria—Victorian Field Naturalists' Club, per Mr. J. W. Audas.

New South Wales—Mr. D. Chalker, Hilltop, Waratahs and Boronia.

Queensland—Queensland Field Naturalists' Club, per H. N. Slaughter, flowers from Thulimbah.

Mr. G. F. Berthoud, Hamel, a fine collection of W.A. everlastings.

The following committees were formed with the following conveners:—

Scientific Classification: A large number of species were labelled with their botanical names and were very instructive to students and others, Messrs. J. M. Black and J. F. Bailey (Dr. R. S. Rogers named the orchids); School Flowers, Mr. W. H. Selway and Miss J. M. Murray; Massed Effects: Mrs. B. B. Beck arranged a very effective pyramid in the centre of the hall; Cultivated Flowers were exhibited by Mr. W. Burdett, who showed a magnificent collection grown by him at Basket Range; Mr. Edwin Ashby, an excellent variety from several States grown at Blackwood; Mr. T. C. Wollaston, many fine blooms cultivated by him at Bridgewater, and Miss Parkhouse a number of species grown at Woodville. A large collection of insects, including moths, butterflies, beetles, wasps, etc., was kindly lent by the Board of Governors of the Public Library, also a fine collection of shells. The Shell Collectors' Committee also exhibited a large number of shells, and gave lecturettes during the course of the Show; Mr. W. J. Kimber, convenor. Pond Life, consisting of a number of jars containing fish and other aquatic life and plants; convenor, Mr. J. E. L. Machell.

The Exhibition opened at noon on Thursday, 10th October, and the official opening by the Lady Mayoress (Mrs. J. L. Bonython) took place at 8 p.m. that evening. Lecturettes illustrated by lantern slides were given by the following:—Mr. H. M. Hale, "Trip to Macdonnell Ranges"; Mr. J. F. Bailey, "Australian Trees"; Mr. W. J. Kimber, "Trip to Barrier Reef"; and Mr. A. J. Morison, "Parks and Gardens, etc."

Mr. L. H. Howie was convenor of the painting competition and, with Miss Lois Laughton, acted as judges. In the Public Schools section for watercolours there were good entries, and Miss J. M. Murray donated the second prize of 5/-; for watercolour design in the same section Miss M. Roeger donated the second prize of 5/-. For the amateur class (watercolour paintings only) there were good entries, and the prizes were awarded as follows: —First, Miss J. Williams, Geraldton waxflower; second, Miss V. Buttrose, Chorizema. Prizes for painting for Public Schools: First: Miss M. Brown, Butterflies; second, Miss I. Salmon, Boronia. For designs: First prize, Miss A. Phillips, Sturt Peas; second, Miss J. Jolly, Waratahs. Sales stall: Convenors, Mesdames C. Pearce and H. M. Hale. The Department of Agriculture exhibited a collection of grasses consisting of many species, including native as well as introduced; Mr. E. Pritchard, convenor. Prof. J. B. Cleland exhibited the following: –Living bacteria drawn to represent various items; named ephemeral native plants; named fungi; named collection of South Australian seaweeds and seeds and pods of various Eucalypts, Hakeas, etc. Mr. A. J. Wiley made a fine exhibit of turnery in native timbers, the northern wattles, oaks and gums were shown to best advantage with a duco polish. One of Mr. Wiley's latest woods to exploit is the grey mangrove *(Avicennia officinalis),* which is a pale grey timber with fine dark lines. Microscopes and a micro projector were exhibited by Mr. English, and loaned by Messrs. Laubman and Pank; Mr. W. H. Briggs also loaned a microscope and slides.

The Woods and Forest Department, through the kindness of the Conservator (Mr. E. Julius), exhibited furniture made of native and S.A. grown *Pinus radiata (P. insignis),* also timber samples and photos of forest scenes. A collection of specimens of wattles was also sent from Mt. Crawford forest reserve. Mr. A. J. Morison had on view a collection of photos of a trip to Queensland. Mr. R. Correll showed a fine collection of flowers from Port Lincoln and some minerals from the same place. A large collection of minerals was kindly lent by the Mines Department through Mr. R. L. Jack. Orchids grown in pots were shown by Master C. and Miss D. Kay, Rosslyn Park, Magill. Timber specimens of trees growing in all the States were shown

by the Section. Mr. G. Beck exhibited a fine specimen of *Eucalyptus torquata* and *E. Luehmannii* and a *Melaleuca;* he also lent his lantern and operated it for the lecturettes. Mrs. Parker showed a unique basket made of shells. Mr. W. Ham showed a series of pictures illustrating vandalism on the one hand and protection of our trees and flowers on the other. The school prizes were gained by the following:—First, Macclesfield; second, Myponga; third, Basket Range; fourth, Athelstone; fifth, Coonalpyn; sixth, Monarto South. Messrs. J. M. Black and J. F. Bailey judged the collections. Music was supplied on the organ on the opening evening by Mr. W. R. Knox, the organ being kindly lent by the Lord Mayor.

We are greatly indebted to the following for special help:—Mr. J. F. Bailey, pot plants and glass jars; Rosella Manufacturing Co., for the loan of bottles; Messrs. A. Simpson & Son, for flower containers; Vacuum Oil Co., through Mr. C. Drummond, for loan of cases; Mr. Tillett, for ticket writing, through Dr. C. Fenner; Mr. D. E. Chalker, for Waratahs and Boronia from Hilltop, N.S.W.; flowers from Mrs. Fowler and Mrs. B. Dodd, Myponga; Mr. Tilling, Mylor; Everlastings from Mr. G. F. Berthoud, Hamel, W.A.; Miss E. Ireland, for typing circulars, and many members of the Section for the splendid assistance throughout the Show.

The following schools contributed flowers:—Aldgate, Ashbourne, Angaston, Athelstone, Birdwood, Bridgewater, Basket Range, Burrungul, Clare, Corny Point, Coonalpyn, Echunga, Hindmarsh Tiers, Jupiter Creek, Keyneton, Laura, Lyndoch, Macclesfield, Myponga, Mt. Barker, Mt. Pleasant, Monarto South, Mylor, Sandalwood, and Upper Sturt.

The estimated profit from the Show is £36.

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RESIGNATION OF THE HON. SECRETARY.

Members of the Society will be deeply disappointed to learn that our indefatigable Secretary, Mr. E. H. Ising, who has worked so well for the Section for a period of over twelve years, has decided to resign the position of Secretary from December 31st. Members are asked to send in nominations for the position on or before December 10th. The General Committee will be called together to make the appointment, which must be made early in order that the programme for 1930 may be prepared.

FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA.

Statement of Receipts and Expenditure in the Year ended 31st August, 1929.

RECEIPTS.	£	s.	d.	£	s.	d.
31st August, 1929.						
To Balance carried forward, 1/9/29				23	0	4
„ Subscriptions				44	5	0
„ Other Receipts—						
Grant from Royal Society	50	0	0			
Flower Show Profit	33	10	7			
Bank Interest	1	3	7			
Sales of Magazines	0	19	0			
Badges & Sundries	0	4	6			
				85	17	8
				£153	3	0

EXPENDITURE.	£	s.	d.
31st August 1929.			
By Printing	48	15	6
„ Advertising	3	0	0
„ Postage	7	5	0
„ Hire of Hall, Lantern, etc.	5	3	1
„ Travelling Expenses	1	8	7
„ Books, Stationery, etc.	3	19	3
„ Aquarium Society Lighting	0	15	0
„ Sundries	2	17	0
„ Repayment to Royal Society	44	5	0
„ Losses on Excursion Account	11	6	7
„ Bank Balance, 31/8/29	24	8	0
	£153	3	0

Audited and found correct.

WALTER D. REED.
Chartered Accountant (Aust.),
WILLIAM H. BROADBENT,
Hon. Auditors.

F. TRIGG, Hon. Treasurer,
Adelaide, 14th August, 1929.

FIELD NATURALISTS SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA.

EXCURSION ACCOUNT.

LOSSES AS UNDER.

1928.	£	s.	d.
Sept. 29—Port Willunga	5	0	0
Oct. 10—Myponga—			
£3/8/6 profit transferred to Wild Flower Show Account.			
Nov. 10—Snow's, Aldgate	1	17	0
Dec. 15—Dredging—Outer Harbour	1	5	6
1929.			
Feb. 16—Dredging—Outer Harbour	0	8	1
Apr. 27—Montacute	2	16	0
	£11	6	7

F. TRIGG,
August, 12th, 1929. Hon. Sec., F.N.S.

———:o:———

MICROSCOPIC COMMITTEE.

It is desired to report to the Field Naturalists' Section of the Royal Society of S.A. that the Microscopic Committee has successfully completed the second year of its meeting.

The membership, while not notably augmented, has held to its customary number, and meetings have averaged eight to ten throughout the year.

The year commenced with a dissertation on the technicalities of the microscope itself, and later the work of the Committee was largely confined to the demonstration of methods of mounting specimens with a view to enabling members to enter more freely into the practical aspects of microscopy. It is hoped that this policy will be further continued, and combined with future demonstrations as to the collection of raw materials suitable for mounting.

Lectures were also given on subjects of interest such as "Micro-photography," etc.

"THE CRUSTACEANS OF SOUTH AUSTRALIA," Part II. By Herbert M. Hale, Curator, South Australian Museum. (Government Printer, Adelaide, August 30, 1929). Price 5/-.

This part completes the British Science Guild Handbook dealing with the South Australian representatives of the Subclass Malacostraca; in the first part (issued in 1927) the larger Crustacea, crabs, prawns, crayfish, and their allies were described and illustrated, and the section now under review deals with the smaller but no less interesting forms—the sea-fleas, sand hoppers, whale-lice, wood lice, opossum-shrimps, etc. As before, a typical member of each order is described in detail, so that the student need have no difficulty in following the descriptions and keys. The author records many species for South Australia, but remarks that a great number of unrecorded and undescribed forms awaits attention; he remarks "Portions of our coast provide ideal conditions for the smaller Malacostraca. Many Amphipods and Isopods live amongst the Algae which occur in abundance where the foreshore is rocky, while sponges and sea-squirts, which harbour some species, are plentiful . . . . . the group offers a fertile field for investigation." As an instance of the groups available for research we may mention the interesting opossum shrimps, so called because the female carries her eggs in a brood-pouch below the thorax; until recently not a single species was recorded from South Australia. Mr. Hale, however, has collected 10 species in St. Vincent Gulf; most were secured, by the way, during the annual dredging excursions of the Field Naturalists. These were described by Dr. Tattersall, a noted authority on this particular order and are included in the handbook. Similarly, no species of the remarkable order Cumacea were recorded, but the author describes 8 bizarre forms.

The work as now completed contains 364 illustrations, the majority of which were prepared by the author; a glossary of the terms used and a complete index is included, and it is hoped that the handbook will form the basis of much further research in connection with our crustaceans.

—:o:—

FLINDERS CHASE.

Professor Cleland is making an appeal for funds in support of Flinders Chase, which is wholly supported by voluntary contributions aided by a Government subsidy. A small amount has been subscribed by some members, and it is thought that others may like to subscribe to such a worthy object. Members may leave their subscription with Mr. Beck, Cole's Book Arcade, 18 Rundle Street.

EXCURSION TO KINGSTON PARK.

August 24th, 1929.

A small party explored Kingston Park, under the direction of Mr. J. A. Hogan, in search of native coast flora. The park comprises about 20 acres, and the present building was erected by Master Mariner Lewis, from whom Marino derives its name. It next came into the possession of the late Sir George S. Kingston, who planted vines and fruit trees, and enlarged the dwelling. He also planted the two conspicuous Norfolk Island pines, which once served as a striking landmark for mariners approaching the coast. The property was inherited by the late Right Hon. C. C. Kingston, and on the death of his widow it was bequeathed to the Tourist Bureau. Additions and alterations to the residence have equipped it as a kiosk for refreshments.

— NO —

EXCURSION TO PARADISE.

September 7th, 1929.

On the invitation of Mr. J. H. Coulls and Mr. L. Wickes, members paid a visit to their orange orchards, between Paradise and Athelstone. Wattles were in full bloom, notably *Acacia armata* and *A obliqua*. The apricots displayed a wealth of flower, an earnest of a bountiful crop. Orange trees were bowed down with an abundance of fruit, and the visitors were hospitably invited to help themselves freely. Almost as far as the eye could reach the landscape was mantled with the dark green foliage and the luscious fruit.

In each of the two orchards stood an ancient orange tree, both more than 70 years old, and claimed to be the oldest in the State. Mr. Coull's tree was estimated to be 35 ft. high and about 100 ft. in spread. It often yielded 30 cases of oranges. In 1855 the owner of the homestead picked up an orange pip in the kitchen of his dwelling and planted it, and this magnificent tree resulted. The tree belonging to Mr. Wickes was but slightly inferior in dimensions and yield.

Mr. Wickes showed a rare kind of plant—a deciduous orange tree. It is immune from most diseases, and although the fruit is not of much value it provides an admirable stock for other varieties. Among other trees the *Prunus japonica* showed a wealth of blossom. The yield of vegetables was extremely prolific. This was due largely to the system of overhead sprinkling. The water is lifted from the River Torrens by a force pump to an elevation about 200 ft. higher into a dam with a capacity of 200,000 gallons.

The young tomatoes were looking particularly healthy. The treatment of these plants is based on ascertained scientific principles. They are first sown in boxes in hotbeds, richly manured, and then transferred to small pots. Then the young tomatoes are hardened out in soil that has been sterilised by the Government steaming plant. This process destroys the numerous microbes and fungoid pests that of recent years threatened to wipe out tomato-growing.

Mr. Wickes devotes his hard-won leisure to the cultivation of native flora. *Callistemon* (bottle brush), *Boronia, Hakea, Elaeocarpus,* and many other species have taken kindly to their new habitat, and the *Hakea* especially shows some fine blooms. Among aliens the South African silver leaf *(Leucodendron)* was conspicuous. A pleasant walk along the banks of the cemented channel conveying the river water to Hope Valley was greatly enjoyed. The banks of the channel are bordered with lofty pines. Through the gaps in these avenues glimpses were caught of the peaceful and prosperous village of Athelstone against the background of lofty cone-shaped hills, broken here and there by long, winding gullies through which sparkled the waters of numberless creeks.

A contrast with modern, convenient dwellings was afforded by the old mill house, built about 1838, and another house, used as a storeroom, consisting of nine rooms, in one long line, and pigeonholes of windows. Here the visitors were shown how the oranges were graded, according to size.

EXCURSION TO DASHWOOD'S GULLY.

October 9th, 1929.

A party, at the invitation of the proprietor, visited the estate of Mr. J. A. Harper, at Dashwood's Gully. On the Coromandel Valley Road a halt was made while members explored the scrub for flowers for the Wild Flower Show. The visitors were received by Mrs. A. Harper. After lunch the party scattered through the bush in quest of native flowers. Many native blooms were obtained. The *Pultenaea* was in full bloom and many of the rich brownish-yellow blossoms were gathered. *Tetratheca, Hakea, Leptospermum* were also growing in profusion. The dainty *Caesia, Kennedya prostrata, Dichopogon strictus* were among other prizes of the search. The golden yellow blossoms of *Hibbertia sericea* (the silky guinea flower) were a marked feature of the landscape. *Platylobium obtusangulum,* known as native or wild ivy, with yellowish blossoms mottled with brown, are a great favourite with nature lovers. *Grevillea lavandulacea* (popularly Cat's claws), with its long pink pistils, was greatly admired.

Pimelea octophylla and *P. phyllicoides* provided a contrast with their cream-coloured and snowy corollas. *Olearia,* a purple daisy-like flower, and white and golden *Helichrysum* represented the *Compositae.* Two rare finds were *Zieria,* of a delicate lavender colour, and *Correa rubra,* a bell-shaped crimson flower often called from its shape and colour the native fuchsia. *Conospermum patens* is a shrub very suitable for decorative purposes. A tiny little blue flower rejoices in the formidable name of *Chaemescilla corymbosa.* Many grass trees *Xanthorrhoea semiplana* were seen, but had not yet developed their shining golden spikes. Other flowers found included *Muehlenbeckia adpressa, Goodenia, Hardenbergia, Daviesia, Dillwynia, Hypochaeris radicata, Boronia, Cryptandra tomentosa.* Orchids were represented by several species of greenhood *(Pterostylis), Caladenia* (spiders), and *Thelymitra.*

EXCURSION TO MR. T. C. WOLLASTON'S AT BRIDGEWATER.

October 19th, 1929.

The country in the vicinity is densely wooded, and the property, which is situated on a hillside, is practically surrounded by a wall of Stringybark *(E. obliqua).* Lofty pines *(Pinus insignis* and *P. maritima)* form a striking contrast to the sombre foliage of the eucalypts. These foreign trees have taken kindly to the soil and climate and have attained a prodigious growth, one measuring four feet in diameter. Graceful poplars, too, reached a height of 100 feet or more. As in most of the gardens in the hills the most varied climates are represented in a comparatively small area. Palms grew in close proximity to pines, and the indigenous *Callitris.* In very few countries can so great a diversity of vegetation be seen in so small a space. This applies also to the shrubs and flowers. English primroses, also tulips and azalea, bloom side by side with the dainty plants of our native bush. A special feature is to be observed in the cultivation of "wild flowers." The favourite *Tetratheca* (Black-eyed Susan), with its delicate pale pink blossom, was growing in profusion. *Pultenaea daphnoides* and other species displayed a wealth of golden brownish blooms. Rich pink and white heath (epacrids) and deep azure *Lithospermum* were greatly admired. These native plants will grow only under conditions to which they are accustomed in their natural habitat, and flourish best on a somewhat stony hillside. Among ornamental trees the shapely cedrus deodora was conspicuous. The dark brown foliage of *Prunus japonica* (the Japanese plum), the vivid green of the maple, the rhus, and liquidambar formed a very pleasing contrast. The native blackwood is also a very handsome tree, the deep emerald of the foliage enhanced by the darker tints of trunk and branches.

VISIT TO THE BOTANIC GARDEN.

November 2nd, 1929.

Several species of *Leptospermum* were observed, including *L. laevigatum,* from which Dr. Anderson, the botanist of Captain Cook's expedition, made a kind of tea, and in consequence the tree is commonly known as the teatree (mistakenly spelled ti-tree, the name of an entirely different plant). The paper bark *(Melaleuca styphelioides)* owes its vernacular name to the strikingly white bark. The red cedar of Queensland is known as producing the finest timber of any Australian tree, tough in texture and yet admitting the finest polish. A peculiarity of the red cedar grown in Queensland is that it is bare both in January and July, but in South Australia only in July. The Christmas bush (native Box) is well known all over the hills. Usually seen as a small shrub, it attains a tree-like growth in the Botanic Garden. Members of the pine family are in considerable numbers, including the Bunya *(Araucaria Bidwillii)*, the seeds in whose large cones are relished by the aborigines. Several stately poplars form a fine contrast in their vivid green foliage to the more sombre tints of the gums. The Black Bean trees *(Castanospermum australe)* has bright green shining leaves. These trees often reach a height of 150 feet, with a diameter of 7 feet near the base. The evergreen mountain cherry of California *(Prunus ilicifolia)* thrives well in the garden, also the Californian laurel, known as *Umbellularia Californica.* Other trees observed included the weeping myall from Central Australia. Among small native plants *Correa rubra* is one of the prettiest, and is commonly known as the native fuchsia, on account of its bell-shaped flowers. A conspicuous flower, a mass of brilliant scarlet, near the Museum of Economic Botany, is the spear lily *(Doryanthes excelsa).* The remarkable partnership for mutual advantage between plants and insects is well exemplified in the *Arum crinitum,* whose strongly-offensive odor attracts crowds of blowflies. The Geraldton wax flower is another highly prized bloom. Near the palm house many plants were in full bloom, among which the *Mesembrianthemum* (pigface) was conspicuous with its mass of pink blossoms. *Grevillea rosmarinifolia* is one of our hardiest native plants, and some of these planted in an English garden withstood the rigours of a European winter, when most other plants succumbed to the fierce cold.

LECTURES.
October 15th, 1929.

Mr. A. M. Lea, of the Museum, spoke on the insects of New Guinea. The mass of New Guinea insects are allied to those found in Northern Australia, Fiji, New Hebrides, and Malay Peninsula, but each island has some peculiar to itself. About a dozen cases from the Museum containing many species of brilliantly-coloured insects of fantastic outlines including Orthoptera (straight-winged), Coleoptera (sheath-winged), Hymenoptera (membrane winged), and Lepidoptera (scaly winged) were shown by Mr. Lea.

The lecturer related in an amusing interlude how he had employed the domestic cat to collect insects. Some of the walking stick insects are over a foot long. The females cannot fly, but the males can. A case of wasps, ants, and bees were shown. One of the wasps exhibited had a formidable sting of unusual length. Carpenter bees from Torres Strait and Queensland were found in this case. An uncommon ant, the green tree ant, is one of the worst pests of tropical Australia. It does not sting; it bites, and in two seconds it will crawl all over one. They build nests in trees by joining the leaves. They work in unison. One ant will grasp a leaf with its mouth, another will seize another adjacent leaf and pull them together as near as possible. They use the living threads from the larvae to weave them together. If the gap is too great they crawl down the bodies of suspended ants and thus form a living chain, which swings in the breeze until the lowest ant can seize the bough desired (a feat comparable to the manoeuvre of the spider monkeys of Brazil). With these ants lives a strange butterfly covered with white flocculent scales. If an ant is rash enough to bite at this butterfly he gets his mouthful of this unpalatable material, and promptly releases his hold. When the butterfly is full grown it drops the white scales, and wisely seeks a new home.

Professor J. B. Cleland in the first place made an eloquent plea for support in the maintenance of Flinders Chase, Kangaroo Island. Financially, the Chase was in a bad way, and he hoped that all interested in our rare and distinctive native fauna would, by their subscriptions, also by systematic canvassing, do their bit in assisting this worthy enterprise. Professor Cleland then gave a graphic description, illustrated by many excellent slides, of the scientific expedition to the MacDonnell Ranges to study the aborigines at the Hermannsburg Mission Station. It was organised by Dr. T. D. Campbell, mainly with the view of anthropological research, and consisted of eight members.

The South Australian Naturalist

The Journal of the Field Naturalists' Section of the Royal Society of South Australia and of the South Australian Aquarium Society.

Adelaide FNS Feb. 1930

VOL. XI. No. 2.

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Press Correspondent: Mr. D. J. McNAMARA.

EXCURSIONS.

Mar. 15—Mount Lofty Flower Show. Train, 2.3 p.m. Leader, Mr. A. J. Morison.

Apr. 12—Hallett's Cove. Train, 1.40 p.m. Physiography and Geology. Leader, Dr. C. Fenner, F.G.S.

May 17—Outer Harbour. Train, 1.35 p.m. Shells and Shore Life. Leader, Mr. W. J. Kimber.

Jun. 9—Kapunda. Train, 8.16 a.m. Physiography, etc. Leaders, the Secretary and Mr. W. Hain.

Jun. 28—Horsnell's Gully. Magill Tram, 2 p.m. Physiography and Botany. Leaders, Mr. J. A. Hogan and Mr. S. Stokes.

LECTURES.

*Mar. 18—"The Architecture of India." By the Rev. J. H. Allen, B.Sc.
*Apr. 15—"Honolulu, California, and Arizona." By Dr. R. H. Pulleine.
*May 20—"A Trip to Cairns." By Mr. A. J. Morison.
*Jun. 17—"The Phenomena of the Atmosphere." By Mr. A. G. Edquist.

* These lectures will be given in the Upper Hall, and will be illustrated with lantern slides.

The
South Australian Naturalist

Vol XI. FEBRUARY, 1930. No. 2.

NOTES ON THE BOTANY OF CENTRAL AUSTRALIA.*

PART II.

By J. Burton Cleland, M.D.

(2). THE FOOTHILLS, MOUNTAINS and GORGES. The ranges and hills are all exceedingly stony, the stones often loose and varying from small pieces to great rocky masses. The lower hills and outliers often have gentle slopes and rounded summits and there are all gradations up to precipitous and broken cliffs. It will thus be seen that much of the available foothold for plants is occupied by stones and rocks, that on the summits and especially on the exposed northern aspects the plants are subjected to intense xerophytic conditions over long periods, that the rocky covering off which the occasional rain at once runs, tends to concentrate this rainfall on the adjacent soil so as perhaps to double the quantity thus supplied and at the same time the shadows cast by the rocks tend to reduce evaporation, and that in the many crevices and shelters, especially those with a southern aspect, considerable protection against the sun is to be obtained. In consequence of these features, the vegetation varies from place to place. One may say in general that where the exposure is not too great and the soil is of some depth, such small shrub-like trees as mulga (*Acacia sp.*) grow in abundance with Porcupine grass *(Triodia)* in between. The native Cypress Pine (*Callitris robusta* var. *microcarpa*) is also often common. Bloodwoods *(Eucalyptus pyrophore* or *E. terminalis)* occur as scattered small trees on the lower parts. Growing out from crevices amongst great rocky masses, usually on the lower and more sheltered aspects, are Native Figs *(Ficus macropoda)*

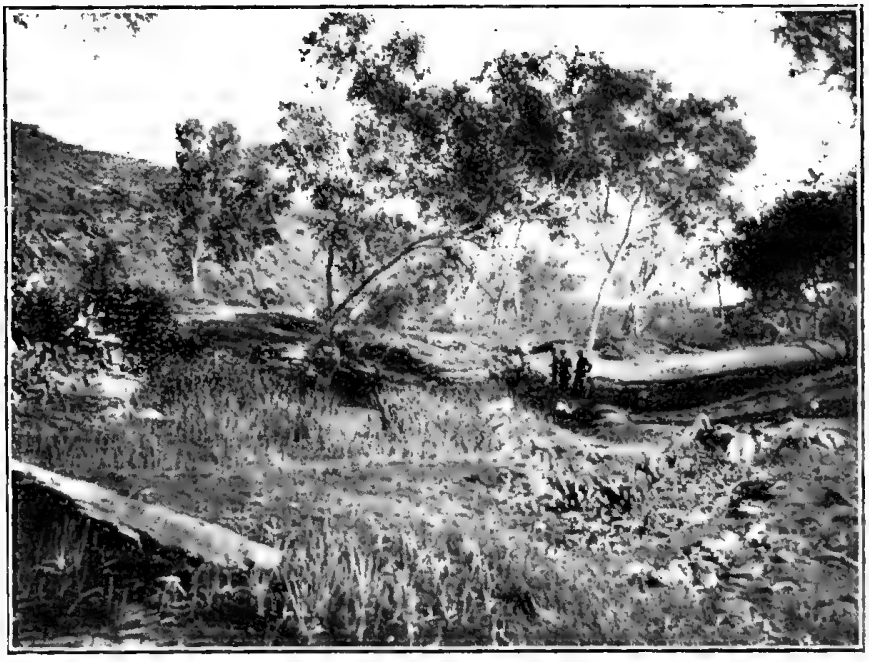
Footnote * Continued from *The South Australian Naturalist*, Vol. XI., No. 1, November, 1929, p. 4, where by inadvertence the title appears as "Notes on the Botany of South Australia."

forming low intricately spreading bushes with small fruits, as is well seen quite near Stuart. In similar situations, and ascending some distance up the rocky sides, handsome Cycads *(Macrozamia MacDonnellii)* are to be seen at Heavitree Gap, in the low hills beside Stuart, at Simpson's Gap, and at Palm Valley, but not at Glen Helen. Here also, where somewhat sheltered, *Tecoma doratoxyllon* sends out long, bending branches and has rather small flowers, white with a little pink. The small fern, *Cheilanthes tenuifolia*; the Native Tobacco *(Nicotiana suaveolens)*, prickly Solanums, Trichiniums, composites and grasses occupy foothold where they can.

When we visited Glen Helen, where the Finke cuts its way through the MacDonnells, we climbed to the top of the hill that forms the west side of this narrow and precipitous gap. The top of this hill was covered with loose stones 1 to 6 inches in diameter. The appearance was that of intense dryness, exposed day after day to the fierce rays of a nearly vertical sun. Harsh tufts of Porcupine Grass *(Triodia* sp.), with long terete leaves like knitting-needles but sharp at the end, each tuft 1½ to 3 feet across, were scattered over the surface, being separated from each other by spaces of one to two feet, enabling one to walk without getting too many sharp pricks. There were a number of shrubs of *Grevillea Wickami*, with leaves with acute angles, many infested with *Loranthus gibberulus*. There was a low shrub, not in flower or fruit, which could not be placed—it suggested either a pea or one of the Myrtaceae. On the lower parts were a few White-wash Gums *(Eucalyptus papuana)*, remarkably handsome trees when well-grown, with their pure white straight stems which leave a white bloom on the hands when rubbed. There were also a few shrubs of *Eucalyptus gamophylla*, a species with rather glaucous opposite sessile leaves that grows on the lower rocky slopes. The only other plants were an occasional *Hakea intermedia*, *Callitris robusta*, *Acacia validinervis* with broad reticulated phyllodes, and the prostrate leafless *Sarcostemma australe* with its milky juice.

(3) THE WATERCOURSES AND THEIR POOLS.—

On the way to Hermannsburg, various watercourses, such as the Hugh and Jay Creek, were crossed and the Mission Station itself is on the side of the Finke, here a wide sandy bed with a steeper bank on one side and on the other a slightly raised overflow surface. These streams were all dry except for an occasional saline soak in the Finke. Higher up, where they cut through the MacDonnells, pools of water may remain for years. In all these



Kaporilya Springs, near Hermannsburg, C.A.
August, 1929.

Photo—J. B. Cleland.

Ironwood *(Acacia estrophiolata).*
Missionary Plains, C.A., August, 1929.

Photo—J. B. Cleland.

watercourses, red gums *(Eucalyptus rostrata)* were abundant. The trees were, however, usually not of much girth. They differ from the southern form in the greater tendency for the sucker stems to be quadrangular and in the very large size of many of the sucker leaves. Mistletoe *(Loranthus Miquelii)* was present on some. Grey tea-trees sometimes formed thickets or else appeared as scattered shrubs along the larger streams. These Melaleucas were of two species, the commonest, with the capsules in clusters, being *M. glomerata*, the other with the capsules spread out on the branchlet being *M. linophylla*. A *Myoporum*, flowering freely, grew along the bank-side at Hermannsburg. A prickly shrub with a small berry also grew on the banks of the Finke. At Hermannsburg, the "flood-plains" beside the settlement were covered with the dry remains of a "cane-grass" *(Spinifex paradoxus)*. In the dry main-bed, *Nicotiana suaveolens*, a white-flowered *Zygophyllum* and a few grasses were seen. Where there was saline matter in the bed of the river, as near Glen Helen, the prostrate *Heliotropium Curassavicum* was abundant. Where there was suitable water, as at Kaporilya Springs, a few miles from Hermannsburg, Bulrushes *(Typha angustifolia)*, Reeds *(Phragmites communis)* and *Scirpus littoralis* grew. Here also, in the wet soil, grew *Samolus repens*, presenting, with its pinkish flowers, a different appearance to the plants seen in salt marshes near the coast. *Stemodia viscosa* was also abundant near the water at Kaporilya. On the Todd at Alice Springs grew *Plumbago Zeylanica* and also the queer-looking Amarantaceous plant *Acrysanthes aspera* with its reflexed flowers.

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ADDITIONS TO OUR LIBRARY.

"Open-air Studies in Australia." By Frederick Chapman, A.L.S., F.R.M.S., etc. London: Dent & Sons. 10/6.

A most charming little volume for the general reader who is interested in the world around him. Mr. Chapman's articles relate mainly to Victorian localities rich in fossil forms and in evidence of the geological changes of the past.

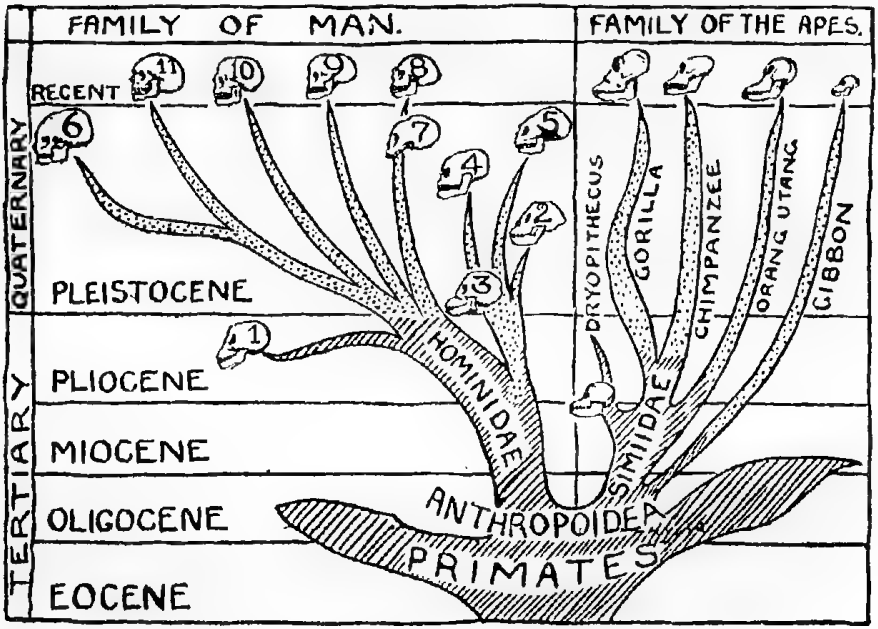
SCIENCE NOTES.

(By "Tellurian" in "The Australasian.")

THE ANCESTRY OF MAN.

Man, who has classified himself in and among the animals, and who has (in his wisdom) bestowed upon his particular species the name of "Homo sapiens," is very curious regarding his ancestry. The question is far from being settled. New discoveries are continually being made. Fresh theories, or modifications of old theories, are required to embody the fresh discoveries. And so we slowly move forward.

The young man whose interest has just been aroused in this fascinating subject must be warned against accepting any statement or theory or diagram as final and definite. The new evidence to which we refer coms not only from the geologist and the ethnologist in their investigations of skulls and of implements.



The study of the psychology of primitive people helps us; the anatomy of man and the higher vertebrates is of very great importance; the evolutionary history of horses, camels, elephants, and whales gives us new ideas that bear closely on the matter; and the study of ancient geography and past climates of the world must also be considered.

Lately, in China, fresh discoveries have been made of the skulls of a primitive type of man. These have been proved to be of first-rate importance, and have been linked up with similar skulls found in the same locality at intervals since 1903. These remains were found in the same locality at intervals since 1903. These remains were found in the lower Pleistocene rocks, and have characteristics quite their own. On them a new race of primitive man has been raised, with the name Sinanthropus pekinensis (the Chinese man of Pekin). We have read so much of the discovery of new skulls of primitive man that we may think they are of endless number. Actually, as we shall see, the number of accepted primitive skulls relates to only about 130 individual persons.

PRIMITIVE HUMAN SKULLS.

We have said that about 130 accepted primitive skulls are known. In some cases, naturally, the skulls are incomplete; in other cases there are a few additional body bones available. But the skulls are of more importance; not only are they usually better preserved, but they tell us much more about their original owners than any other bones would do. In the multiplicity of skulls that have been reported, we may have wondered whether the accumulation of material was not being overdone. Here, then, is Professor Henry Fairfield Osborn's list of the known primitive remains:—

(a) Piltdown: the "dawn-man," Eoanthropus dawsoni, two specimens.

(b) Trinil, Java: the "ape-man," Pithecanthropus erectus, two specimens.

(c) Heidelberg: the "ancient man," Palæanthropus heidelbergensis, one speciment (possibly two others).

(d) China: the "Chinese man," Sinanthropus pekinensis, 27 specimens.

(e) Neanderthal: the Neanderthal man, Palæanthropus neanderthalensis, 48 specimens (plus).

(f) Cro-magon: the Cro-magnon man, Homo sapiens, 42 specimens.

If you add these up you will find they total 124. In addition, there are stray skulls which have not been finally accepted, or which have not yet found a place in the main list; of these, we may mention the Rhodesian and Talgai skulls, the more problematic Taungs skull, and others. This table will, I am sure, clarify the minds of many interested readers regarding the chief relics of primitive man.

OSBORN'S THEORIES.

It would not be appropriate here to attempt to discuss Osborn's theories of man's ancestry in detail. They comprise in at least two important points a distinct breakaway from older theories. But it may be added that, so far as man's ape ancestry is concerned, there are many workers who have long maintained that man did not evolve by way of the apes—that the only factor in common was an ancestral stock, far back in time, from which both groups evolved. Professor Wood-Jones has indeed demonstrated that in certain important features man is anatomically much more primitive than the apes.

The other point emphasised by Osborn is that man's origin goes back into the Tertiary, that is, pre-Pleistocene time. Here also there has been a tendency for a long time among some of the best workers to lengthen the period previously allowed for man's history. The geologist and the physiographer also are finding that the number of years usually allotted to Pleistocene time (about 1,250,000 years) is far too short. Right back, from the time of Bishop Ussher, who dated Creation as 4004 B.C., man has had continually to yield to the pressure of inevitable fact, and to extend his periods of earth history still further and further back in time.

Professor Osborn, whose complete address on this matter appears in "Nature" (January 11, 1930), concludes his claim for the greater antiquity of man as follows:—"To my mind the human brain is the most marvellous and mysterious object in the whole universe, and no geological period seems too long to allow for its natural evolution."

Programmes for the year have been posted to members. Application for copies should be made to the Hon. Secretary. Members will notice that the programme provides for only one charabanc trip. There has been a debit balance on these trips for some time past, and the Committee has, very reluctantly, decided to reduce their number.

EXCURSION TO BRIDGWATER.

November 16th, 1929.

A fairly large party travelled by train to Bridgewater by train to Bridgewater under the guidance of Mr. Ising. Unfortunately the afternoon proved very wet and members had to seek shelter rather than search for specimens in the dripping scrub. However, the walks were not wholly unproductive, and a fair number of flowering plants were seen and identified, and Mr. Ising was able to point out many unique features of some of the species growing amongst the gums of the hilly gorges of Cox's Creek.

EXCURSION TO MR. W. BURDETT'S GARDENS, BASKET RANGE.

November 30th, 1929.

A very large party of members travelled to Mr. Burdett's orchard at Basket Range. The scenery of this part of the hills includes some of the most strikingly beautiful scenes in our State. The party availed themselves of their host's kind invitation to sample the fruit of some of the hundreds of cherry trees then in full bearing.

Mr. Burdett's hobby is the growing of native flowers from every part of the Continent, as well as many species collected in foreign lands. The collection of Australian flowering shrubs is probably unique in the Commonwealth. Even in November there was a wonderful show of flowers of every hue. Especially striking were the many varieties of blue flowers, particularly of the many species of *Leschenaultias*. A stony hillside, otherwise valueless, is clothed with profuse growths of plants from every State in the Commonwealth and from South Africa and other countries.

The party were received by Mr. and Mrs. Burdett, and turned loose in the cherry orchard.

The party were then invited to inspect the special features of the garden—the growth of native flora. A fine avenue of stately eucalypts, still young, but with every evidence of vigorous and healthy promise, was first examined. Besides the South Australian species, most of the other States were represented on each side of the sinuous path. These included *Eucalyptus Tetraptera* (from the four-cornered involucre), with its broad leaf-like petiole), *E. Alpina* (a mere shrub in the Grampians, but here

growing into a forest tree); *E. Sieberiana*, from the Australian Alps; *E. Saligna* (the willow gum); *E. Coriacea* (leathery leaves, to protect them from heat and drought); *E. Radiata* (ray branched); *E. Pressiana*, *E. Sideroxylon* (iron wood), *E. Tetragona* (four cornered); *E. Polyanthema* (many ornaments), *E. Piperita* (the "pepper gum," from the shape of its leaves), *E. Rubida* (candlebark), *E. Goniocalyx* (angular calyx), *E. Torquata* (a beautiful ornamental tree, suitable for street planting), *E. Sepulcralis*, *E. Megacarpa* (great fruited), *E. Macrocarpa* (the beautiful large flowering gum of Western Australia), and many others of the eucalypt family.

Another typical family, "the Grevilleas," were represented by many species, including *Grevillea eriostachya* (woollyeared), *G. Stenocarpa* (narrow fruit), and *G. Oleoides* (olive like). The gorgeous kangaroo paws were seen in several rare colours—yellow, scarlet, green, and green with black base.

Magnificent proteas from South Africa contrasted with the gorgeous Australian waratah, one of the finest of our indigenous growths. Blue *Leschenaultias* formed some azure patches. The rare scarlet variety of this latter flower was also noted. The "Flannel Flower" and the New South Wales Christmas bush. Pimeleas, daisies from the Grampians, the wild currant (Acrotriche) from the Barossa hills; hibiscus of several varieties. The "Suthern Cross" from Albany is a perfect floral replica of the well-known constellation. *Verticordia*, the dessert rose, many beautiful varieties of boronia and erica and epacris; *Cheiranthera* (hand flower) added to the attractions of this charming pleasaunce. Fine blooms of *Callistemon* (bottle brush) and Daviesia, a peculiar kind of erica, with viscid leaves, which had caught a number of insects, and even a small bird.

Besides the eucalypts several varieties of firs and the Queensland kauri were observed; also the silver leaf of South Africa.

After the inspection the party were entertained at afternoon tea, and a hearty vote of thanks was accorded to Mr. and Mrs. Burdett and family.

SHELL COLLECTORS' CLUB.

The fortnightly meetings have been well attended.
Univalves which have been recently reviewed are:—

FAMILY PLEUROTOMARIIDAE.

Shells minute, trochiform, characterized by a deep slit in the outer margin of the body whorl. The part of the slit which has been progressively filled up during growth, forms a band round the whorls. *Schismope atkinsoni* (Ten. Woods). *S. pulchra* (Petterd) have been taken by numbers on the sand-spit at the Outer Harbour, but both are rare.

FAMILY FISSURELLIDAE.

Shells conical, limpet shaped, depressed with apex in front of centre. Anterior margin notched or apex perforated. *Scutus Anatinus* (Donovan). Specimens were tabled up to 5 inches in length. Members have taken this shell on various rocky coasts of the State. This is a distinct species from *S. antipodes* of N.S.W. The animal is much larger than the shell and is blackish.

Tugalia cicatricosa (A. Adams). Specimens shown measured about one inch. A small bare patch appears at the apex—hence its specific name.

T. parmaphoidea (Q. & G.). Exhibited specimens were about one inch and a quarter, and were taken at Wallaroo. Sculpture is finer than *T. cicatricosa*. Shell depressed; anterior margin slightly channelled.

Montfortula rugosa (Q. & G.) has been taken at Pt. Willunga, a specimen measured 12 m.m. x 5 m.m. and is uncommon.

FAMILY HALIOTIDAE.

Ear shaped shell with small flat spire; aperture very wide, iridescent; having a row of perforations near the outer edge; commonly known as mutton-fish, or sea-ear, the "abalone" of California.

Haliotis albicans (Q. & G.). The largest of the genus in South Australia. This shell is smooth-backed, although the growth lines are plainly visible. Members have taken this alive at Port Victoria and Stansbury, but it is usually considered a deep water species. Specimen measured $7\frac{3}{4}$ in. x $6\frac{1}{4}$ in.

H. cyclobates (Peron). Rounded, elevated, medium size. Common, attached to Pinnas at Outer Harbour. $3\frac{3}{4}$ in. x $3\frac{1}{4}$ in.

H. roei (Gray. Uncommon—occasionally taken at Pt. Willunga and Cape Spencer on rocks at low water. This shell is distinguished by its close accremented growth lines. Medium size. Specimen on table: 3⅜ in. x 2¾ in.

H. naevosa (Martyn). The common type in South Australia on rocks generally. Has a flat back. 5 in. x 3¾ in.

H. naevosa var tubipora. Has elevated or projecting tubes and is concave between the spire and the tubes. Specimens taken at Robe. Not reported from St. Vincent or Spencer Gulfs. 5¼ in. x 3¼ in.

H. conicopora (Peron). Syn: H. emmae. Distinguished by a well defined high ridge or band, vein-like, about midway between spire and the tube-like perforations, there being a corresponding groove within the shell. Pt. Willunga—uncommon. 3⅜ in. x 2⅝ in.

FAMILY STOMATIDAE.

Ear-shaped, regular; spire small; large aperture. Nacreous.

Stomatella imbricata (Lamarck). Shell like Haliotis, but without perforations. Has a horny operculum. Common under stones at Pt. Noarlunga. Specimens averaged about 1 inch in length.

Gena strigosa (Adams). A frail nacreous ear-shaped shell about 1 inch x ½ inch. Colour varies in browns and greens and variegated. Smooth with very fine striations. No operculum. Common on Gulf beaches.

FAMILY TROCHIDAE.

Shells conical and nacreous.

There is no true Trochus in South Australia.

Clanculus (Montfort). Australia is the metropolis of this genus. Foreign collectors appreciate the several species, some of which are common on our beaches. The genus may be briefly described:—

> Shell conoidal—whorls mostly granulated—markedly striated—brightly coloured. Aperture contracted, not entire; outer lip denticulated within. Umbilicus runs up almost to spire. Inner lip denticulated. Size ranges from ¼ in. up to 1 in. in height.

Clanculus dunkeri (Koch). Very common, bluish shell, turning to dull red on exposure. Average about ⅜ in.

C. flagellatus (Philippi). Average about ¾ in. Not so common as dunkeri, is more or less irregularly blotched or lined. Whitish in colour with brown markings, ladder-like striations between rows of nodules. More angulated than dunkeri.

C. eucheloides (Tate). About ⅜ in. Rounded with tiny nodules and well defined lines. Rare. Has been taken at Pt. Willunga.

C. limbatus (Q. & G.). About $\frac{3}{4}$ in. Somewhat similar to flagellatus, but has more pronounced crown blotches. Body whorl of limbatus is also more angulated. Common on rock near low water at Pt. Willunga.

C. ochroleucus (Phil). The least nodulous of the genus in South Australia. General appearance is ochre like. Devoid of distinct coloration. Not found on local beaches. About $\frac{1}{4}$ in.

C. plebejus. (Phil). Body whorl not angulated. About $\frac{1}{4}$ in. Pt. Willunga, on rocks.

Members will exchange shells with foreign collectors.

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SHELL COLLECTORS' CLUB.

Excursion.

On the holiday, January 27th, a party of nine members of the Shell Club went to the Outer Harbour under the leadership of their Chairman, Mr. W. J. Kimber. The tide was low and the party got out on to the Pinna bed amongst the weed quite near to where the bank shelves suddenly, probably 30 feet, into the channel of the Port River. Here were taken *Pinna dolobrata (Syn: P. inermis)*, attached to which were found the Chiton *Ischnochiton contractus* (large specimens in a range of colours), *Murex triformis*, *Conus anemone*. In dead shells of Pinna were found *Pyrene lincolnensis*. Amongst the weed were taken *Fasciolaria australasia*, *Fusinus australis*, *Pecten medius*.

Contained within the valves of a dead Pinna was taken an Octopus with a spread of nearly a foot. Mr. Edwards took this home in a jar. Some very small Octopi were also obtained.

After lunch a walk across the sand flats round the next point up river brought the party to a beach of dead shells and a search here resulted in Mr. Kimber making the best find of the day, *Murex umbilicatus*, a rare shell of about one inch in length. Members lying prostrate and using lenses, some very good minute shells were taken and shell sand collected for further examination at home. Back over the sand flats, under rock fragments, were taken live *Cominella eburnea*, and *Monodonta constricta*. On the sand, *Modiolus inconstans*, *Laternula creccina*, *Marcia scalarina*, *Marcia corrugata*, *Marcia aphrodinoides*, *Bittium granarium*, were added to the spoils.

—F. K. GODFREY.

OUR EXCHANGES.

1. The Transactions and Proceedings of the Royal Society of S.A. Vol. LIII. 1929.

   The volume for 1929 contains many important papers dealing with various branches of science. One of the most interesting to our members is Dr. Fenner's "A Geographical Enquiry into the Growth, Distribution, and Movement of Population in South Australia, 1836-1927." Prof. Howchin writes on the Geological History of the River Murray, and Professor David publishes further notes on the Newly-Discovered Fossils in the Adelaide Series (Lipalian or Proterozoic). Mr. Lea adds additional notes on Coleoptera, with description of new species, and Mr. Hale has several notes on Crustaceans from Queensland and West Australia. There are a number of other very important papers contained in the 400 pages of the Proceedings.

2. The Australian Forestry Journal. September and December Numbers.

3. The Queensland Naturalist. October, 1929.

4. The Victorian Naturalist. November, 1929; December, 1929; January, 1930; February, 1930.

5. The W.A. Naturalist Club Journal. November, 1929.

6. Journal of the Arnold Arboretum. October, 1929.
   The trees, etc., of Papua are dealt with in this number.

7. The Annual Report of the Woods and Forests Department for S.A. for 1928-9.
   Diagrams illustrate the remarkable increase in the area planted during recent years. In the year ending June 30, 1929, this area exceeded 5,500 acres.

8. "The Work of the Division of Economic Entomology." By Dr. R. J. Tillyard, M.A., D.Sc., F.R.S.

9. Journal of the American Museum of Natural History. Quarterly Numbers from January, 1919, to December, 1929.
   These volumes published quarterly by the American Museum of Natural History of New York, contain articles of topical interest in matters of Natural History, Exploration, etc. A great feature is the wealth of fine illustrations, many of them, especially in the later numbers, printed in full colour. They represent a mine of interesting and authoritative information for the investigation of our members.

10. The Australian Naturalist. January, 1930.

11. The S.A. Ornithologist. January, 1930.

The South Australian Naturalist

The Journal of the Field Naturalists' Section of the Royal Society of South Australia and of the South Australian Aquarium Society.

Adelaide May, 1930

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NOTES ON THE BOTANY OF CENTRAL AUSTRALIA

*PART III.**

PLATE IV.

By J. BURTON CLELAND, M.D.

(4) PALM VALLEY AND ITS FLORA.

Palm Valley partakes both of the characteristics of the gorges and of the watercourses. The palms, however, give it such a unique feature that we shall describe its flora under a special heading and refer to the significance to be attached to this palm and other plants in Central Australia.

The road to Palm Valley (about 14 miles south of Hermannsburg) and the Glen of Palms runs down the Finke Valley along the Finke Gorge. It is very rough and rocky in places and sandy in others, winding in and out and crossing the river-bed several times. In the bed itself, River Red Gums (*Eucalyptus rostrata*) are numerous. *Melaleuca glomerata* is common. Near the entrance to the Gorge a beautiful Eucalypt (*E. papuana*), with pure white barrel which gives off a white powder when rubbed, may be found growing on the side and away from the water. Bloodwoods (either *E. pyrophora* or *E. terminalis*) grow amongst the rocks. *Triodia* tussocks also grow in this situation. Buck Porcupine Grass, the largest of the three species of *Triodia* occurring in this district, is found in the little valleys and even in the bed of the river itself. Here we found a plant flowering luxuriantly. By kicking into the base of a tussock some of the tall flower stems were dislodged when they could be handled without undue pricking of the fingers by the needle-sharp leaves. Mr. J. M. Black found that the Buck Porcupine of the Finke Valley was an undescribed species and has named it *Triodia longiceps*.

About 10 miles down from Hermannsburg, the first palms are seen with their crowns of fan-shaped leaves towering up 50 to 80 feet from amongst the Eucalypts and shrubs in the river-bed. Here one branches off to the right (westerly) to Palm Valley or one continues on along the Finke Gorge some three miles or so to the Glen of Palms. We did the former, travelling about 4½ miles up this subsidiary valley. Bold and often nearly vertical cliffs close the winding valley on its northerly side, whilst on the opposite aspect they are less steep and tend more to be dissected by further branches or to be etched out into bold bluffs. The palms (*Livistona Mariae*) naturally prefer the more shady side and grow in abundance along the creek bed and at the base of the cliffs, but some nevertheless are to be seen on the southern aspect, more fully exposed to the sun and dryness. Here they often make striking pictures as their crowns appear silhouetted against the sky-line with distant cliffs as a background. The original estimate by the Horn Expedition of only about 100 adult palms seemed to us to be far under the mark. Palms were seen in all stages of growth. We noticed, as they did, many young ones growing amongst the rocks. The butt of one they cut down to measure (it reached 60 feet) and to search for animal life amongst its leaves was still to be seen. The many fallen palm leaves made dangerous walking amongst the rocks if one stood on the slippery petiole. *Livistona Mariae* is a fan palm and is closely allied to the Cabbage Palm (*L. australis*) of the East Coast as for instance in the Illawarra of New South Wales.

Next in interest to the palms, found only in Palm Valley and the Glen of Palms, are magnificent cycads (*Macrozamia Macdonnellii*) each plant a striking feature with its long spreading pinnate fronds. The nuts are much larger than those of the Macrozamias seen near Perth and in New South Wales. They weigh 1¾ to 2¼ oz., and the largest measure nearly 2½ by 1½ inches. The cycads also prefer the shaded cliffs on the north side and do not descend into the creek bed like the palms. A remarkable feature was to see large specimens growing on mere ledges of rock high up on vertical cliff sides. No bird surely could have carried the nuts there—these were too large—though the natives say that the Bower-bird can and does carry them. No mammal could have reached some of these situations. How then could the cycads have got there and how long had they been there? We did not visit the hill top above the site where we noticed the cycads, but we climbed to other similar positions. On such bare stony sun-exposed tops cycads do not now grow. But it seems

evident that at one time they must have done so and the nuts must have fallen over the cliff-edge to be caught on the ledges where plants are still to be seen. It must be many thousand years back and the climate must have been moister when cycads grew also on the tops of the ranges. Are the ones we see growing now the direct offspring of these long-departed cycads growing on top? The Macrozamia is a slow-growing plant. Eventually a very thick trunk-like base is formed. These trunks are probably in some cases hundreds of years, possibly thousands of years old. But though one may attribute great antiquity, possibly two or three thousand years, to occasional cycads, it can hardly be that the plants we see now grew from the seed that fell from those cliffs before the Pharaohs were or Babylon's glory had appeared. The original cycads on the ledges, some male, some female, would in the latter case set seed. Thus, as old age overtook one here or there, if indeed old age does overtake such plants, its place might be taken by the germination of some nut that it had shed. This species of cycad grows not only at Palm Valley but elsewhere in the MacDonnell Ranges as at Heavitree and Simpson's Gaps and near the township of Stuart. Its nearest allies are far away in the Northern Territory, in Queensland, in New South Wales, and in Western Australia. Another plant, *Trema cannabina,* grows in the MacDonnell Ranges as at Simpson's Gap and also in the Illawarra brushes. A *Tecoma* (*T. doratoxylon*) also occurs, which was for long considered identical with that of coastal New South Wales (*T. australis* R.Br.). How can the presence of these four species, especially the palm and the cycad, suggestive of moist semi-tropical jungle, be explained? They must surely all be relics of an ancient flora, indications that at one time a jungle with a moister atmosphere and good rainfall stretched north and east and perhaps west as well, linking up Central Australia's vegetation with the coastal brushes of the East Coast and the cycads of the South-west. The fertile plains of Adelaide probably then were not and the diprotodon whose remains have been found at L. Callabonna, doubtless roamed amongst the luxuriant vegetation. Eheu fugaces!

I have made enquiries as to the nearest places in the other States in which palms are known to grow. In F. Bailey's *Flora of Queensland,* there is reference to some palm leaves from the Campaspe R. which it was thought might belong actually to this Central Australian species, *Livistona Mariae,* F.v.M. Mr. W. D. Francis, of the Botanic Gardens, Brisbane, has kindly located for me the Campaspe R. of Queensland, which is not very far from Charters Towers. Nothing further seems known of this palm.

Amongst the specimens of palms in the Brisbane Herbarium, the nearest locality sites to Central Australia are Mt. Perry and the Bunya Mountains for the palm *Archontophoenix Cunninghamii* Wendl. et Drude.

Mr. E. Cheel, Curator of the Herbarium, Botanic Gardens, Sydney, tells me that *Livistona australis* Mart. occurs at Stanwell Park, the Illawarra generally, Cambewarra Mountain, Berry, Kangaroo Valley, Bateman's Bay, Geringong, and at Orbost in Victoria.

In Ewart and Davies' "The Flora of the Northern Territory," *L. Mariae* is given for the MacDonnell Ranges and it is stated as being recorded for 'Arnhem's Land, R. Brown; Adam River, McAdam Range, F.v.Mueller; Port Darwin (Scultz); Port Essington, Armstrong; Liverpool River and Wood Island, Gulliver.' *L. inermis* R. Br. is given for the Islands of the Gulf of Carpentaria, *L. Alfredi* F.vM. for North Australia, *Kentia Wendlandiana* F.v.M. for Liverpool River and *K. acuminata* Mend. for North Australia. Professor A. J. Ewart tells me that he has not been able to verify personally the records of *L. Mariae* for the far north.

Mr. C. A. Gardner, Government Botanist of Western Australia, says that *Livistona* is the only genus of palms in that State. He says:—"*L. Alfredi* F.v.M. occurs at Millstream Station on the Ashburton River and the palm at Yardie Creek near the North-West Cape is probably the same species. *L. Eastoni* Gardner is a North Kimberley species found around Admiralty Gulf, the tallest of our palms. *L. inermis* is a Kimberley species extending almost throughout the district but never common.

As regards Cycads, Mr. Cheel tells me that the Sydney Herbarium has a specimen of a form of *Macrozamia spiralis* Miq. from Coonabarabran, which place is about 470 miles distant easterly from the South Australian border, and which he thinks is the nearest point to Central Australia where cycads grows in New South Wales.

Mr. Francis says that in the Brisbane Herbarium there is a specimen of *Cycas Cairnsiana* F.vM. from the heads of the Robertson and Percy Rivers. This locality is east and a little south of Normanton and the southern end of the Gulf of Carpentaria. There are specimens of *Macrozami Pauli-Grilielmi* F.v.M. from Inglewood, 50 miles east of Goondiwindi.

Ewart and Davies cite *Cycas media* R.Br. for 'North-west and North Coasts, A. Cunningham; Port Essington, Armstrong;

Escape Cliffs, Hulls' and *Macrozamia Macdonnellii* F.vM. for Simpson's Gap and (apparently) Hermannsburg.

Mr. Gardner has kindly supplied the following information from Western Australia: "*Cycas furfuracea* occurs on the mountains of the Leopold Range in the Kimberley district. It was described by W. V. Fitzgerald in 1918. *C. Lane-Poolei* Gardner occurs near Mt. Ham in the Central Kimberleys. *C. basaltica* Gardner occurs towards the estuary of the Lawley River in the Northern Kimberleys. *C. angulata* R.Br., which Bentham includes under *C. media,* occurs at Camden Harbour on the north-west Kimberley coast. These four are the only recorded species of *Cycas* in Western Australia. *Macrozamia.* There are two species, *M. Reidlei* and *M. Dyeri.* The former, which is a new combination as yet unpublished (will appear in my census now nearing completion) is commonly known as *M. Fraseri.* It is the common Cycad Palm of S.W. Australia, extending as far north as the Moore River at Mogumber and as far east as the Pallinup River. It is purely south-western, not exceeding the domain of the savannah. *M. Dyeri* is a closely allied species found on the south coast between Stokes Inlet and Israelite Bay. It is a much larger plant than *M. Reidlei.*

A Cycad, either *Macrozamia* or *Cycas,* occurs not far from Marble Bar in the Pilbarra district. No botanist has collected it, but I have received reports of its occurrence from several persons, but unfortunately no specimens. It is a north-west plant."

Mr. Gardner goes on to say:—"It will therefore be seen that our palms and cycads are isolated from their relatives in the MacDonnell Ranges by a wide strip of Eremaea. Their distribution in Western Australia is determined by the favourable conditions of the south-west province for *Macrozamia,* and the higher rainfall of the Kimberley district for *Cycas* and *Livistona.* These areas are separated from the MacDonnell Ranges by a wide strip of Eremaea, which is in part arid desert.

"I have regarded the MacDonnell Ranges as an oasis in the Central Australian Eremaea in which survive a few elements of the pan-Australian species of former times. I regard it as practically impossible at the present time to try and trace distributions connecting the elements of this area with the more favoured provinces of Australia. At the same time, since these ranges lie so closely to ranges near the eastern boundary of this State, it is possible that some outposts for a species such as *Macrozamia Macdonnellii* might still be discovered in places like Giles Pinnacle and the Rawlinson Ranges, but our knowledge of these botanically is practically nil."

We roamed in delight along the creek bed and up its forking branches. Though the drought had been so persistent, several pools of water still remained amongst the rocks, being fed by springs. Round the edge of the water in the mud a light bright green plant with pink flowers turned out to be *Samolus repens*—in appearance unlike the plant of the south found usually near salt water. A little Nardoo (*Marsilea Drummondii*) was also seen. Many young Sow Thistles (*Sonchus oleraceus*), an introduced species, were coming up. Shrubs were numerous. A tea-tree, *Melaleuca nodosa,* grew in or near the water as did *Myoporum montanum.* Some Native Pines (*Callitris glauca* (*C. robusta*) var. *microcarpa*) also grew near, these three species harbouring a beautiful Loranth (*Loranthus Exocarpi*) with scarlet flowers having green tips. Red Gums (*Eucalyptus rostrata*) were common. Several small shrubs of *Plectranthus parvifolius* with small bluish flowers were seen—the natives use the plant for medicine. Also growing amongst the rocks were occasional figs (probably *Ficus platypoda*), *Pittosporum phillyreoides,* and *Tecoma doratoxylon,* a rock-loving shrub with long lithe bending branches which the natives straighten by means of heat and use for spears, hence the specific name. High up on ledges of the rock in the shade was a little composite, locally called 'edelweiss' from its resemblance to this plant. It had broad green sticky leaves and heads of pure white flowers, as yet unexpanded. It looked rather like a *Cassinia* in appearance, but turned out to be a *Helichrysum,* probably *H. Thomsoni.* Native tobacco plants grew near the creek. *Nicotiana suaveolens* and probably also the larger *N. excelsior* with sheathing leaves that the natives chew as a narcotic. A *Didiscus* (*D. glaucifolius*) was in flower, the head about the size of a shilling and quite showy. A clump of shrubs of *Santalum lanceolatum* (?), in flowers and early fruit, grew near the bed on an island of soil. It differs from the South Australian *S. lanceolatum.* A small rock fern (*Pleurosorus rutaefolius*) grew in a crevice. Numbers of a young *Gnaphalium* (*G. luteoalbum*) were coming up in the mud left by drying pools. Here also a small *Triglochin* was found. A few grasses grew in soil caught between the rocks. These comprised *Themeda Forskali* (Kangaroo Grass), *Andropogon exaltatus* with scented leaves and species of *Eragrostis* and *Aristida.* A bush of *Cassia artemisioides* in bloom was a beautiful sight. A frickly *Solanum* growing amongst the stones had fine large pinkish-purple flowers.

A FIELD NATURALIST'S VISIT TO YORKETOWN.

Yorke's Peninsula forms part of the great mallee region of South Australia, so that, especially in autumn, there is very little variety in the botany to be seen on the journey to Yorketown. Speeding over the bitumen road to Port Wakefield, the mallee country comes in just north of the Gawler River, and mallee, with a few teatrees and peppermint, are practically the only trees seen. A few farmers have planted the sugar gum along the fences. The best plantation we saw was made by harrowing alongside the fence, then dragging a fruiting branch of sugar gum along and finally firing the grass. Young trees have come up very freely and look healthy. One wonders why farmers do not try the olive, which should do well here.

The Peninsula is very flat. In the southern part one cannot see any rise deserving the name of a hill, and the eye roams far afield to discover any relief. A few trees are left along the roads and rare blocks of scrub remain here and there. In the middle of the Peninsula the road runs through the prosperous town of Maitland, centre of a most productive wheat area, and the driver points out the farm that brought £29/17/6 per acre! The fine modern residences scattered over the country testify to the fact that the farmers have done well.

Nearing Yorketown, we begin to pass the salt lakes for which this part is famous. There are many scores, if not hundreds, of these lakes, though only a few are scraped for salt. There is so little relief that there are no streams, the rain when it does fall accumulating in hollows and forming swamps, marshes, and lakes. During the drier part of the year the water evaporates, in some cases leaving a more or less thick crust of salt covering the muddy flat bottom of the lake. Very small and shallow depressions are usually covered with the so-called "samphire" bushes (*Arthrocnemum*). The next stage is that of shallow lakes, into the surface of which the water sinks before forming salt. A final stage is that of the larger lakes where the bottom is quite flat, and where salt is deposited as the waters evaporate. Hundreds of thousands of tons have been collected and refined, but for many years the supply seemed to be inexhaustible. Of late years there can be little doubt that the annual increment fails to keep pace with the amount scraped from the lakes. From any little elevation these lakes form a most picturesque feature of the landscape, with their snowy white expanses of salt.

The problem of the origin of the salt has been a matter of dispute, but much light has been thrown on the question by a careful scientific research by Mr. R. Lockhart Jack, B.Sc., Deputy Government Geologist of S.A. The local theory is that there is somewhere below the surface a great mass of salt from which the water obtains its supply, but Mr. Jack points out that the facts of the case render this highly improbable.

There are no such lakes in the northern part of the Peninsula for the reason that there is no sheet of impermeable clays to impound the waters and prevent them sinking. The southern part of the Peninsula is underlain by Permo-Carboniferous till very largely impermeable. This till was distributed over the land by the glaciers of the Permo-Carboniferous age (possibly 200 million years ago). These glaciers were, of course, formed of fresh water ice, and no large amount of salt could be entangled in the muds derived from the wearing down of these rocks by the ice. And even if this is admitted possible the salt would have gone into solution during the long ages since the period of distribution. The scientific theory is that of "Cyclic salts." It is well known that a certain amount of salt is blown off the ocean by the winds and tests made in many countries show that there is an appeciable amount of salt deposited on coastal lands everywhere. Examination of rain water tanks gave an amount of over one hundred weight of salt per acre per year. In the case of Yorketown the amount was shown to be over 141 lbs. to the acre each year. In a wet climate this amount is returned to the sea by streams, but in an area of inland drainage the salt is drained into the hollows forming salt lakes.

Another feature of great interest is the occurrence of gypsum deposits. The larger lakes have banks of more or less pure gypsum (sulphate of calcium) on the south or south-east edge of each lake. On Lake Fowler, the largest of the lakes, having a coast line of over 14 miles, the gypsum forms a long hill rising to 70 ft. high and extending along a mile and quarter of the shore. The gypsum is practically pure, and is bagged and sent to the factories to make "Plaster of Paris," etc. The explanation for this separation of the gypsum from the salt is that gypsum crystallizes more easily than salt. When in the hot summer a certain part of the water has been evaporated the gypsum becomes so concentrated that it begins to crystallize out as feathery crystals on the surface of the water. The northerly winds of this season carry the crystals to the southern shore where they accumulate. But what a time it must have taken to pile up a miniature range of the mineral!

On this lake a certain amount of scraping has been done this year, but the recent rains have probably ended this for the year, and the lake is now mainly covered with a thin sheet of water. On the northern side the geologist is interested to see the glacial till covered by modern travertine, and here, too, may be seen several great erratics, blocks of granite and of quartzite carried by the great glaciers of the bygone age probably from the far south of what is now the mainland of South Australia.

In another way, too, the east coast provides interesting material for observation. At Klein's Point the Adelaide Cement Company has built a fine jetty (claimed to be the first one built wholly of cement in the world). Here a most complete plant has been established for the handling of large quantities of the polyzoal limestone of which the cliffs are composed. A large electric generating plant supplies current to work the whole plant. The rock face, a mile long and about 60 feet high, is blasted down and a big electric shovel bites into it, taking a ton at a bite. Dumped into trucks it tipped into crackers which reduce the great blocks to handy sizes. These are then carried by belts to a hammer mill, by which they are broken to a fineness of less than five-eighths of an inch and carried by belts into great storage bins, from which other belts automatically carry the crushed rock to the end of the jetty where it runs into the waiting barge. Our visit was at a slack time, about 50 tons per hour were being collected from the face, crushed and delivered into the bins by a total force of eight men! The Klein's Point Quarry was opened in October, 1920. Over 500,000 tons of limestone have been taken out of the quarry the machinery of which can turn out approximately 500 tons daily crushed to quarter inch size.

The rock supplied is a very pure limestone made up of the fossilised shells of tiny sea animals (mainly polyzoans) of the Miocene age (possibly living in the shallow seas of 19 million years ago). Careful search reveals many fossils which establish the period of the deposition.

W. HAM.

A REMARKABLE FRESH-WATER CRAYFISH.

By HERBERT M. HALE
(Curator, South Australian Museum).

Mr. A. J. Williamson, of Dunolly, Victoria, recently sent me for examination a curiously abnormal Yabbie (*Parachaeraps bicarinatus*) from his State. Unfortunately the specimen, a male, is dried, and the internal parts have been largely destroyed. The exoskeleton, which is practically intact, is remarkable in that the lateral parts of the carapace, posterior to the cervical groove, are raised to form a conspicuous elevation on each side, while at the summit of each elevation is a comparatively large aperture (with a thickening ciliate margin) leading to the branchial chamber. The rims of the apertures resemble the crassate inferior edge of the branchiostegites, while the fringing hairs also are similar to those on the lower margin of the gill-cover, and not to the longer hairs on the inner face of the latter. The opening on the right is more slit-like than that of the left side; the apertures are otherwise dissimilar, for the rim of the left one is completed by a ciliate lappet (text fig. 1).

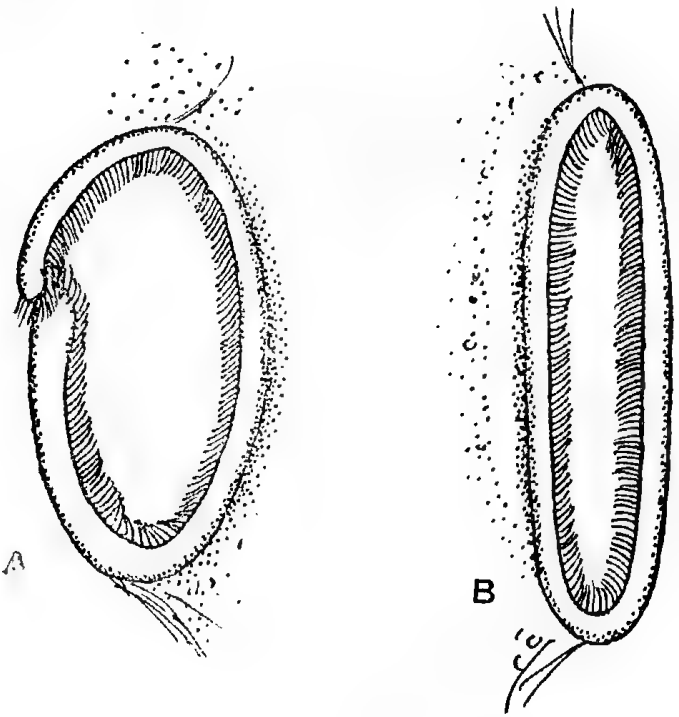
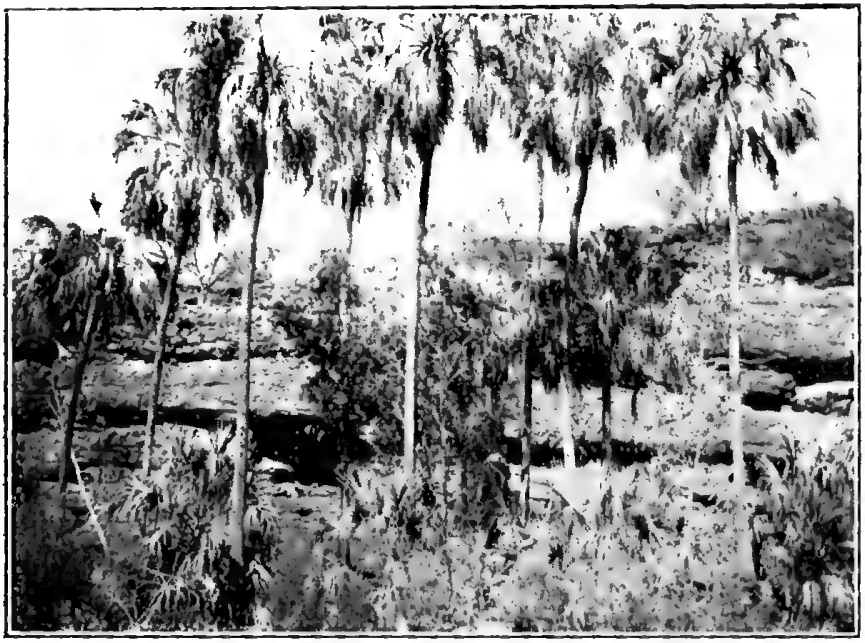


Fig. 1 on (A) left and (B) right side of carapace. Dorso-lateral view of openings.

Fig. 2. Fresh-water Crayfish.

Dorsal and lateral views, showing openings.

PLATE IV.



Photo—J. B. Cleland.

Palm Valley, Central Australia.

Photo—J. B. Cleland.

Palm Valley, Central Australia.

Comparison with normal individuals shows that the chelae (of which the left is larger than the right) are more slender than is usual, and the fingers, particularly the dactyli, are narrower; also, the abdomen is quite markedly roof-shaped, but this may be in part due to drying.

It is evident that the inhalant currents, which normally flow into the gill-chambers only between the bases of the legs and the lower edge of the carapace, would in this specimen pass in through these dorso-lateral openings as well.

It seems rather improbable that this individual is a mutant, but if it be a "sport" its occurrence is of considerable interest; the animal can have suffered no severe inconvenience through its abnormality—in fact it is reasonable to suppose that under certain circumstances the additional inhalant apertures might be advantageous rather than otherwise.

The abnormalities in the exoskeleton may, of course, have developed during the life of the creature. The almost symmetrically placed apertures were possibly primarily due to injury (such as might conceivably be inflicted by the beak of a bird). In this case water would doubtless enter the gill-chambers through these dorsal openings as well as inferiorly, and this may have resulted in their persistence and the development of "straining" marginal hairs and an incrassate margin.

My best thanks are due to Mr. Williamson for the opportunity of examining this interesting crayfish.

THE CINEMATOGRAPH OF LIFE.

Throughout the seasons of the year the Field Naturalists in their excursions to beach or hillside, by winding streams or whispering forest, are witnesses to the moving scenes of Life's great spectacle. On the world's broad stage a continuous drama is being enacted. Without fall of the curtain scene has followed scene since life began. In spite of its spaciousness the stage is always crowded. Everywhere we see repetitions of the same episodes and situations on different scales. Here a scene among the birds and there among the insects. What the mammals are acting is being caricatured by the amphibians. Nor are the actors altogether silent. As in the latest mechanical spectacle sound sychronises with movement. The bee's quest of honey is accompanied by the drowsy hum and the assaults of the mosquito are heralded by her dreary monotone. The graceful evolutions of

the bird are timed to the thrilling love song. It is a world of echoes and refrains. The actors and actresses always appear artistic in their proper setting and scenery. Some are on the boards for minutes, some for days like the adult and aerial phases of scrub flies or ephemerids. Some for weeks, like the house flies or mosquitoes, some for months like the humble bees, some for years like the wedge-tailed eagle, the cockatoo, the swallow and many other birds, some for centuries like the eucalypts or the redwoods of California, but all in the end succumb to the scythe of the Great Reaper. So automatic is the succession among the short lived creatures that no gap is ever apparent. There is always an understudy to fill a vacant place.

When, however, we lengthen our vision scientifically we see that in spite of the apparent sameness there is continual change and that one cast follows another as age succeeds age. Many great actors like the sea scorpions, the giant saurians, the flying dragons, the diprotodons, have made their final exit and have left no successors. Nor has their mantle fallen on any other. The play goes on, but the players change. Throughout the age-long drama known as "Evolution" nothing must be new, and yet paradoxical as it may seem, all must be new. Everything in the present is linked to the past and grows out of what has gone before. Just as Shakespeare developed his wonderful plays from the prosy tales of Holinshed, the "Parallels" of Plutarch and other sources, and other sources, but in so doing entirely transformed the original so Nature in her eternal drama has steadily evolved characters and situations from apparently primeval confusion. Yet there is nothing in the end that was not potentially in the beginning, although the original may have been profoundly modified. All must be new or it would not be a drama, and would not be life if it were static. Beyond doubt the most impressive fact about animate nature is the "Ascent of Life," though there have been many backslidings and disappearances. Life has gone marching on from step to step. It is a well established fact that nobler and finer forms have appeared on the world's stage as one geological period has followed another.

D. J. McNAMARA.

BOTANICAL NOTES.

By ERNEST H. ISING.

Daviesia corymbosa, Smith (Leguminosae). The reticulation of the veins on the leaves is different on the top and bottom surfaces. By holding the leaves up to the light this is easily observed and the veins can be seen crossing one another. The leaves also have longitudinal furrows on both surfaces which may correspond to the space between the veins.

Pultenaea daphnoides, Wendl. (Leguminosae). On the upper surface of the leaf there are some fine white appressed hairs on the midrib. Commencing at the lower half they are sparse, but become more numerous as they reach the petiole, which is also somewhat hairy all round. The under surface also has very scattered hairs on the midrib as well as on the blade.

Tretratheca pilosa (Tremandraceae). In a previous article (1) I referred to this species (under *T. ericifolia*) growing from some exposed roots in a cutting. On 18/4/30, at Mount Lofty, I observed another instance of this species growing from some disturbed roots on the bank of an old road. There are four plants growing in the cutting, one each at 15, 19, 26 and 29 inches below ground level from roots more or less exposed. The plants consist of shoots 6 to 12 inches in length, and each has several branches in the cluster. These exposed roots, if they belong to the plant growing on the edge of the cutting, are at least 29 inches long. The lowest root is about 3 mm thick, and evidently descends even further into the soil. This shows to what a great depth even small plants send their roots to obtain the necessary moisture.

Goodenia geniculata (Goodeniaceae). A plant was observed at Mount Lofty flowering on 18/4/30. Flowering was stimulated by a light rain of about 30 points several weeks earlier. This species flowers from November through all the heat of summer and into the autumn, its bright yellow flowers making an attractive sight in the forest which is, at this time of the year, mostly devoid of flowers.

Eucalyptus leucoxylon, F.v.M. (Myrtaceae). This species was flowering at Belair on 21/5/28, and there appeared to be a general flowering of these trees along an ironstone ridge near the railway line. It was also in flower at Blackwood on 3/7/28. As Black's "Flora" does not give the flowering times for this genus, it is interesting to record this for the genus in the various districts.

(1) This Journal, Vol. IV., No. 4 (1923), p. 142.

Acrotriche serrulata, Labill (Epacridaceae). This is an early flowering species, and flowers were observed on 1/7/28 at Mount Lofty and again on 11/8/29. On the latter date the plant produced its first flowers, as all except one cluster were in bud. Another plant was in full flower on 15/9/29 at Aldgate. On 17/4/29 new growth was developing at tips of branches.

Haleocharis acuta, R.Br. (Cyperaceae). This rush is growing below a permanent spring along the roadside near Crafers. It grows from near the spring to 56 yards below it in the gutter downhill towards Stirling. At 18 yards from the spring to 26 yards the rush is crowded out by other growth. The gutter in which this plant grows is always moist and full of vegetation, and there must be a large quantity of water soaking down this gutter below the surface all the year round. This is evident from the constant freshness of the growth and the damp condition of the soil. The rush flowered on 23/11/28 for about 2 months. In this situation it grows very densely and practically forms a closed community. It has underground horizontal stems, with the buds an inch or so below the surface. It grows from 12 to 18 inches in height. On 28/12/28 this rush had died down and 2 months later new growth had come up and was several inches high. The spring and summer had been very dry, for no rain had fallen from 6/10/28 to 15/1/29. On 16/3/29 the spring was almost dry. At this time the gutter was cleaned out by workmen and the rush was skimmed off with a shovel, but the roots were not disturbed. By 16/8/29 the rush had developed new shoots from 9 to 12 inches in height, and two months later had grown up to 20 inches and was in flower.

Persoonia juniperina (Proteaceae). I noticed a cluster of buds apparently about to flower on 28/8/29, which must have developed 4 to 6 weeks earlier. This appears to be very early for buds to mature, as this species does not usually flower until early in January. The past unusually dry winter may have a direct influence on the flowering time.

Pterostylis nana (Orchidaceae). This small greenhood orchid was growing and flowering very plentifully on road cuttings near Mount Lofty Station, in spite of a dry winter. On 8/9/29 many plants were growing on the steep side of a cutting, from the top to the bottom, a distance of about 5 feet. They were also growing on a deep cutting near the Cross Roads, Mount Lofty, on the exposed rock face. These plants must have been dormant for several years, or they were seedling or young plants vegetating by tuberous expansion, as during the last 10 years they had not been seen previously although I had kept a close watch on the cutting. Growing as they are in this situation seems to point to their propagation by means of seed.

REGENERATION OF NATIVE PLANTS AFTER BEING CUT DOWN.

By ERNEST H. ISING.

On a part of the roadside that was cleared of vegetation in the winter of 1928 (June to August) the following plants have grown again apparently from the root-stock or underground stems of the old plants. (Date 17/8/29).

1. *Persoonia juniperina.* Several plants have grown and one was 12 inches in height.

2. *Banksia marginata.* A plant had grown up 6 inches.

3. *Lepidosperma lineare.* In fairly young fruiting stage and leaves about 6 inches in length. On 20/7/29 the flower stems were fully developed and fruits appearing. Evidently flowers in May or June.

4. *Olearia grandiflora.* Very healthy growth on 12 or more branches, which were cut off at about ground level and were now 12 inches in height. A month or two later there were 40 branches, each with a terminal flower. The rough "pruning" to which this plant was subjected produced very vigorous new growth.

5. *Xanthorrhoea semiplana.* New leaves had grown and were 18 inches in length.

STARTING TIME OF MEETINGS.

Members are asked to note that the evening meetings will commence at 7.30 p.m. in the lower room. This will allow time for disposal of business so that at 8 p.m. the lectures can be commenced.

EXHIBITS.

Will members please endeavour to bring exhibits at all meetings, especially the one to be held in October.

NATIVE FLOWER SHOW.

After some discussion, it was resolved that the Show be held again this year on the dates assigned in the programme, October 10th and 11th. Don't forget Collecting Day, October 8th, at Mt. Compass. The members realize that in all probability the financial returns may not be so high as in former years, but that the value of the exhibition is in many ways so great that it is worth while going on with it. Its real success will depend upon the enthusiasm and hard work of the members themselves. In particular everyone is asked to bring exhibits relating to any branch of natural history.

LECTURE ON "THE ARCHITECTURE OF INDIA."

By REV. J. H. ALLEN, B.Sc.

March 18th, 1930.

With the aid of slides the lecturer gave a vivid description of the notable works of Indian builders through the centuries interspersed with a great deal of information on the development of Indian life and customs.

LECTURE ON "HONOLULU, CALIFORNIA."

By DR. R. H. PULLEINE, M.B., Ch.M.

April 15th, 1930.

Dr. Pulleine gave an interesting account of visits to Honolulu, California, and Arizona. Of particular interest were his descriptions and views of arid districts in the western United States, and of the peculiar plants found in such desert conditions, with their many adaptations enabling them to flourish with the minimum of water supply.

LECTURE ON "A TRIP TO CAIRNS."

By MR. A. J. MORISON.

A feature of Mr. Morison's lecture was the wealth of beautiful slides by which the lecturer's interesting remarks were illustrated. The audience was taken to Melbourne, Sydney, Townsville, and Cairns, and thence to the many places of interest in this tropic land of palms and sugar canes.

EXCURSION TO GLENELG AQUARIUM.

April 26th, 1930.

A party visited the Glenelg Aquarium and were greatly interested in the various forms of marine life collected there.

EXCURSION TO MT. LOFTY.

March 15th, 1930.

Mr. A. J. Morison led a party of members to Mt. Lofty. The Flower Show was visited by members, who were greatly interested in the fine exhibition of hills plants.

EXCURSION TO HALLETT'S COVE.

Dr. Fenner led the party and explained the physiographical features of the Cove, and by the aid of a map distributed to each visitor pointed out the points of special geological interest, including Tate's Rock, the polished pavement at Black Point, and the fossiliferous Miocene limestone which runs across the Cove. Dr. Fenner was particularly interesting when dealing with the geological history of the Cove from early Cambrian times through the period of Permo Carboniferous fluvio glacial action, the Miocene life now represented by a fossiliferous limestone, the deposit of Pleistocene mottled clays, the travertine formation and recent soil formation.

EXCURSION TO OUTER HARBOUR.

The party, under the leadership of Mr. F. K. Godfrey, found such a rich harvest of shells on the bank at the north end of the harbour that they failed to notice the encroaching tide till they were surrounded and had to wade out. On Snowden's Beach specimens are found both of estuarine and open sea shells, and a good number of species was collected.

Among the estuarine shells reference was made to *Monodonta obtusa*, which in appearance resembles the common winkle. *Modiolus inconstans* has an almost transparent shell. The shells from the open sea washed in by strong tides into river mouths included *Mitra Australis*, characteristic of this beach. *Chlamys bifrons* belonging to the family of the *Pectenidae*, but unlike the ordinary pecten, the two valves being convex. *Haliotis cyclobates* (circular lobed sea ear) is often found attached to a Pinna or Razor Shell, and within the two valves of the latter a small Pea Crab is sometimes observed. This is not a parasite, but while enjoying the protection of the Pinna enjoys its meals in common. The Pinna is deficient in carbonate of lime, the usual shell-forming material, but its valves are formed of horny matter known as *Chitin*. It is generally found up-right in the sand, moored to the bottom by its byssus or fringe. *Pyrene lincolnensis* was another interesting find.

Nassarius victorianus, a prettily marked red shell, and *Conus anemone* is another beautiful shell, and *Murex triformis*. *Polynices conica* is a carnivorous mollusc, which bores holes in other shells, generally the portion covering the vital organs. *Bitteum granarium* is an open sea shell, generally much deformed by rock and waves before it reaches the beach. In the sand the tracks made by the *Amphidesma cuneata* were pointed out and near the nodes several of these shells were unearthed. The egg *nidus* of *Polynices conica*, a strap-like structure of fine grains of sand in which the eggs are deposited. Other shells found were *Clanculus dunkeri* (peculiar to Australia), *Salinator*, sp., *Coronella*, pp., *Siliquaria* and the dainty *Oliva australis*.

SOUTH AUSTRALIAN SHELL COLLECTORS' CLUB.

The attendance at the regular meetings on first and third Mondays is well maintained.

Family Trochidae has been under review during the quarter. Many of these shells are amongst the most common found on our beaches, and a little trouble is worth while to become familiar with those which the young folk are most likely to pick up and ask questions about.

Genus Cantharidus may be summarised—pyramidal—not having a depression at the centre of the base, which depression would be called an umbilicus—outside smooth, spirally sculptured—brilliantly iridescent within—colours generally bright and variegated. Mouth is less than half the length of the shell, longer than wide, egg-shaped. Columella, the upright pillar in the centre, toothed or notched near base. Shell is rather thin. Australian Seas the metropolis of this genus.

Cantharidus apicinus (Menke). Much variety in coloration. About four-fifths of inch in height. Base of the shell is flecked or blotched. Interior is violet. Port Willunga and farther south.

C. bellulus (Dunker). A real gem and common on almost every local beach. Half-inch in height and a quarter-inch diameter. Base colour is brownish or greenish, with about 16 to 18 reddish bands, narrow, some of which appear to be doubled. Between the bands are numerous nearly circular white lined figures. The spire of the shell is elevated, but not very slender. The outer lip appears folded or plaited within.

C. conicus (Gray). Solid appearance, elevated, conical. Pinkish or grey-white, with crimson apex and close dark red-brown stripes. Spire is straightly conical. Protoconch, that is, the first formed portion at the apex is bluntly conical and is eroded as though the baby shell could not stand the weather. Outer lip thick and plaited within. Reddish iridescent within the mouth. Three-quarters inch in height, half-inch diameter. Very common on all local beaches.

C. eximius (Perry). Common on beach at Port Noarlunga and farther south, not found on beaches nearer Adelaide. The ocean beaches produce the best specimens. Colours green and red with interior greenish sheen. The shell shows numerous narrow spiral bands which are not much coloured and are not prominent. Fairly solid looking and generally attractive. The shell is brilliantly iridescent beneath the outer coating. About 1¼ inches in height by half-inch diameter.

C. fasciatus (Menke). Common most beaches. This shell is elongated, thin, polished and shining. Colour white, creamy, or pink, with spiral bands of pink, purplish-red, brown. Spire is elevated and slender. Apex is dark and acute. Whorls about nine, very slightly convex. Mouth smooth, whitish within. Outer lip thin, acute. Inner lip (near centre of base) narrowly reflexed. This shell is not iridescent. Ocean beaches yield the best specimens. Up to about ¾ inch high and ¼ inch diameter.

C. irisodontes (Q. & G.). Common all beaches. Any size up to three-fifths inch high by three-eights inch diameter. On almost every patch of shell sand little green shells of this species are present. Shell is small, but stout looking. Not very polished. Sculpture dense with several concentric, impressed lines on base. Colour greenish, with several whitish dotted spiral lines. Spire is but moderately elevated. Apex greenish-brown. Whorls about seven, slightly convex. Mouth greenish-white within. Outer lip not very sharp on the edge. Inner lip set with small teeth.

C. pulcherrimus (Wood). This shell may best be distinguished from irisodontes by its distinct rosy lip encircling the mouth. Shells mostly green, some are reddish. Interior iridescent. Common on local beaches. About ½ inch in height by ¼ inch diameter.

Genus Monodonta (Lamarck). Shells of this genus are shaped like a top, and have few whorls, which are spirally grooved and beaded. The lip is thickened internally and grooved. The sand at Outer Harbour is mainly this shell in abundance. Shell columella—the upright central pillar, is toothed. The name Monodonta signifies "one tooth." Operculum or trap door is horny and, viewed through a lens, is many-whorled, that is, with many wreaths or turns. Monodonta is without the depression in the centre of the base which is styled the umbilicus. Mouth is rounded, but is angulated towards the centre of the base.

Monodonta concamerata (Wood). Prefers the less exposed crevices in rocks, very common at Marino, under stones between tide-marks. Has strong solid appearance and is pearly, with well-marked green lines parallel with the line of growth. Any size up to rather more than 1½ inches height by 1 inch diameter. This is not common at Pt. Willunga.

M. constricta (Lamarck). The common winkle. Rocky coasts exposed at low tide. It is good eating. About an inch in height and diameter.

M. Adelaidae (Phil). Smaller than "concamerata" and better sculptured, with greenish interior sheen. Fairly common certain local beaches, look for them on the shell sand patches. About ½ inch high and nearly ¾ inch diameter.

M. odontis (Wood). More finely sculptured than "adelaidae" and of similar size and outline. Many have well pronounced yellowish spots in lines, but this does not always apply. Uncommon on several Gulf beaches.

M. obtusa (Dillwyn). More acute and angulated than "constricta." Might be taken for young "constricta" but for its zebra-like markings. About ¾ inch high by ½ inch diameter. Look for this shell in life amongst the weeds in the mud between the sand spit at the Outer Harbour and the shore line which leads up the Port Creek, on the same side of the stream.

M. rudis (Gray). In general appearance and size this is like "constricta," but on the base is a black patch, and the black line around the outer lip is unbroken—in "constricta" the line is broken in several places. Nearly 1¼ inches high by 1 inch diameter. On rocks, not so common as "constricta."

The quarter's review also included the genera Cantharidella and Calliotrochus; although these shells are not large they are full of interest to students, instancing:—

Calliotrochus Reedi—named by Sir Jos. Verco after Mr. Walter Reed, a member of this Section. This shell is found in shell sand at Corney Pt., Wardang Island (Kimber), Edithburgh, Holdfast Bay, Levens Beach. The type is 6.2 mm diameter by 3 mm height.

F. K. GODFREY, *Hon. Secretary.*

PRESENTATION TO RETIRING SECRETARY.

At the conclusion of Mr. Morison's lecture opportunity was taken to make a presentation to Mr. E. H. Ising, who recently retired from the position of Hon. Secretary after 12 years of devoted service.

In making the presentation the President, Mr. H. M. Hale, referred in felicitous terms to the deep debt of gratitude for the splendid services rendered to the Society by Mr. Ising during his long term of office.

The remarks of the President were supported by Messrs. W. H. Selway and W. Ham.

The presentation took the form of a wallet of notes.

OFFICE-BEARERS, 1929-30.

Chairman: Mr. HERBERT M. HALE, Museum, Adelaide.

Vice-Chairmen: Rev. H. A. GUNTER and Mr. F. K. GODFREY.

Hon. Secretary: Mr. HAROLD WOODLANDS, Box 989, G.P.O.

Hon. Assistant Secretary: Miss J. M. MURRAY, 36 Main North Rd., Prospect.

Hon. Treasurer: Mr. E. V. DIX, c/o Harbours Board, Adelaide.

Librarian and Magazine Secretary: Miss ROEGER.

Committee:

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Mr. WM. HAM, F.R.E.S., Teachers' College.

Press Correspondent: Mr. D. J. McNAMARA.

EXCURSIONS.

July 12—Henley South. Tram, 2 p.m. Botany. Leader, Mr. J. A. Hogan.

July 26—Museum. Meet at entrance, 2.30 p.m. Leader, the President.

Aug. 16—Burnside (Mr. P. Ifould's). From 2 p.m. Botany. Leader, Mr. P. Ifould.

LECTURES.

July 15—"The Association of Insects with Plants." By Dr. J. Davidson, D.Sc.

Aug. 19—Annual Meeting.

The South Australian Naturalist

The Journal of the Field Naturalists' Section of the Royal Society of South Australia and of the South Australian Aquarium Society.

Adelaide Aug., 1930

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OUR BEAUTIFUL SOUTHERN COAST.

A Record of Five Days' Easter Tramping Excursion on Fleurieu Peninsula.

By L. Reynolds.

PART I.

Fleurieu Peninsula is that section of country stretching between Cape Jervis and ending near Rosetta Head (the Bluff), Victor Harbour. This extreme Southern Peninsula is unfamiliar to the average person. Less familiar still is the rugged precipitous coast, intersected by steep gullies and ravines, sheltered coves and ocean beach. Throughout the ages, the free and mighty rollers from the far southern ocean have piled high the foam and spray along this rugged shore. Devoid of tracks or signs of habitation, this ever changing coast offers much to artists, naturalists, and sportsmen, for the last named may hunt the kangaroo, or ply the line for the fish which abound along this coast. In the valleys, too, bird life is prevalent.

With haversacks rammed with provisions—bread, rice, potatoes, and a dozen other lines, including sleeping kit and camera, we stepped away from Second Valley on the Good Friday morn of last Easter.

My companion, Ted, civil servant, and Y.M.C.A. Field Naturalist Secretary, wanted to forget office routine, and test the beauty of the Southern shore. His swag of forty pounds was found to weigh heavier on his shoulders than some of his office problems. Being much shorter and broader than my companion, with the advantage of having humped the same weight for eight days from Moana, via Cape Jervis to Victor Harbour on November last, I felt a greater degree of comfort than my handicapped pal.

We passed the pretty little home of the late Henry Van Raalte picturesquely situated upon the hillside of the Delamere Valley.

As we ticked off each of the thirteen miles separating us from Cape Jervis, we stopped to investigate a very old, but distinctly charming little Church of England, standing in an atmosphere of peace and indeed "afar from the madding crowd." From her elevation she looks down and watches over the hallowed spot surrounded by trees where her faithful departed are sleeping. A point of interest presented itself as we passed into the church. Near the entrance doors stood a font, and a tablet nearby indicated that this font had been presented to Archdeacon Moyes, and was over 200 years old, having served in a parish church in England.

A winding hilly road brought us to Cape Jervis—our "hopping off" place. Here we obtained a good supply of fish for tea and breakfast from a visiting fisherman.

Lack of water at the lighthouse is the bugbear. Disappointment awaits visitors if they have not been wise enough to bring supplies. At one time visitors could obtain any little common want from the kindly keepers of the light, but now the keepers are gone, their cottages demolished, and an automatic light now flashes nightly without man's help.

The following morning (Saturday) we breakfasted, packed, and pushed away from the Cape, heading in a south-easterly direction.

Beyond an old homestead of J. Malthouse, near the sea, stood the new cable station. The old station at Yankalilla carried the cable to Kangaroo Island, but from this new position the cable distance is shortened, being only 8 to 10 miles across to the island.

Fishery Creek (2½ miles from the Cape) has bad drinking water. Here at one time mining was pursued, but now just the slaggy dumps remain.

From Fishery Creek to Campbell's Creek the contour of the coast changes. Short scrub appears, and from the sea the land slopes gently inland, meeting the hills and valleys, which become steeper as one moves eastward. Campbell's Creek is one of the many sheltered sandy coves encountered after leaving the Cape country. An islet of rock stands guard at the sea entrance, while the surrounding hills dip-slope to the sandy beach which is a few hundreds of yards in length. From the valley between the hills, pure fresh water finds its way to the beach. In wet seasons the supply flows over the sand, but in a dry season, it filters beneath it. By scooping a hole in the sand, one can intercept the stream and obtain excellent drinking water.

Blowhole Creek (why thus named, I don't know) also contained abundance of fresh water. It was reached on Saturday afternoon, and by this time the coast was rapidly assuming proportions of scenic splendour. A prettier scene than that which now presented itself would be difficult to find. From a sandy knoll I surveyed the sight before me, and just wondered how Nature from a continuity of rocky cliffs and rugged broken coastline should suddenly see fit to mould such a snug little haven, a real shelter from the outside breakers and southerly squalls and winds. The cove entrance was guarded by storm-worn sentinels of high jagged rocks, following around and hemming in the cove. The rocks terminated in deliberate slopes to the beach. The hills to the east of the cove were broken by a rocky steep-sided valley, which frowned upon the little winding fresh water stream as it turned and twisted its way between rock and bushes, and presently flowed into the sea. Strange to relate, white lilies grew in profusion up this valley. Here the prospects were so inviting, we decided to camp.

A fire was lighted in a sheltered spot on the beach, and sufficient wood and water secured for the night. It is most interesting to observe the varying amounts of driftwood found along this coast. Bleached white with exposure, I have seen it piled high and dry the whole length of a sheltered cove, and sometimes three to four feet deep. Huge trunks of ancient trees rest along with timber and boxes lost or thrown over by ships at sea. As night descended, two fine leather jackets were placed on a flat stone to sizzle before the fire—a good method of cooking fish, no pots or pans! When cooked, peel off the skin or scales, and "Goodbye, Fish!" Ted scratched around for seaweed, and soon reported beds made. Shielding my face from the heat of the fire, I plunged a fork into the fish and dragged them to the festive scene. At about 10 p.m. that evening a big mail boat hove into sight ablaze with electric lights. Although she appeared quite near, over three miles must have separated her from the mainland.

The following morning was dark and threatening. Halfway through breakfast down came the rain, and continued for some hours. Beneath the canvas we dismally watched the rain falling whilst the fire spluttered and eventually fizzled out. The tin plates which were thrown on to the sand were now filled with water. At 11 a.m. the rain ceased, the clouds rolled away, and the warmth and cheer of the sun poured upon us. We hastily packed and moved away down the coast.

Directly south were two islands. They appeared to be some miles from shore, but were recognised as The Pages—North and South Page (70 feet high). Travelling now becomes slower and more difficult. Valleys are steeper, hills higher, and dense scrub appears. Mr. Madigan, in his report before the Royal Society, refers to this section of the coast as "A succession of rocky bluffs, small shingly coves, and the ridges between the gullies reaching from 200 to 300 feet high." He continues by stating the going to be difficult and tiring, and in one day from 8 a.m. to 7 p.m. only six miles were covered.

The approach to Deep Creek was lined with dense scrub. Shorter scrubs grew on the hilltops, but the descent into the valleys was checked by high scrub reaching over our heads. One had to force one's way through this dense growth.

The needle bush (Hakea rugosa) kept us well awake. It is covered with sharp needles one inch long.

The silky teatree (Leptospermum pubescens) welcomed us more kindly as we tramped through its territory. A few members of the daisy bush family seemed to be well represented and widespread along the Peninsula.

Near Porpoise Head a little surprise awaited us. We had just emerged from a particularly steep and rocky valley, puffing and blowing like a pair of mountain-type engines. A fine panorama lay before us, and also another view, but not so pleasant as the former. In the grass ahead, at full length, lay a five foot snake. While he wondered who and what we were, I also pondered the question as to why he should choose to be directly across our track, and what the result might have been had one of us stepped on him. Keeping an eye on him, I slipped the haversack to the ground, but he anticipated my move, and quickly glided away. One, two, three, and the fourth bush proved fatal to him. I broke his back as he emerged and after a few sundry taps for luck, he was presented before the camera. We displayed a sudden interest in ground study for the next few miles—maybe the thoughts of meeting the relatives of our late friend were responsible for this.

PART II.

The coast continued steep and rocky, and from every vantage point, one saw scenes of varying coastal splendour. Every mile revealed something new; miniature coves and inlets were sheltered by sheer walls of rocks, whilst deep down one became fascinated with the rise and fall of the swell, causing a gurgling stifling noise as it receded, leaving a struggling surging backwash to follow in its wake. Many beautiful views were unravelled as we lessened the distance to our objective—Deep Creek. By now the sun was dropping away to the west. At intervals, as we gained the hilltops, we observed its rays grow less, whilst down in the valley, the shades of night were gathering. In a neighbouring valley, we heard welcome sounds of the surf playing on the rocks outside Deep Creek.

Ten minutes later, torch in hand, we stood on the top of a particularly high and steep valley, which surrounds and overlooks and gives to this creek the name of "The Deep Creek." Aided by torchlight, we descended from the hilltop down the valley to a sheltered sandy cove beneath. The valley darkness had completely enveloped us; although not able to see, we could plainly hear the boom of the rollers outside crashing on the precipitous cliff rocks. With the crash of each roller a silvery serpentine stream wound its way over sands and rocks into the sheltered creek, and mingled its salt with the fresh water. But thanks to Nature, the might and volume of the sea was kept outside shelter cove. Directly above, the stars were contesting with the clouds for the supremacy of the night. At intervals, they were obscured by the dark clouds, which were driven by the same wind that caused the trees and shrubs growing high on the valley tops above to sing and whistle a mournful welcome to a tired pair gazing from the valley below, where silence and peace prevailed and contrasted strangely with the elements outside and above.

Here we were to camp for the night. To an observer from the valley heights, our campfire would appear no brighter than one of the stars above, but to us it was a cheerful blaze. High seas had washed seaweed and sand into the creek, and the decaying vegetation polluted the water. Although temporarily disappointed we found suitable water for boiling, and with the failing torchlight we hastily gathered our supply of firewood for the night. It was a tired, but contented pair of tramps who dried their clothes and camped by the fire that night.

The camera worked overtime on the following morning (Monday) depicting scenes inside the valley and outside by the ocean. It is difficult to paint a word picture of a coast so beautiful. The best attempt is indeed poor, so I say one must see for oneself "our charming Southern Coast," this "rugged loveliness." As the sun penetrated the valley, we broke camp, and wound away up creek, searching for a convenient exit from this deep gorge. The little vale below was clothed with bracken fern, and along the creek and right into the gully the silky teatree grew. Beneath its shelter grew what every woman admires—the delicate maiden-hair fern. To the right and left along the creek and afar into the hillside, maiden-hair flourished and grew in unpretentious profusion. I photographed a view looking through this fern valley to the Pages Islands in the distance.

The most difficult part of the journey ended at Deep Creek, although the coast ahead was by no means easy. The cabbage or scrub gum (Eucalyptus cosmophylla and Eucalyptus fasciculosa) grew in the scrub a short distance from the cliff. Pleasant grassy patches were in evidence, and the country generally appeared more hospitable. A unique sight presently loomed up. From a point on the cliff face, a delightful panorama stretched 10 to 12 miles eastward, bringing within range the beautiful Tunkalilla Beach, Tunk Head and Newland Head. I had just recorded this scene by camera, when quite near us the Yacca or grass trees rustled, and away hopped a pair of fine kangaroos, and made into the scrub. A few minutes later we surprised another big chap which had been feeding too intently to hear our approach. There are signs of the presence of numerous 'roos throughout this country. On one occasion we made a circuitous track through some scrub, when we came upon a large species of eagle, being the second one seen. From here to Tunkalilla Beach the Black Boy, Yacca or Grass Tree, grows in abundance. These old man trees are reputed to reach a great age, and from certain of their species, the Yacca Gum is extracted.

At Tapanappa Creek we had lunch, and presently set off for Tunkalilla Beach. Ted's eyes sparkled as we walked and talked. I had told him great things concerning Tunkalilla Beach of the straight flat walk of 4 miles along a marvellous platform. It would be a welcome relief to us both, being the first flat section of country encountered since the start. Tunkalilla Beach is uniquely set out. It is a memorial picture as seen from a hill looking eastward along the beach.

In stormy weather the fury of the unbroken rollers spends its strength and spray along the four miles of this beach. During these four miles, the tramper has the incessant drone and boom of the thunderous breakers ringing in his ears, as each roller leaves the shore laced white with foam. Ten feet above beach level is a platform about 200 yards wide running the whole length of the beach. It is composed of alluvial soil washed down from the hills. The background, a marginal line of steep hills, follows this platform to Tunkalilla Head, four miles away. Sheep graze along this plateau and about in the centre, is an old woolshed, where I believe the sheep are still shorn.

As a rule on this trip we are continually racing the sunset, and this night was no exception. Callawonga Creek was the goal for the night. At the summit of Tunkalilla Head, we had the pleasure of seeing the sun go down. In order to save time and skip a few hills, we made a detour into the scrub. This proved disastrous, and landed us into trouble Darkness rapidly descended, and after much blind walking and stumbling, we were reluctantly obliged to make camp where we stood, being temporarily bushed for the night.

Under a few Yacca trees, we dumped the haversacks, and went away to gather firewood. With our arms full, we turned in the direction of the haversacks, but to our surprise and disgust, the darkness had made all Yacca trees appear the same. The firewood was dropped, and a good ten minutes search revealed the swags some distance beyond where we had been searching. Of course, it seemed humorous then, but we were not to be caught again.

In the light of a regular bush-fire, we were much more at ease, but our good cheer fell a few degrees when the water bottle registered half-full and the contents had to be divided. The food supply looked very sick, so that also suffered division. It was quite certain that if we had tea, nothing would be left for breakfast. We hoped to reach Victor the next day, and by that time something was bound to turn up.

That night saw a very heavy dew fall, so we formed a human hob on each side of the fire, and with the inner man still demanding his rights, we did our best to sleep.

The morning following being Tuesday, our last day, we were astir early. While the stars were yet shining, we warmed ourselves around the fire, and wondered what a decent breakfast would taste like. Not a remnant of food was in the tucker bag. After much diving into his bag, Ted reappeared with a little cocoa and coffee. I suggested that

he should undertake another submarine excursion to the depths of his bag, in hopes of digging up something that would look or taste like sugar or milk, but by the expression on his face, I saw that he also realised our mutual disappointment. He handed me a little bag, the substance left from the wreck of our gloriously ladened swag of five days before. He grinned as I steered my nose into the bag. Salt! Greet Scott, of all the unwelcome stuff in the world. Salt! For days we had seen oceans of it. Salt! Certainly not. So in the light of dawn, we gulped down the world's worst combination—coffee and cocoa, minus milk and sugar.

Callowonga, the evasive creek of the night past, was reached in the early morning. The creek had a good flow of fresh water, and somewhere inland Wolfram has been found. This valuable metal was used extensively during the war, adding properties of toughness to steel for armour plate and shell making. Beyond Callawonga appeared excellent grazing country, the grass seemed plentiful, and long. Bolloparudda and Coolawanga Creeks were crossed, showing Newland Head covered with a dark scrub. We skirted the scrub on Newland Head, and passed into the Waitpinga country. This country was inviting, and by the well kept fences, we judged that settlements were at hand. After midday we were feasting at a kindly settler's cottage, and this welcome meal provided sufficient fuel to complete the remaining 8 miles journey, arriving at Victor Harbour the same Tuesday afternoon, having completed forty to fifty miles of ocean coast.

This State possesses an almost unknown rugged coastal gem unspoiled and unpolished by the ways of man. To those who are lovers of natural scenery, to botanist and marine scape admirers, to camera enthusiasts, and to the army of the young and active, and all those who long for the unbeaten ways, I commend this trip, that they too may see and appreciate our Southern heritage.

S.A. AQUARIUM SOCIETY.

A meeting of the above society was held on July 1st, when Mr. H. M. Hale presided over a large attendance of members and visitors.

Mr. A. G. Edquist delivered an instructive address on "Nutrition in Relation to Aquatic Animals." The lecturer explained that all living organisms require food to sustain life, lack of suitable food ultimately resulting in death. All living substance breathes, and in the process uses oxygen, liberating carbon dioxide. The carbon of the carbon dioxide formed during respiration is derived from waste tissues of the body and such waste has its origin in food, so that in order to maintain life an organism must ingest as much carbon as it loses in the process of breathing. From this we see that carbon or charcoal is a most important food, and that as a result of breathing it is oxidized or slowly burnt by combustion. The process of combustion produces heat which maintains the temperature of the body, and thorough oxidation of the body is as necessary to growth as is an abundance of food material.

ANALYSES OF BODY SUBSTANCE.

Analyses of the body substance of fish reveal the following facts: Water, 10.8 per cent.; Carbohydrates, — per cent.; Protein, 44.1 per cent.; Fat, 10.3 per cent. of a digestible nature, and minerals such as lime, silica, soda, iron, magnesia, phosphorus, sulphur, manganese, iodine, fluorine, etc. The absence of any one of these substances means a cessation of growth and probably breakdown in the health of the organism by food deficiency diseases. All living organisms consist of water, carbon, nitrogen, and minerals, hence it is clear that success is only attainable to the aquarist by careful selection of foods containing the substances mentioned, and those substances must be given in correct proportions. In other words the food must represent a properly balanced ration. By this we mean that the carbon must bear a definite ratio to the nitrogen and the minerals. The ratio of the proteins to the carbohydrates is 44.1: 23.2.

CONSTITUTION OF FOODS.

Solid foods are divided into groups according to their chemical composition and the part they play in the economy of the organism.

CARBOHYDRATES.

Typical examples of carbohydrates are sugar and starch. Sugar consists of carbon plus oxygen and hydrogen in the proportion in which they exist in water, i.e., two parts hydrogen combined with one part of oxygen: (C_{12} H_{22} C_{11}) or (C_{12} H_{24} O_{12}). Other carbohydrates are cellulose, glucose, dextrine, maltose, caramel, etc.

Fats and Oils.

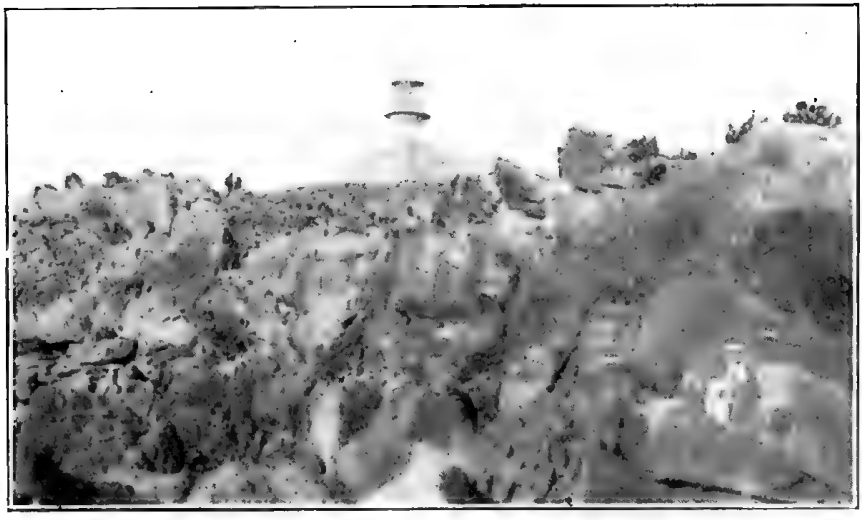
Another group of substances, very like carbohydrates in composition, contains the fats and oils. In these compounds the oxygen and hydrogen do not always exist in the proportions found in water. They may be looked upon as concentrated carbohydrates. In this group we have lard, suet, tallow, butter, olive oil, linseed oil, fish oil, cocoanut oil, cottonseed oil, and margarine. Some of these fats are of a very complex nature, butter for instance containing stearine, clein, palmatin, butyrin, myristin, caprin, caprylin, caproin, and laurin.

Proteins.

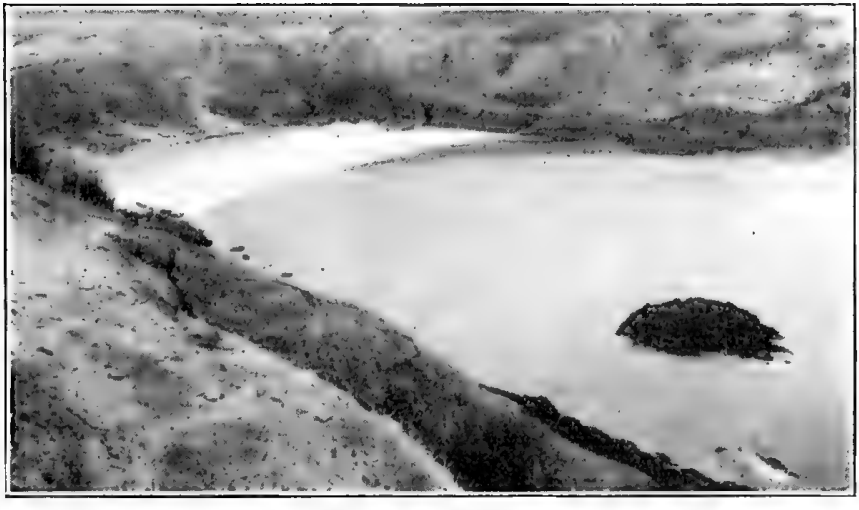
Proteins are more complex in composition than carbohydrates, having in addition to carbon and the elements of water, nitrogen, and mineral salts, including phosphorus and sulphur. In this class of foods we have gluten, legumin, albumin, casein, globulin, myosin, fibrin, etc.

Function of Foodstuffs.

Food is necessary to maintain the body and to produce a growth of body tissues. The carbohydrates and fats supply bodily heat and heat energy which exertion requires. The heat energy is derived from the oxidation of carbon in the carbohydrates and fats, any carbohydrate ingested and not oxidized being stored up as fat between the muscles and around the kidneys, nerves, liver, etc., in the form of animal starch named glycogen. Too much carbohydrates is detrimental to general health and the so-called lower animals, in their natural state, choose a correctly balanced diet. Man, with his superior knowledge, gorges geese with food rich in carbohydrates and eats the livers in the form of *pate-de-foie-gras,* which is considered a great delicacy in France and other countries of advanced civilisation. The temperature of fish is that of the water in which they live, hence they are classed as cold-blooded animals, so that they do not require heating foods as do birds with a body temperature of 103 to 108 degrees Fah. For this reason it is inadvisable to provide fish with a diet consisting of breadcrumbs, oatmeal and suchlike farinaceous foods. Fishes should have a diet very rich in proteins, a ration of about 1 of carbohydrates to 4 of proteins being ideal, although a ration as narrow as 1 to 3 would not be harmful. Proteins, on account of the carbon content, maintain bodily heat, but they do more than this. The nitrogen and minerals contained, particularly the phosphorus and sulphur, build up flesh, bone, blood, nerve, brain, scales, and the elements of reproduction.

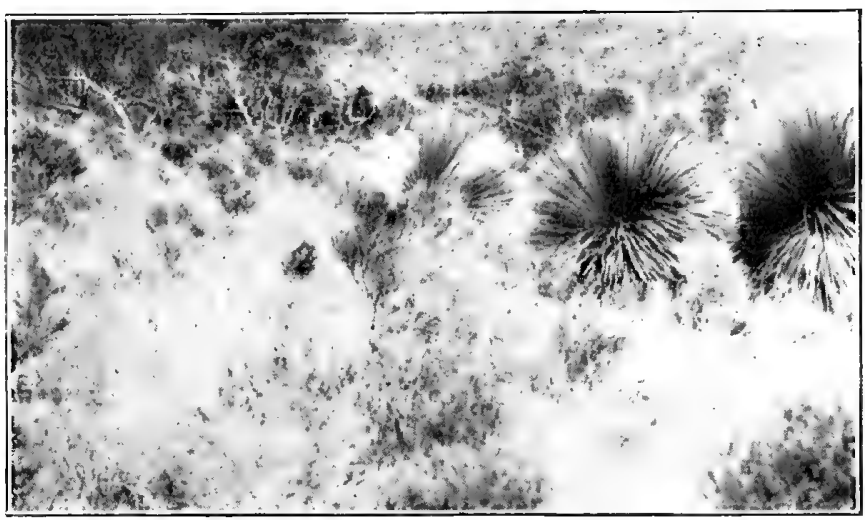


Cape Jervois, showing Lighthouse.



Campbell's Creek, showing Island.

Coastal scene between Blowhole and Deep Creek.



Scrub and Grass Trees near Deep Creek.

MINERALS.

Minerals are necessary in the building up of bone, scales, blood and reproductive organs. Without these fish may live for quite lengthy periods, but growth is impossible. Lack of minerals leads to lack of stamina and resistance to disease, and fish so fed are very susceptible to fungoid diseases. Such minerals must be ingested with the food, it being useless to add soluble minerals to the water excepting for its beneficial effect on plant life. Nature provides foods rich in proteins and minerals in the form of small aquatic creatures such as *daphnia, cyclops, estheria, cypris, branchipus,* and other crustaceans, while for small fry such organisms as *amoeba, vorticella, volvox, diatoms, protococcus, euglaena, paramoecium,* larvae of mosquito and *chironomous* are particularly good.

METHODS OF FEEDING.

Feed regularly, and give little at a time. Provide living food as much as possible, this is rich in vitamines. Never allow food to lie in the tank after the fish have satisfied their hunger, such debris rapidly giving rise to bacterial action with dire results. Weed eating fish get their minerals from the plants, and in standing water these minerals are soon depleted, so that soluble minerals should be added from time to time to counterbalance the loss. Minute animal life is also attached to the weeds eaten and is of course highly beneficial. Plant life becomes very scanty and attenuated when minerals become depleted.

CONCLUSION.

Living tissues are always preferable to dead matter as food for fish. Such food (living) contains substances which undergo chemical changes immediately the protoplasm in the tissues dies. In a battery of wooden tubs or ponds small animal life such as that enumerated above may be successfully bred for the use of aquarists in feeding their pets.

OUR EXCHANGES.

1. "Annals of the National Zoological Museum of Poland." Four Numbers.
2. "The Australian Forestry Journal." June, 1930.
3. The Annual Report of the John Crerar Library, Chicago. 1930.
4. "The W.A. Naturalists' Club Magazine. May, 1930.

BUSH FIRES AND OUR NATIVE FAUNA AND FLORA.

By J. B. CLELAND, M.D.

In *Nature* for May 24, 1930, page 783, Dr. G. P. Bidder, under the title of "The Importance of Cataclysms in Nature," points out that from time to time, at intervals of perhaps hundreds or even thousands of years, great catastrophes may occur which may overwhelm living things with the exception of only a few individuals which differ from their fellows in possessing some factor which has proved of survival value under these exceptional conditions. The survivors would tend to transmit to their descendants this fortunate factor even though it might never again be operative in saving the species from destruction. The species after the ordeal would differ in certain features from its ancestors. It would constitute a variety on the road to the establishment of a new species. As examples of such cataclysms, prolonged drought, flood and fire are given. To these might be added for Australia the effects on our native fauna and flora of exotic introductions such as rabbits, foxes, cattle, sheep and noxious weeds. The object of this note is to call attention to the author's references to the the effects of fire in Australia. He says:—"I am told that in Australia, the first sign of a fire in the forest is the escape of the winged things—birds and insects. This gives another reason for delicate olfactory organs in insects, equally cogent with sex and food. In Australia every tree and bush is burned, and nothing remains but hot ashes—through which the seedling eucalypti rise to refill the long swath in the forest."

May I suggest that the Field Naturalists' Section should make a study of the effects of fire in our Mt. Lofty Ranges? Is Dr. Bidder correct in his statement that the first sign of a forest fire is the escape by flight of birds and insects? It is certainly not the case that every tree and bush is burned so that hot ashes alone remain. Most of our eucalpyts are fire resistant, even though they may be severely scorched. Sprouting occurs abundantly from the main trunk and larger branches. Many of the undershrubs have resistant butts. But do we know sufficiently well what species do survive and how they are able to do so and which are those that first appear as seedlings and how the order changes and other species appear as the eucalypt forest or scrub gradually returns to the normal? It would surely be of considerable interest for our members to collect this information and publish it in *The South Australian Naturalist*.

LECTURE: "THE PHENOMENA OF THE ATMOSPHERE."

By MR. A. G. EDQUIST. June 17, 1930.

Mr. Edquist dealt in a very interesting way with the ocean of air round the earth. By the help of a fine collection of lantern slides he made the whole subject one of very great interest.

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LECTURE: "THE ASSOCIATION OF INSECTS WITH PLANTS." By DR. J. DAVIDSON, D.Sc. July 15, 1930

The lecture proved most instructive. The lecturer stated that insects develop in a natural area in association with climate and flora, the latter being affected by geological formation and soil conditions. With the development of virgin country for agriculture the balance of insect life is disturbed, owing to change in flora, large areas of one crop being grown. Some native insects may take to feeding on the cultivated plants and may become pests; some insects may be introduced into the area from other countries and similarly become pests in the cultivated plants.

Insects in their relation to plants are of two classes: (a) biting or chewing, like caterpillars, bettles, locusts and grasshoppers; (b) sucking, such as aphides, scale insects, and plant bugs. The large orders of insects like butterflies and moths, beetles, flies, exhibit a very wide range of habit in relation to the food plant—some eat the leaves or young shoots or bore in the stem, many of them in the young larval stage bore in the wood, mine the leaves, destroy the buds or blossoms and fruit.

The sucking insects in addition to causing serious damage to the plants on which they live by destroying the leaves or fruit are important in that several species have been shown to be able to transmit diseases of plants known as "virus diseases."

The manner in which insects find the correct food-plant is not yet fully understood—they are attracted to the plant for food and for the purpose of laying eggs.

The association of insects with plants has an important economic side in that certain insects may prove to be useful in keeping down noxious weeds. The work on the control of Prickly Pear in this way is well known—certain insects are associated with furze or gorse, blackberry and ragwort and they do great damage to these plants.

VISIT TO MUSEUM: JULY 26, 1930.

Members were received by the Curator (Mr. H. M. Hale) and first viewed the recent acquisitions of the Museum. These included a Conger Eel found in S.A. waters. A most interesting exhibit was made of material unearthed by Messrs. Hale and Tindale on the Murray, below Swan Reach. The exhibits included certain human bones in a semi-fossilised condition. Other finds were numbers of chipped stone implements and implements of bone. Four different culture phases are represented. Shells of different ages were also found as well as many bones of the animals used as food by the aborigines of long past ages. These included some bones of the Tasmanian Devil, long extinct on the mainland. Aboriginal weapons and articles fabricated mainly by the lubras of the tribes formed an exhibit of great interest. Among many exhibits were some flimsy-looking rafts of reeds, on which the dark man ventured to navigate the Murray.

Mr. Lea, the Museum Entomologist, exhibited a great number of specimens, including the *Cactoblastis cactorum,* the insect that is doing such fine work in destroying the pest pear of Queensland and Northern New South Wales. Over 35 million acres of land have been so densely covered by this prickly pest that they were rendered useless. After years of world-wide research an insect has been found which attacks the pear. Photographs showed that the insect is destroying the cactus over large areas, Mr. Lea also showed specimens of the parasite which he was the means of introducing into Fiji to attacking an insect pest which was destroying the cocoanuts.

In showing an immensely varied collection of spiders, Mr. Lea said that brightly coloured spiders were usually venomous.

In the basements the ravages of the white ants or termites had been led to the employment of "steel" cabinets for the protection of the valuable collections. These destructive insects penetrated the cement floors.

The Kea, with a long hooked beak, formerly lived mainly on honey obtained from the nectar of flowers. The advent of the white man led to a remarkable change in its dietary. From

drinking the blood from slaughtered carcases the bird took to attacking the living animal, especially seeking the fat around the kidneys. The Kaka, a closely allied species, is, however, content with honey. The Kiwis nostrils are seen at the end of the beak, and its egg is of abnormal size for a bird not much larger than a pigeon—the egg being equal almost to an emu's.

Among the handiwork of the Murray Blacks the cat's cradle of childhood is a favourite product with some mysterious meaning. This simple but peculiar device prevails among the children of nearly all races, but the origin and meaning is hidden in prehistoric antiquity. A flimsy raft of reeds is still used by our natives in fishing on the lakes. It is ingeniously made and buoyant in spite of its slight appearance. Well constructed hand baskets made of rushes occupy the spare time of the lubra's. They exhibit very clever workmanship and design. In the armoury were more than 2,000 spears, all barbed, some singly and some doubly, with barbed heads of flint or bone; those with spines being considered especially deadly.

Rings with red feathers outside and white pigeon in the inner ring came from Santa Cruz. One of these would purchase two wives or one pig.

NATIVE FLOWER SHOW.

The Sub-Committees are busy planning for the Show to be held on October 10th and 11th. Members generally are desirous of making this Show as wide and varied as possible. Members are asked to send in every sort of natural history exhibit they think would be of interest to nature lovers. Timbers, plants, insects, shells, curios of all kinds, anything you think would prove of interest, bring them along.

SOUTH AUSTRALIAN SHELL COLLECTORS' CLUB.

1st August, 1930.

The interest of the members is well maintained, and the meetings have been well attended.

The Chairman (Mr. W. J. Kimber) continued his review of *Family Trochidae*:—

Genus *Calliostoma* (Swainson). Shells conical, without depression at the centre of the base (umbilicus); largest or body whorl angulated and usually ribbed at its periphery or circumference; mouth somewhat squarish; columella or central pillar oblique, often ending in a notch or tooth at the basal front.

C. meyeri (Philippi). A vertical section would appear almost as an equilateral triangle. The shell is rather solid, pearly, also closely and conspicuously beaded in spiral lines from the apex to the base; the fifth spiral constituting the suture or line which separates the whorls, is more coarsely beaded than the rest. Colour is pinkish-red, regularly blotched with red. There are numerous impressed concentric lines on the base. Height one inch. Greatest diameter is slightly larger as 26:25. Not common—Pt. Willunga, Pt. Lincoln, Corney Point, Pt. Victoria. A handsome shell.

C. nobile (Philippi). From C. meyeri this pink shell is more acutely conical, the mouth is more angulated, the sutural ridge is more prominent, also there are five well defined finely beaded spiral lines in addition. About one inch high, about one-eighth less in greatest diameter. Not common—Pt. Willunga, Pt. Lincoln.

Six other species of Calliostoma are rare, *C. incerta* (Reeve) being a left-handed shell.

Genus *Euchelus* (Philippi). Shells conical, top-shaped, with umbilicus or deep depression at centre of base; whorls rounded with beaded revolving ribs; columella or central pillar drawn out at base to a central tooth; outer lip of the mouth scalloped or milled within. Operculum or trap-door with but a few whorls.

Euchelus baccatus (Menke). A creamy white shell, blotched or perhaps spotted with red, the beaded spirals showing well under a low power lens. About one-third inch in height, nearly half-inch greater diameter. Fairly common in South Australia generally. In life it adheres to the under side of stones at low water. As a beach shell it is found amongst shell sand.

E. fenestratus (Tate). The type was from West Australia, but it has since been taken at Normanville. A small white shell with reddish-brown spots on the spirals which are not conspicuously beaded. About one-sixth of an inch high and slightly less in diameter.

E. scabriusculus (Adams & Angus). A top-shaped shell, with narrow, deep depression at centre of base; creamy white, usually spotted with red; spirals thickly beaded on the whorls, and with a channelled impression at the sutures. About one-sixth of an inch in height and about one-fourth greater in diameter. Not common—Outer Harbour, Pt. Willunga, Normanville, Semaphore, Grange.

E. vixumbilicatus (Tate). Somewhat like E. scabriusculus but broader and whorls more convex, with fourteen beaded girdles on the body whorl between the beaded umbilical border and the suture. White with pink spots. About one-fifth of an inch in height and diameter. Somewhat rare—West Coast, Hardwick Bay.

Tallorbis ampullus (Tate). A plump conical shell with a small narrow depression at centre of base. Whitish with red spots, about eight girdles on the large whorl and trellised between them. Barely half-inch either way. Uncommon—Corney Point.

Family Trochidae occupied nine meetings of the Club.

Family Turbinidae.

Genus *Phasianella* (Lam:). Shells elongated, polished, richly coloured; whorls convex; aperture oval, not pearly: inner lip callous, outer lip thin. Operculum or trap door, shelly, with a suggestion of a spiral on the inner face.

The foot of the animal appears to be divided longitudinally into halves, which advance alternately with an undulatory motion.

The larger species are found only in Southern Australian waters.

P. australis (Gmelin). The Pheasant-shell or Painted-Lady is common from Swan River to Victoria (Western Port) and Tasmania. No two specimens are exactly alike in colour and pattern. Shells in a cabinet are apt to become dull and lose their freshness: Mr. Edwardes, of the Shell Club, found that by first

smearing the shell with vaseline, dipping it, enclosed in a cloth, in boiling water, then removing the animal, left the shell bright and fresh as in life; the film of vaseline tending to prevent the multitudinous surface cracks which disfigure so many specimens. The largest Pheasant shell tabled was by Mr. Kimber, from Levens Beach, 97 mm, or nearly 4 inches.

P. kochi (Philippi). Small, pinkish, not very thin for its size, not very elevated, with white blotches on the upper part of each whorl. One-sixth of an inch. South-East Coast. Not common.

P. perdix (Wood). The body whorl occupies rather more than two-thirds of the entire height. (P. australis is about half). Also, there is not the same diversity of pattern as in the larger shell. $1\frac{3}{4}$ inches for the largest specimen. Fairly common Encounter Bay, and farther south.

P. rosea (Angas). Only about three whorls, yet somewhat elongated; the body whorl occupies about seven-eighths of the entire height, and the outer lip at its posterior extremity forms an obtuse angle with the descending body whorl. Pink to crimson. One-sixth of an inch. South-East only, in shell sand.

P. variegata (Lam:). Small, narrow, reticulated, and with lines of coloured and white spots spirally round the whorls—about twelve such lines on the body whorl and base. Colour mostly rose with white stripes. $\frac{3}{4}$ inch. Pt. Willunga and farther south. Fairly common.

P. virgo (Angas). Pink, flamed with white at the sutures, which are deep. Base, white flamed with brown. Whorls about three, swollen in the middle. One-sixth of an inch. Pt. MacDonnell, in shell sand. Not common.

Genus *Turbo* (Linne). Top-shaped shells, solid, whorls convex, smooth or often grooved or beaded. Mouth round, large, slightly drawn out in front. Operculum shelly and solid, the inner face horny and with a few spiral turns.

T. jourdani (Kiener). Our largest univalve. Very rare. Mr. Kimber's specimen was $3\frac{1}{2}$ inches by $3\frac{3}{4}$ inches. The specimen in the Museum is larger and worth a visit. Some of the members of the Club are delighted to possess even the central axis without the rest of the shell, not having anything better. Some of us have not that. Francis Island, Corney Point, Cape Borda, Wallaroo.

T. gruneri (Philippi). With transverse granular ribs, deeply channelled. Seventeen such ribs on the body whorl and base. The shell is not umbilicated, that is, no deep depression at the centre of the base. Pinkish-brown, mottled with a lighter tint. The aperture or mouth is two-thirds of the height. Height, $1\frac{1}{2}$ inches; greatest diameter, $1\frac{3}{4}$ inches. Ranges from Swan River to Bass Straits. Not common, but occasionally found on shell sand, Adelaide beaches.

T. stamineus (Martyn). A reef loving shell at Pt. Noarlunga and farther south; not often on beaches. Very deeply umbilicated; whorls four, are somewhat angulated at their greatest circumference, and coronated above near the suture or dividing line. Colour greyish. Height, $3\frac{1}{4}$ inches; diameter, a third greater.

T. undulatus (Martyn). The Warrener or periwinkle, and common on all coasts of South Australia. Smooth, bluish-green, with white zigzag streaks. Deeply umbilicated. Operculum solid, white, about five whorls, elliptical, outer surface grunulose (under a lens) shining, centre raised; inner surface flat. About two inches.

Genus Astrea (Bolten). A yellowish shell with diagonal ribs about $\frac{3}{4}$ inch in height and diameter and often found on the shell sand patches is *Astrea aurea*—a pearly shell somewhat like a small Trochus with the whorls flattened at the edge to a kind of flange, about the same size, is *Astrea fimbriata,* also found on the shell sand.

Family Liotiidae.

This was also included in the quarter's review. There are several genera and about thirty species, many of which are microscopic, taken from shell sand. A number are discoidal, or disc-shaped, that is to say, the apex of the spire is no higher than the mouth, like the well-known fossil Ammonites.

Members of the Club will exchange shells with foreign collectors.

F. K. GODFREY, Hon. Secretary.

ALTERATION OF PROGRAMME.

Members are notified that the trip to Mount Compass on October 8th will instead be to Basket Range. The charabanc fare has been fixed at 5s. per passenger. Members are asked to invite their friends for this outing. Seats will be reserved in order of booking. This is the only charabanc trip for the year.

EXCURSIONS.

Sept. 20—Mt. Lofty. Train at 2.14 p.m. Botany. Leader, Mr. E. H. Ising. Please note train time alteration.

Sept. 27—Waite Research Institute. 2 p.m. Take Fullarton tram to terminus.

Oct. 8—Basket Range, 9 a.m. Flinders Street. Charabanc seats are 5/- each and must be paid for at time of booking. Book with Mr. Beck in Cole's Book Arcade. Tea and sugar will be provided, but members bring their own lunch and milk. Members are asked to collect flowers for the Show and bring a bag or basket to put them in.

Oct. 18—The Knoll, Upper Sturt. Tram at 2.14 p.m. Botany. Leader, Mr. J. A. Hogan.

Nov. 1—Botanic Gardens, entrance at 2.30 p.m. Australian Flora. Mr. J. F. Bailey.

Nov. 15—Blackwood. Mr. E. Ashby's. Train at 2.14 p.m. Cultivated Native Flora. Leader, Mr. F. K. Godfrey.

EVENING MEETINGS.

On September 16 and November 18, the meetings will commence at 7.30 p.m. in the lower room, where the business items will be gone through, adjourning to the upper room in time to enable the lecture to begin promptly at 8 p.m.

LECTURES.

*Sept. 16—"Trees of Adelaide Plantations," by Mr. J. F. Bailey.

Oct. 21—Exhibit Evening. Mr. E. H. Ising. Members are to bring something of interest no matter how small.

*Nov. 18—"The Unknown Bali," by Sir W. J. Sowden.

* These lectures will be held in the Lecture Room, and will be illustrated by lantern slides.