Journal and Proceedings

OF

The Royal Society of Western Australia

PATRON: H.M. THE KING.

Volume I.

1914 - 1915.

Published August, 1915.

The Authors of Papers are alone responsible for the statements made and the opinions expressed therein.

Price: Five Shillings.

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President : Prof. W. J. Dakin, D.Sc., F.L.S., F.Z.S.
Vice-Presidents : Mr. A. Gibb Maitland, F.G.S. ; Mr. E. S. Simpson, B.E., F.C.S.
Hon. Secretary : Mr. M. A. Browne, B.A.
Hon. Treasurer : Mr. J. J. East.
Hon. Librarian : Mr. A. O. Watkins, A.R.S.M., F.G.S.
Members of Council : Mr. H. B. Curlewis, B.A., F.R.A.S. ; Mr. W. J. Hancock, M.I.C.E., M.I.E.E. ; Prof. A. D. Ross, M.A., D.Sc., F.R.S.E., F.R.A.S. ; Mr. B. H. Woodward, F.G.S., C.M.Z.S. ; Prof. W. G. Woolnough, D.Sc.
Editors of Journal : Mr. A. Gibb Maitland ; Prof. W. J. Dakin (to March, 2nd, 1914) ; Mr. M. A. Browne (from March 2nd, 1914).

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Patron : H.M. the King.
Vice-Patron : H.E. the Governor of Western Australia, Major-General Sir Harry Barron, K.C.M.G.
President : Prof. W. J. Dakin, D.Sc., F.L.S., F.Z.S.
Vice-Presidents : Mr. A. Gibb Maitland, F.G.S. ; Prof. A. D. Ross, M.A., D.Sc., F.R.S.E., F.R.A.S.
Hon. Secretary : Mr. M. A. Browne, B. A. (to August 11th, 1914) ; Mr. W. B. Alexander, M.A. (from August 11th, 1914).
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Members of Council : Mr. W. B. Alexander, M.A. (to August 11th, 1914) ; Mr. H. B. Curlewis, B.A., F.R.A.S. ; Mr. W. J. Hancock, M.I.C.E., M.I.E.E. ; Mr. A. Montgomery, M.A., F.G.S. ; Mr. E. S. Simpson, B.E., B.Sc., F.C.S. ; Mr. B. H. Woodward, F.G.S., C.M.Z.S. (from August 11th, 1914).
Editors of Journal : Mr. A. Gibb Maitland ; Mr. M. A. Browne (to October 13th, 1914) ; Mr. W. B. Alexander (from October 13th, 1914).

CORRESPONDENCE RELATING TO THE FOUNDATION OF THE ROYAL SOCIETY OF WESTERN AUSTRALIA.

The following motion was proposed by Mr. A. Gibb Maitland, F.G.S., and seconded by Mr. W. Catton Grasby, F.L.S., at a general meeting of the Natural History and Science Society of Western Australia, held on May 13, 1913:—"That the time has arrived for taking the necessary steps for altering the designation to 'The Royal Society of Western Australia,' and for obtaining the Royal assent thereto; and that the matter be left in the hands of the Council."

The resolution was carried.

Copy of a letter dated June 27, 1913, *addressed to His Excellency Major-General Sir Harry Barron, Governor of Western Australia.*

Sir,

By a resolution of the 13th day of May the Natural History and Science Society of Western Australia has decided that the time has arrived when this, the chief and oldest scientific society of the State, should take steps to obtain the Royal assent for the assumption of the title of "The Royal Society of Western Australia." The change of name would bring us into line with the other Royal Societies of the Commonwealth, which, by the results of their activity, have fully justified their existence and the dignity of their title. At the instance of the members of the Society a memorial has been drafted, which we now have the honour to place before you, with a respectful request that it be forwarded by Your Excellency to His Majesty the King, together with a bound copy of the last three numbers of the Society's Journal. Included in the same volume will be found a copy of the Rules and By-laws of the Society. At the present time the Society numbers 114 members. In recognition of the value of the Society's work the Government has for years past provided us with many facilities, in addition to securing for us an annual grant from Parliament. The claims of this Society to be placed on an equal footing with those of the other States of the Commonwealth are, we believe, stronger than ever before; and the foundation of a modern University in this State makes the present an appropriate time to apply for the Royal assent. We ask you to accept the duplicate copy, bound in red, of the Society's Journal, enclosed herewith, as a token of our respect, and as a record of the scientific work which is being carried on in this State.

We are,
Sir,
Your Excellency's obedient Servants,
(Signed) C. G. THORP,
President.

(Signed) MAURICE A. BROWNE,
Honorary Secretary.

Copy of a Memorial dated June 27, 1913, *addressed to the King's Most Excellent Majesty, Buckingham Palace, London.*

Sire,

Representing the Council and Members of the Natural History and Science Society of Western Australia, we, Your Majesty's loyal and obedient subjects, pray that you will be graciously pleased to permit the Society to assume the title of "The Royal Society of Western Australia," and, in addition, that Your Majesty will consent to become Patron of the Society—an honour which was accorded to the Royal Society of South Australia by Her Late Majesty, Queen Victoria. In petitioning these signal favours we beg to point out that the principal scientific societies of all the other States of the Commonwealth of Australia have received permission from the reigning Sovereign to assume the title of "Royal Society" of the respective States—Tasmania in 1843, Victoria in 1854, New South Wales in 1866, South Australia in 1879, and Queensland in 1885—and, further, that our own Society, like those of the other States, is, and has been, actively engaged in fostering the study of the natural sciences, and in publishing the results of original research since the year 1897.

We represent the collective scientific activity of the State, and number among our members the heads and staffs of various scientific Departments of the Government and many of the Professors of the newly founded State University. We are sending herewith a bound volume of the last three numbers of the Society's Journal, as evidence of the substantial contributions to the sum total of natural knowledge which have already been made within the State of Western Australia.

We remain,

With profoundest veneration,

Sire,

Your Majesty's most faithful Subjects and dutiful Servants,

(Signed) C. G. THORP,
President.

(Signed) MAURICE A. BROWNE,
Honorary Secretary.

Copy of a letter dated from Government House, Perth, on June 30, 1913, *and addressed to the Honorary Secretary of the Natural History and Science Society of Western Australia.*

Dear Sir,

I am desired by the Governor to acknowledge receipt of your letter dated 27th instant, transmitting a Memorial from the Members of the Natural History and Science Society of Western Australia to His Majesty the King, together with a bound copy of the last three numbers of the Society's Journal.

His Excellency wishes me also to express his grateful thanks for the duplicate copy of the Society's Journal, which he has perused with great interest.

Yours faithfully,

(Signed) H. CADELL,
Major,
Private Secretary.

Copy of a letter dated from Government House, Perth, on November 18*th,* 1913, *and addressed to the President of the Natural History and Science Society of Western Australia.*

Sir,

I am directed by His Excellency the Governor to inform you that His Majesty the King has been graciously pleased to accede to the application of the Natural History and Science Society of Western Australia for permission to assume the title "The Royal Society of Western Australia."

I have the honour to be,
Sir,
Your obedient Servant,

(Signed) H. F. WILKINSON,
Major,
Private Secretary.

Copy of a letter dated from Government House, Perth, on March 11th, 1914, and addressed to the President of the Royal Society of Western Australia.

Sir,

I am desired by His Excellency the Governor to inform you that a despatch has been received from the Secretary of State for the Colonies saying His Majesty the King is graciously pleased to become Patron of the Royal Society of Western Australia.

I have the honour to be,

Sir,

Your obedient Servant,

(Signed) H. F. WILKINSON,

Major,

Private Secretary.

RULES OF
THE ROYAL SOCIETY OF WESTERN AUSTRALIA.

Adopted March 10, 1914.

CONSTITUTION.

1. The Society shall be called The Royal Society of Western Australia.

2. The Royal Society of Western Australia is founded for the advancement of Science in all its branches.

3. The Society shall consist of members, who shall be classed as follows: (1) ordinary members (who may be life members); (2) honorary members; (3) corresponding members; (4) associate members; (5) student members.

RULES.

Management.

1. The General Management of the affairs of the Society together with the custody of its property, shall be vested in a Council, comprising a President, two Vice-Presidents, a Treasurer, a Secretary, a Librarian, the retiring President, and five other members.

2. All office-bearers and general members of Council shall be elected annually by ballot at the General Meeting of the Society, held in July.

3. It shall be the duty of the Council each year to prepare a list containing the names of members whom they recommend for election to the respective offices of President, Vice-Presidents, Secretary, Treasurer, and Librarian, together with the names of two other members whom they recommended for election as ordinary members of Council, and who have not been Council members for that year.

4. The names thus recommended shall be contained on a ballot paper, which shall be posted to members at least fourteen days before the day of the Annual Meeting. Additional nominations, duly proposed and seconded, must be lodged with the Secretary at least 24 hours before the meeting.

5. Any vacancies occurring amongst the office bearers or Council during the year shall be filled up by the Council.

Members.

6. Every candidate for admission as an ordinary member of the Society shall be proposed and recommended by three or more members of the Society, who shall at an Ordinary Meeting of the Society, cause to be delivered to the Secretary a nomination form,

signed by themselves, signifying the name, description and usual place of residence of such person, who must be known personally to at least one of the recommending members.

7. Every nomination form having been read at one of the Ordinary General Meetings, shall be posted in some common room of the Society, and the person thus recommended shall be balloted for at the next Ordinary General Meeting, after such reading.

8. No person shall be declared duly elected unless three-fourths of the number of members balloting shall vote in his favour.

9. Persons so elected shall have immediate notice thereof transmitted to them by the Secretary, accompanied by a copy of the Rules.

10. No candidate shall be deemed a member until his subscription for the current year be paid or the annual payments be compounded for. If any person elected as a member shall omit to pay the subscription (or composition in lieu thereof), within six months after the day of election, the Council shall have authority to declare such election void.

11. The annual subscription of every ordinary member shall be One Guinea, and the composition fee for life membership, £15 15s.

12. The annual subscription becomes due on the 1st July in every year, in advance, and is recoverable as debt due from the member to the Society. If any member shall be in arrears of his annual contribution for two years on the day of any Annual Meeting, he shall be apprised by letter that unless the amount due by him be paid before the end of the current year his name will be removed from the list of members.

Withdrawal and removal of Members.

13. No member shall be at liberty to withdraw from the Society without previously giving notice in writing to the Secretary of his intention to withdraw, and returning all books and other property of the Society in his possession. Retiring members shall be liable for payment of all subscriptions due to the Society.

14. The Council may, by a majority of seven of its members, remove or suspend any member of the Society, with or without assigning reasons for such action. But a member whose name has been removed from the Roll shall have a right of appeal to the Society. Notice of such appeal to the Society shall be sent by such member to the Secretary within four weeks of the removal of his name, and the appeal shall be considered by the Society at the next General or Special Meeting, a majority of votes recorded at such Meeting sufficing to confirm or annul the decision of the Council.

Privileges of Members.

15. Ordinary members have the right to be present and to vote at all General Meetings; to be eligible for election to a seat on the

Council; to be entitled to receive the publications of the Society; to propose candidates for admission as ordinary and associate members, and subject to the approval of the Librarian, to borrow any books, papers, manuscript, etc., belonging to the Society.

16. Ordinary members may introduce one visitor at any meeting, provided such visitor is not introduced at more than three meetings in one year.

Associate and Student Members.

17. Associate members shall have all the privileges of ordinary members, with the exception that they shall not have the right of voting, nor of eligibility for office, nor of proposing new members. They shall pay an annual subscription of half a guinea.

18. Student members shall be persons attending recognised science classes in Western Australia, who shall, on application to the Council, be elected by them. They shall be elected for the calendar year, and shall pay a subscription of 5s. Student members shall not be entitled to any privileges, except that of attending the Ordinary Meetings of the Society.

Honorary Members.

19. The honorary members of the Society shall be distinguished workers in science or zealous patrons thereof, and shall not exceed 25 in number.

20. Every person proposed as an honorary member shall be recommended by Council, and be elected and removed in the like form and manner, and be subject to the same rules and restrictions as ordinary members. He shall be entitled to all the privileges of membership except voting.

Corresponding Members.

21. The Corresponding members of the Society shall be constituted of such persons not resident in Western Australia, as may show a willingness to promote the objects of the Society, and shall be recommended and elected and be liable to be removed in like form and manner as ordinary members. The corresponding members shall be exempt from paying any subscription.

22. In cases of corresponding members taking up their residence in Western Australia, their privileges shall cease at the end of the current financial year. Provided that the corresponding member shall have the privilege of becoming an ordinary member without ballot on paying subscription or composition fee.

23. The corresponding members of the Society are required to keep the Secretary informed of their addresses, or of that of some agent in Western Australia, through whom communications may reach them.

President and Vice-Presidents.

24. The business of the President shall be to preside at all meetings of the Society and Council, and regulate all the proceedings therein; and generally to execute or see to the execution of the Rules and Orders of the Society. In the case of an equality of votes the President shall have a casting vote.

25. In case of the absence of the President from any of the meetings of the Society or Council, his place shall be filled by one of the Vice-Presidents, or in their absence, by a member of the Council then present, who shall, for the time being, have all the authority, privileges and power of the President. If no member of Council should be present at an Ordinary Meeting no business shall be transacted.

Treasurer and Accounts.

26. The Treasurer shall demand and receive for the use of the Society all moneys due or payable to the Society, and shall disburse all sums due by the Society, and shall keep full and particular account of all sums so received and disbursed.

27. All moneys received on the Society's behalf shall be paid into an account in the name of the Society in a Bank approved by the Council.

28. No moneys shall be drawn out of the said account except by cheque signed by the Treasurer, Secretary, and President, or any two of them, and all payments must first be authorised by the Council.

29. The accounts shall be made up at the end of every financial year, June 30, and be audited in the month of July by a committee of two, to be appointed at the Ordinary Meeting in June.

30. The Auditors shall have the power of calling for a statement of the debts, credits and assets of the Society, and for any information relative thereto.

31. The Committee of Auditors shall make their report to the Society at the Annual General Meeting.

Secretary.

32. The Secretary shall perform the following duties:—

(1) Conduct the correspondence of the Society and Council.

(2) Attend all meetings of the Society, and take minutes of the proceedings of such meetings. He shall also summon such meetings.

(3) Read aloud at the commencement of meetings of Council and Society the minutes of the previous meeting; read the nominations of candidates for admission to the Society; and read the lists of donations made to the Society.

(4) Keep a list of the attendances of the members of Council at Council meetings, in order that the same may be laid before the Society at the Annual General Meeting held in July.

Council.

33. The Council shall meet at such times as shall be appointed by the President, or in his absence by one of the Vice-Presidents, or Secretary, due and sufficient notice being previously sent to every member.

34. No business shall be transacted in Council unless there be four or more members present. Should any member fail to attend three consecutive Council meetings without satisfactory reason being given, his position shall be declared vacant.

35. The Council shall present and cause to be read to the Annual General Meeting a report on the general concerns of the Society for the preceding year, and such report shall be printed and transmitted to the members.

Ordinary General Meetings.

36. The Council may institute and enforce any by-laws necessary for the government of the Society, provided that such are not at variance with these Rules.

37. The Ordinary General Meetings of the Society, to be convened by public advertisement, shall take place at 8 p.m. on the second Tuesday in every month during the last ten months of every calendar year.

38. The ordinary course of proceedings at the General Meetings after the Chair has been taken, shall be as follows:—

(1) The minutes of the proceedings of the previous meeting.
(2) Correspondence.
(3) Communications from Council.
(4) Nominations for membership and election of members.
(5) Donations to be laid on the table and acknowledged.
(6) Any other formal or general business to be dealt with.
(7) Papers and exhibits.
(8) Discussions on the various papers and exhibits which have been brought before the meeting.

39. At the Ordinary General Meetings of the Society nothing relating to the regulations or management, except as regards the election of members, shall be brought forward, unless the same shall have been announced in the notice calling the meeting or be otherwise provided for in these Rules.

Annual General Meeting.

40. The course of Proceedings after the Chair has been taken shall be as follows:—

(1) Reading of the Minutes of the previous Annual Meeting.

(2) Reading of Nominations of Candidates for Council, appointment of Scrutineers, and opening of ballot.

(3) Presentation and discussion of the Auditors' Report.

(4) Presentation and discussion of the Council's Annual Report.

(5) Report of the Scrutineers on the result of the ballot.

(6) President's Address.

41. At the Annual or any General Meeting seven members shall constitute a quorum.

Contributions to the Society.

42. Every paper intended to be read before the Society, of whatever character, must be sent to the Honorary Secretary at least seven days before the date of the next ensuing Council meeting, to be laid before the Council. It will be the duty of the Council to decide whether such contribution shall be accepted, and whether it shall be read in full, in abstract, or taken as read. The Council may obtain an opinion as to the suitability of any paper from any person it may select for the purpose.

43. A Publication Committee, appointed by the Council, shall decide whether a paper presented to the Society shall be published in the Proceedings.

44. The original copy of every paper communicated to the Society, with its illustrations, shall become the property of the Society, unless stipulation be made to the contrary, and authors shall not be at liberty to publish their communicated papers elsewhere, prior to their appearance in the publications of the Society, unless permission be given by the Council for so doing.

PROCEEDINGS

OF

THE ROYAL SOCIETY OF WESTERN AUSTRALIA.

April 21, 1914.—Prof. W. J. Dakin, President, in the Chair. It was announced that His Majesty the King had graciously consented to become Patron of the Society. His Excellency the Governor, Sir Harry Barron, was unanimously elected Vice-Patron. Captain F. Johnston was elected an Ordinary Member and the Rev. E. R. Gribble an Associate.

Mr. M. A. Browne laid upon the table a paper entitled "The Approximate Summation of Series in which each Term is a Function of the Corresponding Term of an Arithmetical Progression." Mr. W. B. Alexander read a paper entitled "On a Stomatopod new to Australia, with a list of the Western Australian species of the Order," and exhibited specimens of the species referred to.

Mr. E. S. Simpson exhibited specimens of molybdenite from near Swan View. Prof. A. D. Ross exhibited several meteorites, rough and in section. Mr. W. D. Campbell exhibited a set of "Napier's bones," spiders from Mingenew, and objects of ethnological interest from the Pacific Islands.

May 12, 1914.—Prof. W. J. Dakin, President, in the Chair. Mr. T. Blatchford, B.A., and Mr. H. W. B. Talbot were elected Ordinary Members. Prof. A. D. Ross delivered a lecture on "Artificial Lighting—Past, Present, and Future."

June 9, 1914.—Prof. W. J. Dakin, President, in the Chair. Mr. J. T. Jutson was elected an Ordinary Member, and Miss M. C. Jolly, M.A., an Associate. The President delivered his Anniversary Address on the subject of "Marine Biology in Western Australia." After the address the President and Mrs. Dakin held an informal reception.

July 14, 1914.—Annual Business Meeting. Prof. W. J. Dakin, President, in the Chair. Mr. E. de C. Clarke, M.A., Mr. C. S. Honman, B.M.E., Mrs. C. M. G. Dakin, B.Sc., Mrs. A. D. Ross, B.Sc., and Mr. R. H. B. Downes were elected Ordinary Members, and Miss E. Conning an Associate.

The President announced some facts about Peripatus which had been learnt since his communication in August, 1913.

The Statement of Receipts and Expenditure for the year ended June 30, 1914, duly audited, was read and adopted.

The Council's Annual Report for the same period was read by the Secretary and adopted.

The election of officers for the ensuing year was carried out.

ANNUAL REPORT OF THE ROYAL SOCIETY OF WESTERN AUSTRALIA FOR THE SESSION 1913-14.

Ladies and Gentlemen,—

Your Council begs to submit the Annual Report and Financial Statement for the year ended 30th June, 1914.

As stated in the last Annual Report, steps were taken to obtain the assent of His Majesty the King to a change of title from "The Natural History and Science Society of Western Australia" to that of "The Royal Society of Western Australia." In November, 1913, the Royal assent was received, and on 10th March, 1914, a new set of rules was adopted by a general meeting of members and the change of title formally made. Resolutions carried at the same meeting provided for the continuity of membership and finances, so that the records of the last months of the old Society and the first few months of the new one may fitly be dealt with in a single report.

The movement to found a Royal Society in Western Australia dates back many years, and the Council feels it a matter of congratulation that the Society has at length come into line with those of the other States. It remains to add that in March, 1914, notification was received from His Excellency the Governor that His Majesty the King had graciously consented to become Patron of the Society, while in the following month His Excellency Major-General Sir Harry Barron was elected Vice-Patron.

The Society's credit balance, which stood at £5 6s. 1d. at the beginning of the financial year, is now £19 2s. 1d. At the beginning of the year there was an unpaid account for printing of £31 11s. 11d., while at its close there are no outstanding accounts. To a timely and generous grant by the Government of £50, obtained at the instance of Mr. Walter Dwyer, M.L.A., the Parliamentary representative of Perth, this satisfactory position is mainly due.

The number of members on the roll is 112, and until these are definitely classified under the new Rules they may be grouped as paying members 104 and honorary members 8. Dr. Alex. Morrison, one of the honorary members, died in December, 1913. His admirable work in botany and his devotion to the Society from its early days, both during and after his tenure of the position of Government Botanist of Western Australia, render his death, at a time when his scientific capacities were still unimpaired, deeply regrettable. Twelve ordinary members resigned from the Society, one died, and twelve new members were elected.

The Council has met 13 times during the year. At the first meeting of the new Council Professor W. J. Dakin and Mr. A. Gibb Maitland were appointed Editors of the Journal, and Mr. M. A.

Browne, the Secretary, was appointed to act as Librarian. Subsequently Professor Dakin retired from the office of co-Editor, and Mr. Browne was elected in his place.

The practice has been inaugurated of going into recess during the hot months of January and February. In the course of the last twelve months 10 general meetings, besides the Annual Meeting, were held. The following papers were delivered before the Natural History and Science Society:—"A Contribution to the Study of Australites," being the presidential address of Dr. C. G. Thorp for 1912-13; "The Onychophora of Western Australia," by Professor W. J. Dakin; "Aquatic Animals from Hannan's Lake, Kalgoorlie," and "A History of Zoology in Western Australia," in two parts, by Mr. W. B. Alexander; the third part of Dr. Michaelsen's "Fauna of the South-West"; "The Foundation Stones of Western Australia: An Early Chapter in the Geological History of the State," by Mr. A. Gibb Maitland; "Time and its Measurement," by Professor A. D. Ross, and "A Theory of the Method of Formation of Australites," by Dr. C. G. Thorp; while the following papers were delivered before the Royal Society:—"The Approximate Summation of Series in which each Term is a Function of the Corresponding Term of an Arithmetical Progression," by Mr. M. A. Browne; "Artificial Lighting—Past, Present, and Future," by Professor A. D. Ross, and "Marine Biology in Western Australia," being the presidential address of Professor W. J. Dakin for the year 1913-14.

During the year there were excursions to Gooseberry Hill (led by Professor Dakin) and to Swan View (by Mr. Simpson), a dredging and tow-netting expedition (arranged and conducted by Professor Dakin), and visits to the new automatic telephone exchange (introduced by Mr. Hancock) and to the Royal Mint (by Mr. Watkins).

Presentations to the Society include 14 scientific books and several of the early and scarce numbers of the Society's *Journal,* by Dr. Frank Tratman; early numbers of the Mueller Botanic Society's Journal, by Miss Creeth, and books on metallurgy and chemistry by the Deputy Master of the Mint.

The last volume of the *Journal of the Natural History and Science Society* is almost ready for the printer. It will be succeeded by the *Proceedings of the Royal Society.*

(Signed) W. J. DAKIN,
President.

(Signed) MAURICE A. BROWNE,
Honorary Secretary.

STATEMENT OF RECEIPTS AND EXPENDITURE FOR THE YEAR ENDED JUNE 30, 1914.

Receipts.

	£	s.	d.	£	s.	d.
To Balance in Bank		..		5	6	1
Members' Subscriptions (Nat. Hist. and Science Soc. of W.A.)—						
43 Full Members at 10s. 6d.	22	11	6			
1 Full Member, balance of year's payment	0	9	0			
8 Full Members, arrears at 10s. 6d.	4	4	0			
2 Junior Members, at 5s.	0	10	0			
1 Full Member, in advance for 1914-15	0	10	0			
				28	4	6
Advance Subscriptions (Royal Society of W.A) for 1914-15—						
4 Ordinary Members, at 21s. ..	4	4	0			
2 Associate Members, at 10s. 6d. ..	1	1	0			
1 Student Member, at 5s.	0	5	0			
				5	10	0
Other Receipts—						
Government Grant	50	0	0			
Journals and Authors' Papers ..	1	11	0			
Savings Bank interest	0	6	0			
				51	17	0
				£90	17	7

Expenditure.

	£	s.	d.	£	s.	d.
By Rent	18	0	0			
Printing and Stationery	45	14	2			
Petty Cash Payments	8	0	4			
Bank Charges	0	1	0			
				71	15	6
Balance in Savings Bank		..		19	2	1
				£90	17	7

(Signed) J. J. EAST,
Hon. Treasurer.

Audited and found correct.
(Signed) Edward S. Simpson.
Alex. J. Robertson.

15th July, 1914.

Aug. 11, 1914.—Mr. H. B. Curlewis, Member of Council, in the Chair. Mr. M. A. Browne resigned the position of Secretary on leaving Perth and Mr. W. B. Alexander was appointed to fill his post. Mr. F. E. Allum and Miss E. Allum were elected Ordinary Members.

Mrs. A. D. Ross read a paper entitled "The Geographical Basis of Nationality."

Sept. 8, 1914.—Prof. W. J. Dakin, President, in the Chair. Miss F. M. Jewell, B.Sc., and Prof. J. Paterson, Ph.D., B.Sc., were elected Ordinary Members.

Prof. A. D. Ross delivered a lecture on "John Napier of Murchison" in celebration of the tercentenary of the birth of the inventor of logarithms.

Oct. 13, 1914.—Prof. W. J. Dakin, President, in the Chair. Mr. F. R. Feldtmann was elected an Ordinary Member. The President exhibited specimens of the common freshwater shrimp of S.W. Australia, which proves to belong to the genus Palaemonetes, not previously recorded from Australia. Mr. H. B. Curlewis lectured on "The Tides; with special reference to those of Fremantle and Port Hedland."

Nov. 10, 1914.—Mr. A. Gibb Maitland, Vice-President, in the Chair. Dr. D. D. Paton, M.A., M.B., Ch.B., D.O., was elected an Ordinary Member. Mr. E. Kidson gave an account of Terrestrial Magnetism and the Magnetic Survey of the World at present being carried out by the Carnegie Institution of Washington.

Dec. 8, 1914.—Conversazione. The following exhibits were on view:—

Section of Mt. Edith Meteorite; Exhibit showing methods used in determining the commercial applicability of clays; Mr. E. S. Simpson.

Rock slices (microscope); Mr. Farquharson.

Chinese wood-carvings; Mr. Creeth.

Kangaroo embryos; Mr. Allum.

Bolas from Patagonia; Wheats raised from crossing "Federation" x "Huguenot" and fixed by Mendelian methods; Mr. Catton Grasby.

Model of Seismograph; Earthquake records; Mr. Curlewis.

Copper and Brass-work from India, etc.; Miss Creeth.

Butterflies from N.W. Australia; Giant Crab from Rottnest; Mr. Alexander.

Geological Photos.; Mr. A. Gibb Maitland.

Harmonograph (in motion) and curves produced by it; Prof. Ross.

X-ray Photos. of the Interior of an Instrument; Mr. Hancock.

Minerals; Mr. East.

Refreshments were provided by a special committee.

March 9, 1915.—Mr. E. S. Simpson, Member of Council, in the Chair. A letter from the Colonial Treasurer announced that he could not give a grant to the Society this year. Vol. 5 of the *Journal of the W.A. Natural History and Science Society* was published. Mr. East delivered an address on "The Possibility of Predicting the Australian Seasons."*

April 13, 1915.—Prof. W. J. Dakin, President, in the Chair. The following motion was carried: "The Members of the Royal Society of Western Australia feel that a popular work on the commoner wild flowers of the State would be of scientific and educational value and are glad to learn that Mr. O. H. Sargent is preparing a volume on the subject. They will be glad to assist him in this undertaking by forwarding specimens." Mr. Simpson contributed a paper by himself and Mr. M. A. Browne entitled "Natrojarosite from Kundip, Phillips River Goldfield." Mr. Alexander read a paper entitled "Further notes on Western Australian Stomatopods," and exhibited the specimens referred to. Mr. H. B. Curlewis showed some views of Sunspots, and made some remarks on their possible influence on the weather. Mr. Campbell read a paper on "The Natives of Sunday Island, King Sound," and exhibited weapons and ornaments made by them.

May 11, 1915.—Prof. W. J. Dakin, President, in the Chair. Mr. Alexander exhibited a lizard, *Lygosoma taeniolatum,* from Collie, and remarked that the species had not been recorded previously from this State. He also exhibited specimens illustrating the stages and methods of manufacture of stone arrow-heads by the natives of Port George IV., Hanover Bay. Prof. Dakin exhibited a stick-insect. Mr. R. H. B. Downes read a paper on "Architecture: its History as a guide to future development." †

June 8, 1915.—Prof. W. J. Dakin, President, in the Chair. Rev. D. T. Whalley was elected an Ordinary Member. Mr. F. E. Allum and Mr. R. H. B. Downes were appointed to audit the Treasurer's accounts and report to the next meeting. Mr. W. B. Alexander laid on the table a short paper entitled "Note on the Birds met with on the Swan River by Vlamingh in 1697." Prof. Dakin delivered his Presidential Address for the session 1914-1915, on the subject of "The Philosophy of Vitalism in Modern Biology," Light refreshments were provided by the kindness of the President and Mrs. Dakin at the close of the meeting.

July 13, 1915.—Annual Business Meeting. Prof. W. J. Dakin, President, in the Chair. Papers by Mr. W. B. Alexander entitled "The History of Zoology in Western Australia, Part 2, 1791-1829," and by Mr. C. Hedley entitled "A Preliminary Index of the Mollusca of Western Australia," were received, and part of the former was read by the author. Prof. A. D. Ross and Mr. A. Montgomery were appointed scrutineers of the ballot for officers for the ensuing year. Mr. B. H. Woodward, F.G.S., C.M.Z.S., was elected an Honorary

* See *West Australian,* March 23, 1915. † See *West Australian,* May 17, 1915.

Member; Dr. A. Webster, Mr. C. G. Hamilton, and Mr. F. B. Creeth Ordinary Members; and Mrs. Creeth an Associate.

The Statement of Receipts and Expenditure for the year ended June 30, 1915, duly audited, was read and adopted. The Council's Annual Report for the same period was read by the Secretary and adopted.

Mr. H. B. Curlewis exhibited a tide-curve for Port Hedland drawn from values calculated at the Observatory.

The result of the ballot was announced. The following officers were elected:—

President: Mr. A. Gibb Maitland, F.G.S.

Vice-Presidents: Prof. A. D. Ross, M.A., D.Sc., F.R.S.E., F.R.A.S., and Mr. A. Montgomery, M.A., F.G.S.

Hon. Secretary: Mr. W. B. Alexander, M.A.

Hon. Treasurer: Mr. F. E. Allum.

Hon. Librarian: Mr. A. O. Watkins, A.R.S.M., F.G.S.

Members of Council: Mr. E. S. Simpson, B.E., B.Sc., F.C.S.; Mr. W. J. Hancock, M.I.C.E., M.I.E.E.; Mr. G. L. Sutton; Dr. F. Stoward, D.Sc., and Mr. H. B. Curlewis, B.A., F.R.A.S.

Prof. Dakin vacated the chair in favour of the new President. A vote of thanks to the retiring President and Council was moved by Mr. G. L. Sutton, seconded by Mr. R. H. B. Downes, and carried. Prof. Dakin responded.

Mr. A. Gibb Maitland expressed his thanks for his election to the position of President.

ANNUAL REPORT OF THE ROYAL SOCIETY OF WESTERN AUSTRALIA FOR THE SESSION 1914-1915.

Ladies and Gentlemen,—

Your Council beg to submit the Annual Report and Financial Statement for the year ended June 30, 1915. The Society's credit balance, which stood at £19 2s. 1d. at the beginning of the financial year, is now 3s. 2d., with an outstanding account of £21 due to Messrs. V. K. Jones for printing. This results from the fact that the Government were unable to make any grant to the Society this year. The Government Printer has, however, been authorised to print the Society's *Journal* for the year 1914-15 free of charge, and this concession will allow the Society to recover its financial stability as soon as the subscriptions which became due on July 1st have been received.

The number of members on the roll is now 85, of whom 12 ordinary members and one associate have been elected during the year. Five associates have resigned their membership, and the list is further diminished by the fact that several members of the pre-existing Natural History and Science Society have failed to register themselves as members of the Royal Society.

Of the 85 members, eight are honorary members, 47 ordinary members, 29 associates, and one a student member.

The Council has met 11 times during the year, and the attendance of its members has been as follows:—Mr. Watkins, 10; Mr. East, Mr. Simpson, Mr. Alexander, 9; Mr. Curlewis, Mr. Hancock, 8; Mr. Montgomery, Prof. Ross, 7; Prof. Dakin, 6; Mr. Gibb Maitland, 4; Mr. Woodward, 3 (out of 4).

At the first meeting of the Council Mr. M. A. Browne tendered his resignation as Hon. Secretary as he was leaving Perth. This was accepted with regret and it was decided that an expression of the Council's appreciation of the many services rendered by Mr. Browne to the Society should be placed on record in the minutes and conveyed to Mr. Browne. Mr. W. B. Alexander was appointed Hon. Secretary and Mr. B. H. Woodward elected to the Council to fill the vacancy thus caused. Mr. E. S. Simpson agreed to act as Secretary until Mr. Alexander returned to the State. On October 13th Mr. Alexander was appointed to fill Mr. Browne's position as co-editor of the *Journal*. On December 10th Mr. Woodward was granted leave of absence for the rest of the financial year.

Nine general meetings have been held during the year at which 13 papers, in addition to the Presidential Address, were read or laid upon the table. The meeting of December 8th took the form of a conversazione, at which 11 members and one visitor had exhibits on view and refreshments were kindly provided by some of the members. This innovation proved a great success, and it is hoped that a similar exhibition may become an annual feature of the Society's work.

Several members of the Society were privileged to join in the excursions arranged for the visiting members of the British Association in July and August. Prof. Dakin also conducted an excursion to the zigzag on the slopes of Gooseberry Hill.

The list of Societies and Institutions which forward copies of their publications in exchange for the Society's *Journals* has been considerably increased during the year, and as soon as funds are available further bookshelves will have to be provided. A large number of pamphlets and parts of journals also require binding. The most important donation to the library was a gift of numerous books and journals made by Mr. W. D. Campbell.

Volume 5 of the *Journal of the Natural History and Science Society of Western Australia* was published in March at a cost of £69 5s. 1½d. Most of the manuscripts for the First Volume of the Royal Society's Proceedings are now in the hands of the Government Printer, and it is hoped that this will shortly be ready for distribution to members.

(Signed) W. J. DAKIN,
President.

(Signed) W. B. ALEXANDER,
Honorary Secretary.

July 1, 1915.

STATEMENT OF RECEIPTS AND EXPENDITURE FOR THE YEAR ENDED JUNE 30th, 1915.

Receipts.

	£	s.	d.	£	s.	d.
July 1, 1914, Balance in Savings Bank ..	..			19	2	1
Subscriptions—						
For Year 1914-15	53	11	0			
Arrears	3	13	6			
	57	4	6			
Sales of Society's Annual Journal, and other receipts	3	10	8			
				60	15	2
				£79	17	3

Expenditure.

	£	s.	d.	£	s.	d.	£	s.	d.
Rent				18	0	0			
Printing and Stationery				52	3	3			
Petty Cash Payments				8	5	4			
Bank Charges				0	1	0			
Balance in Bank	0	3	2						
Petty Cash in Secretary's hands	1	4	6						
				1	7	8			
							£79	17	3

Memorandum.—At the end of the financial year there remained a debt due to V. K. Jones & Co. of £21, against which there is a cash balance of £1 7s. 8d., and certain arrears of subscriptions, the practical value of which is at present indeterminate.

(Signed) F. E. ALLUM,
R. H. B. DOWNES,
Auditors.

July 10, 1915.

LIST OF MEMBERS : JULY 1, 1915.

HONORARY MEMBERS.

Cooke, Prof. W. E., M.A., F.R.A.S., the Observatory, Sydney, New South Wales.

Diels, Dr. L., University of Berlin, Germany.

Forrest, Rt. Hon. Sir John, G.C.M.G., P.C., F.R.G.S., Federal Parliament House, Melbourne, Victoria.

French, C., F.L.S., F.R.H.S., Government Entomologist, Melbourne, Victoria.

Maiden, J. H., F.L.S., Government Botanist, Sydney, New South Wales.

Milligan, A. W., c/o. Royal Australasian Ornithologists' Union, Melbourne, Victoria.

Pritzel, Dr. E.

ORDINARY MEMBERS.

Alder, Miss, State School, James Street, Perth.
Alexander, W. B., M.A., W.A. Museum, Perth.
Allum, Miss E., Forrest House, Perth.
Allum, F. E., Royal Mint, Perth.

Blatchford, T., B.A., Geological Survey, Perth.
Browne, M. A., B.A., Government Smelter, Ravensthorpe.

Clarke, E. de C., M.A., Geological Survey, Perth.
Creeth, Miss M. E., 59 Bagot Road, Subiaco.
Curlewis, H. B., B.A., F.R.A.S., The Observatory, Perth.

Dakin, Prof. W. J., D.Sc., F.L.S., F.Z.S., The University, Perth.
Dakin, Mrs., B.Sc., Suburban Road, South Perth.
Downes, R. H. B., 4 Outram Street, West Perth.

East, J. J., 21 Colin Street, West Perth.

Feldtmann, F. R., Geological Survey, Perth.

Grasby, W. Catton, F.L.S., "West Australian" Chambers, Perth.

Hackett, Hon. Sir. J. Winthrop, K.C.M.G., LL.D., M.A., M.L.C., "West Australian," Perth.
Hall, A. J., State School, Osborne Park.
Hancock, W. J., M.I.C.E., M.I.E.E., Public Works Department, Perth.
Hancock, Mrs., Prince's Buildings, Perth.
Holmes, H. D., Western Australian Bank, Perth.
Honman, C. S., B.M.E., Geological Survey, Perth.

Jewell, Miss F. M., B.Sc., Perth College, Bellevue Terrace, West Perth.
Johnson, Miss E., Glen Lyn, Shenton Road, Claremont.
Johnston, Capt. F., Wyndham.
Jutson, J. T., Geological Survey, Perth.

Maitland, A. Gibb, F.G.S., Geological Survey, and 3 Ventnor Avenue, Perth.
Maitland, Mrs., 3 Ventnor Avenue, West Perth.
Male, A., M.L.A., Parliament House, and 10 King's Park Road, Perth.
McMillan, Hon. Chief Justice, R. F., Supreme Court, Perth.
Montgomery, A., M.A., F.G.S., Mines Department, Perth.
Montgomery, Mrs., 30 Richardson Street, West Perth.

LIST OF MEMBERS—*continued.*

ORDINARY MEMBERS—*continued.*

NEWMAN, L. J., F.E.S., Department of Agriculture, Perth.

PATON, D. D., M.A., M.B., Ch.B., D.O., St. George's Terrace, Perth.
PERRY, B., Kenny Street, West Guildford.

RILEY, Most. Rev. C. O. L., D.D., Lord Archbishop of Perth.
ROSS, Prof. A. D., M.A., D.Sc., F.R.S.E., F.R.A.S., The University, Perth.
ROSS, Mrs., B.Sc., Palace Court, Perth.
ROWLEY, H., F.C.S., 39 Barrack Street, Perth.

SHELTON, Mrs., 138 Hamersley Road, Subiaco.
SIMPSON, E. S., B.E., B.Sc., F.C.S., Geological Survey Laboratory, Perth.
STOREY, J. G., 358 Hay Street, Subiaco.
STOWARD, F., D.Sc., Department of Agriculture, Perth.
SUTTON, G. L., Department of Agriculture, Perth.

TALBOT, H. W. B., Geological Survey, Perth.
THOMAS, W. C., Millar's Timber and Trading Co., Perth.
THORP, C. G., M.B., The Residency, Onslow.

WATKINS, A. O., A.R.S.M., F.G.S., Royal Mint, Perth.
WHALLEY, Rev. D. T., Congregational Manse, Bunbury.
WILSMORE, Prof. N. T. M., D.Sc., The University, Perth.
WOOD, J. A., State School, Australind.
WOODWARD, B. H., F.G.S., C.M.Z.S., Harvey.

ASSOCIATE MEMBERS.*

ALLEN, F. B., M.A., B.Sc., Technical School, Perth.

BELL, W. G., B.Sc., 57 St. George's Terrace, Perth.
BIRD, Mrs. A. M., The Old Farm, Albany.

CAMPBELL, W. D., A.K.C., F.G.S., A.M.I.C.E., Richardson Street, South Perth.
CLELAND, Dr. J. Burton, Bureau of Microbiology, Sydney, New South Wales.
CONNING, Miss E., 53 Rose Street, Subiaco.

DAVY, Miss M., 86 Thomas Street, Perth.

EDWARDS, S. S., 170 Brisbane Street, Perth.

FARQUHARSON, R.A., M.A., M.Sc., A.O.S.U., F.G.S., Geological Survey, Perth.

GRIBBLE, Rev. E. R., Wyndham.

HARDY, G. H., Tasmanian Museum, Hobart, Tasmania.

JOLLY, Miss M. C., M.A., Modern School, Subiaco.

LAPSLEY, R., Fire Station, Perth.
LAWRENCE, F. G., c/o. L. Samson & Son, Cliff Street, Fremantle.
LE MESURIER, C. J. R., T. and G. Chambers, Perth.

* Including those who have not signified their intention of becoming Ordinary Members.

LIST OF MEMBERS—*continued.*

* ASSOCIATE MEMBERS—*continued.*

LESOUEF, E. A., B. Vet. Sc., Zoological Gardens, South Perth.
LIPFERT, O., W.A. Museum, Perth.
LOWE, Miss, Perth Central Girls' School.
LOVEGROVE, F., M.B., Tambellup.

OLLEY, J., State School, Peringellup.

RAWSON, V. S., Explosives and Analytical Department, Perth.
ROBERTSON, A. J., M.Sc., Geological Survey Laboratory, Perth.

SHELTON, Miss K., 138 Hamersley Road, Subiaco.
SIMPSON, Mrs., 61 Mount Street, Perth.
STEEDMAN, H., Suburban Road, Victoria Park.

WAKEFIELD, F. W., Department of Agriculture, Perth.
WHITFELD, Prof. H. E., B.A., B.E., The University, Perth.

Changes of address or other alterations should be notified to the Secretary "West Australian" Chambers, Perth.

* Including those who have not signified their intention of becoming Ordinary Members.

OBITUARY:

MR. RICHARD HELMS.

By the death of Mr. Richard Helms, which occurred at Sydney on July 17th, 1914, Australian Science has lost a versatile and enthusiastic worker in many branches, and the Royal Society of Western Australia one of its few honorary members.

Richard Helms was born at Altona, in Holstein, on December 12th, 1842, and arrived in Australia in 1858. At different periods of his life he resided at Melbourne, Sydney, and Perth, as well as in several New Zealand cities, and he was in turn a tobacconist, a dentist, a watchmaker, and finally an experimentalist in the Department of Agriculture of New South Wales.

For a review of his scientific work in other portions of Australasia the reader should refer to the account of him contained in the Presidential Address delivered to the Royal Society of New South Wales on May 5, 1915, by Mr. Charles Hedley, from which the foregoing particulars are taken.

He first visited Western Australia as naturalist to the Elder Exploring Expedition which entered the State from South Australia on July 18, 1891, in the neighbourhood of Blyth Range, from which, after visiting the Cavanagh and Barrow Ranges, it crossed the Great Victoria Desert to Queen Victoria Spring and Fraser's Range. From Fraser's Range the party travelled to Southern Cross and thence northward to the Murchison, where the expedition was dissolved in January, 1892.

The collections made by Helms on this expedition are our chief source of knowledge as to the fauna of the dry interior regions of Western Australia, and he added considerably to our knowledge of their flora. These collections are described by various specialists in the transactions of the Royal Society of South Australia, vol. XVI.; Helms himself contributing a valuable account of the natives of the several tribes met with, notes on whom he had taken during the journey in the intervals of his work as collector.

From 1896 to 1900 he was in Western Australia as Biologist to the Department of Agriculture. During this period he published a number of papers on subjects connected with the work on which he was engaged, of which the following is a list—

Apiculture: The Honey Bee (3 articles); Foul Brood or Bee Pest.

Animal Parasites: The Fowl Tick; The Common Bot-fly of the Horse; The Parasites of the Sheep (external and internal); A Horse-Bot new to the Southern Hemisphere; The Cattle Tick; The Camel Tick; The Bot-flies of Cattle; The Camel Bot; Parasites of Poultry (external and internal); Horse-Bots; On the Synonymy of Ticks.

Laboratory Notes: The Lesser Wax-Moth, etc.

Noxious Weeds: The Bathurst Bur; Stinkwort; Dodder.

Plant Diseases: Ear Cockle in Wheat; Potato Scab; "Take-All."

Useful and Noxious Birds: The House Sparrow; The Starling; The Goat-Suckers.

A Proposal for the Acclimatisation of a few Insectivorous Animals.

From June to October, 1896, Mr. Helms visited the neighbourhood of Wyndham with the special object of investigating cattle-ticks. A report on this subject was written by him, as well as an article in three parts entitled "East Kimberley," which probably gives the best account of the geology, climate, fauna and flora of the neighbourhood of Wyndham which has yet appeared.

In 1897 he made a trip to the Houtman's Abrolhos, on which he read a paper to the Mueller Botanic Society on June 6, 1898, which was subsequently published by the Department of Agriculture. This is the best and most comprehensive account of that interesting group of islands which has appeared at present.

A note in the Journal of the Department for January, 1900, records the fact that the Department had sustained a severe loss in the departure of Mr. R. Helms.

Mr. Helms was an enthusiastic member of the Mueller Botanic Society, inaugurated on July 1st, 1897, and was elected Vice-President. Two lectures on Entomology given by him were printed in the Society's Journal, and after his removal to Sydney he was elected an Honorary Member.

A collection of plants made by Mr. Helms is incorporated in the Herbarium of the Department of Agriculture, whilst his collection of birds' eggs is in the Western Australian Museum.

W.B.A.

LIST OF SOCIETIES AND INSTITUTIONS WHOSE PUBLICATIONS HAVE BEEN RECEIVED.

Australia—

Geological Survey of Western Australia.
Western Australian Museum and Art Gallery.
Royal Society of South Australia.
Department of Agriculture of Victoria.
Field Naturalist's Club of Victoria.
National Herbarium of Victoria.
National Museum, Melbourne.
Royal Society of Victoria.
Commonwealth Bureau of Census and Statistics, Melbourne.
Department of External Affairs, Melbourne.
Royal Australasian Ornithologists' Union.
Field Naturalists' Club of Tasmania.
Royal Society of Tasmania.
Technological Museum, Sydney.
Botanic Gardens, Sydney.
Royal Society of New South Wales.
Australian Museum, Sydney.
Royal Zoological Society of New South Wales.
Government Bureau of Microbiology, Sydney.
Naturalists' Society of New South Wales.
Public Health Department of New South Wales.
Botanic Gardens, Brisbane.
Royal Society of Queensland.

Asia—

Botanical Survey of India.
Department of Public Instruction, Assam.

Europe—

Royal Botanic Gardens, Kew.
Royal Colonial Institute.
Museum National d'Histoire Naturelle, Paris.
Societé Royale de Botanique de Belgique.

America—

Royal Society of Canada.
United States Department of Agriculture.
United States Geological Survey.
Academy of Natural Sciences of Philadelphia.
University of Minnesota.
University of Nebraska.
Field Museum of Natural History, Chicago.
Lloyd Library, Cincinnati.
John Crerar Library.
American Association for International Conciliation, New York.

THE JOURNAL

OF

THE ROYAL SOCIETY

OF

WESTERN AUSTRALIA.

VOL. I.

THE APPROXIMATE SUMMATION OF SERIES, IN WHICH EACH TERM IS A FUNCTION OF THE CORRESPONDING TERM OF AN ARITHMETICAL PROGRESSION.

By

Maurice A. Browne, B.A.

(Read April 21st, 1914.)

Harmonical Progressions.

The height of a column of air of unit cross section may be shown, by the integral calculus or otherwise, to be equal to K. log $\frac{P}{P'}$, where P is the pressure at the bottom, P' the pressure at the top, and K a constant. But the same height may be expressed as the sum of the heights of n short columns of air of equal mass. If the weight of each is w the pressures at the centres of the sections will be approximately $P-\frac{1}{2}w$, $P-\frac{3}{2}w$, etc., and by Boyle's Law their heights will be :—

$$\frac{C}{P-\frac{1}{2}w}, \quad \frac{C}{P-\frac{3}{2}w}, \quad \ldots\ldots \quad \frac{C}{P-(n-\frac{1}{2})w},$$

where C is another constant. The sum of these heights is the total height.

$$\therefore \frac{C}{P-\frac{1}{2}w} + \frac{C}{P-\frac{3}{2}w} + \ldots + \frac{C}{P-(n-\frac{1}{2})w} = \text{K}.\log\frac{P}{P-nw}$$

$$\text{or, } \frac{1}{P-\frac{1}{2}w} + \frac{1}{P-\frac{3}{2}w} + \ldots + \frac{1}{P-(n-\frac{1}{2})w} = \frac{\text{K}}{\text{C}}.\log\frac{P}{P-nw}$$

Putting $n = 1$ we have :—

$$\frac{1}{P-\frac{1}{2}w} = \frac{K}{C}.\log\frac{P}{P-w}$$

$$\therefore\quad \frac{K}{C} = \frac{1}{P-\frac{1}{2}w}.\frac{1}{\log\dfrac{P}{P-w}}$$

$$\therefore\quad \frac{1}{P-\frac{1}{2}w} + \frac{1}{P-\frac{3}{2}w} + \ldots + \frac{1}{P-(n-\frac{1}{2})w}$$

$$= \frac{1}{P-\frac{1}{2}w}\cdot\frac{\log\dfrac{P}{P-nw}}{\log\dfrac{P}{P-w}}$$

Putting $P - (n - \frac{1}{2})\,w = A$, and writing the series the other way about :—

$$\frac{1}{A} + \frac{1}{A+w} + \ldots\ldots + \frac{1}{A+(n-1)\,w}$$

$$= \frac{\dfrac{A+(n-\frac{1}{2})\,w}{A-\frac{1}{2}w}}{\{A+(n-1)\,w\}\cdot\log\dfrac{A+(n-\frac{1}{2})\,w}{A+(n-\frac{3}{2})\,w}}\qquad \text{FORMULA I.}$$

The best results are obtained when A is much greater than w. An empirical variation of Formula I was obtained as follows:— The denominator of the above was observed to equal

$$w\,.\,\log\left(\frac{A+(n-\frac{1}{2})\,w}{A+(n-\frac{3}{2})\,w}\right)^{(A+[n-1]\,w)\,/w}$$

$$= w\,.\,\log\left(1+\frac{w}{A+(n-\frac{3}{2})\,w}\right)^{(A/w+n-1)}$$

$$= w\,.\,\log\left(1+\frac{1}{A/w+(n-\frac{3}{2})}\right)^{(A/w+n-1)}$$

which is the limit, when n is infinite,

$= w.\log e.$

$= w$, if hyperbolic logarithms are used.

The expression then becomes :—

$$\frac{1}{w}\log_e\frac{A+(n-\frac{1}{2})\,w}{A-\frac{1}{2}w}$$

Then, as a first approximation, we have :—

$$\frac{1}{A} + \frac{1}{A+w} + \ldots + \frac{1}{A+(n-1)\,w}$$

$$= \frac{1}{w}\,.\,\log_e\frac{A+(n-\frac{1}{2})\,w}{A-\frac{1}{2}w}$$

$$= \frac{1}{w}\,.\,\log_e\left(1+\frac{n\,w}{A-\frac{1}{2}w}\right)$$

Putting $n = 1$,

$$\frac{1}{A} = \frac{1}{w} \cdot \log_e \left(1 + \frac{w}{A - \frac{1}{2} w}\right)$$

$$\therefore \frac{w}{A - \frac{1}{2} w} = e^{w/A} - 1 .$$

Substituting this approximate identity in the equation above we obtain the following formula which holds even when n is not large :—

$$\frac{1}{A} + \frac{1}{A+w} + \ldots + \frac{1}{A + (n-1) w}$$

$$= \frac{1}{w} \cdot \log_e \{1 + n\,(e^{w/A} - 1)\} \qquad \text{FORMULA II.}$$

EXAMPLES :

Series.	True Sum.	Formula I.	Approx. Error in parts per 100,000	Formula II.	Approx. Error in parts per 100,000
$\frac{1}{2} + \frac{1}{3}$	·83333	·83939	+727	·83180	−184
$\frac{1}{2} + \cdots + \frac{1}{10}$	1·92897	1·94429	+795	1·92257	−332
$\frac{1}{2} + \cdots + \frac{1}{25}$	2·81596	2·83284	+601	2·80755	−299
$\frac{1}{10} + \frac{1}{11} + \frac{1}{12}$	·27424	·2 428	+15	·27423	−4
$\frac{1}{10} + \cdots + \frac{1}{20}$	·76877	·76897	+26	·76866	−14
$\frac{1}{10} + \cdots + \frac{1}{25}$	·98699	·9872	+26	·98683	−16
$\frac{1}{100} + \frac{1}{101}$	·0199010	·0199010	?	·0199010	?
$\frac{1}{100} + \cdots + \frac{1}{115}$	·14911	·14911	?	·14911	?
$\frac{1}{100} + \cdots + \frac{1}{150}$	·41380	·41380	?	·41380	?

It may be observed that the summation of the series $\frac{1}{A} + \frac{1}{A+w} + \ldots + \frac{1}{A+(n-1)w}$ can be carried out to any required degree of accuracy by an application of one of Euler's asymptotic series. Euler states (Inst. Calc. Diff., 1755, Pars Posterior, cap. VI) that

$$1 + \tfrac{1}{2} + \tfrac{1}{3} + \ldots + \frac{1}{x} = \gamma + \log x + \frac{1}{2x} - \frac{B_1}{2x^2} + \frac{B_2}{4x^4} - \frac{B_3}{6x^6} + \ldots$$

where γ = constant, and B_1, B_2, B_3, ... are Bernoulli's numbers, viz., $B_1 = \frac{1}{6}$, $B_2 = \frac{1}{30}$, ... An adaptation of the above formula gives:—

$$\frac{1}{A} + \frac{1}{A+w} + \ldots + \frac{1}{A+(n-1)w} = \frac{1}{w} \cdot \log \frac{A+(n-1)w}{A-w} + \frac{1}{2(A+[n-1]w)} - \frac{1}{2(A-w)} - \frac{B_1 w}{2(A+[n-1]w)^2} + \frac{B_1 w}{2(A-w)^2} + \ldots$$

The alternation of + and − signs makes it necessary to carry the series on the right to five terms, when the summation is usually accurate to several places of decimals.

Relations between the powers of e.

If, in Formula II, w is put = 1 we get:—

$$\frac{1}{A} + \frac{1}{A+1} + \ldots + \frac{1}{A+n-1} = \log_e \left\{ 1 + n\left(e^{1/A} - 1\right) \right\}$$

or $e^{\left(\frac{1}{A} + \frac{1}{A+1} + \cdots + \frac{1}{A+n-1}\right)} = 1 + n\left(e^{1/A} - 1\right) = n.e^{1/A} - n + 1,$

from which the following approximate relations are obtained:—

		True Values. A.	True Values. B.
	A. B.	A.	B.
If $n = 2$, $A = 1$	$e^{1+\frac{1}{2}} = 2e - 1$	4·482	4·437
,, $A = 2$	$e^{\frac{1}{2}+\frac{1}{3}} = 2e^{\frac{1}{2}} - 1$	2·301	2·297
,, $A = 3$	$e^{\frac{1}{3}+\frac{1}{4}} = 2e^{\frac{1}{3}} - 1$	1·792	1·791
If $n = 3$, $A = 1$	$e^{1+\frac{1}{2}+\frac{1}{3}} = 3e - 2$	6·255	6·155
,, $A = 2$	$e^{\frac{1}{2}+\frac{1}{3}+\frac{1}{4}} = 3e^{\frac{1}{2}} - 2$	2·955	2·946
,, $A = 3$	$e^{\frac{1}{3}+\frac{1}{4}+\frac{1}{5}} = 3e^{\frac{1}{3}} - 2$	2·189	2·187

and so *ad infinitum*.

Arithmetical Progressions and Cognate Series.

By a method analogous to that used for Formula I the summation of other series can be effected. Instead of taking PV constant, as in the case of Boyle's Law, assume the theoretical relation $P^{-m}V \equiv$ constant. Then the heights, which are proportional to the volumes, may be integrated thus:—

$$\mathrm{C}(P-\tfrac{1}{2}w)^m+\mathrm{C}(P-\tfrac{3}{2}w)^m+\ \dots\ +\mathrm{C}(P-[n-\tfrac{1}{2}]w)^m$$

$$= \int_{P'}^{P} \mathrm{K}\,.\,P^m dP$$

$$= \frac{\mathrm{K}}{m+1}\cdot\left(P^{(m+1)} - P'^{(m+1)}\right)$$

$$= \frac{\mathrm{K}}{m+1}\cdot\left(P^{(m+1)} - [P - nw]^{(m+1)}\right)$$

whence, by a process similar to that employed for the harmonical progression, we get:—

$$A^m+(A+w)^m+\ \dots\ +(A+[n-1]w)^m$$

$$= (A+[n-1]w)^m\,.\,\frac{\left(\dfrac{A-\frac{1}{2}w}{A+(n-\frac{1}{2})w}\right)^{m+1}-1}{\left(\dfrac{A+(n-\frac{3}{2})w}{A+(n-\frac{1}{2})w}\right)^{m+1}-1} \qquad \text{Formula III.}$$

If m is put $= 1$ the above formula reduces to:—

$$A+(A+w)+\ \dots\ +(A+[n-1]w) = \tfrac{1}{2}n(2A+[n-1]w),$$

which is the usual formula for the exact summation of an arithmetical progression. If $m = 0$ each term becomes unity, and the sum is n, exactly. But in other cases the summation is approximate only. Those series which are convergent may be summed to infinity, the general formula, derived from III, being:—

$$\frac{1}{A^m} + \frac{1}{(A+w)^m} + \ \dots\ \text{ad inf.} = \frac{1}{(m-1)\,.\,w\,.\,(A-\frac{1}{2}w)^{(m-1)}}$$

EXAMPLES:

Series.	True Sum.	Sum by Formula III.	Approx. Error in parts per 100,000.
$\frac{1}{10^2}+\frac{1}{11^2}+\frac{1}{12^2}$	·0252089	·0252193	+ 41
$\frac{1}{10^2}+\frac{1}{11^2}+\ldots$ ad inf.	·105166	·105263	+ 92
$\frac{1}{\sqrt{10}}+\frac{1}{\sqrt{11}}+\frac{1}{\sqrt{12}}$	·906414	·906455	+ 5
$\frac{1}{\sqrt[3]{10}}+\frac{1}{\sqrt[3]{11}}+\frac{1}{\sqrt[3]{12}}$	1·35059	1·35063	+ 3
$10^2+11^2+12^2$	365·	365·039	+ 11
$10^3+11^3+12^3$	4059·	4060·20	+ 30
$\sqrt{10}+\sqrt{11}+\sqrt{12}$	9·94300	9·94284	$-1\frac{1}{2}$
$\sqrt[3]{10}+\sqrt[3]{11}+\sqrt[3]{12}$	6·66784	6·66775	$-1\frac{1}{3}$
$\sqrt{100}+\sqrt{101}+\ldots+\sqrt{115}$	165·8534	165·8516	-1

Derivatives of Formula II.

Formulæ for the approximate summation of series of the form $\frac{1}{A^m}+\frac{1}{(A+w)^m}+\ldots$ can also be obtained by repeated differentiation of the empirical Formula II. E.g.:—

$$\frac{1}{A}+\frac{1}{A+w}+\ldots+\frac{1}{A+(n-1)w}=\frac{1}{w}.\log_e\left\{1+n\left(e^{w/A}-1\right)\right\}$$

$$\therefore\ \frac{-1}{A^2}+\frac{-1}{(A+w)^2}+\ldots+\frac{-1}{(A+[n-1]w)^2}=\frac{1}{w}.\frac{n.e^{w/A}(-w/A^2)}{1+n(e^{w/A}-1)}$$

$$\therefore\ \frac{1}{A^2}+\frac{1}{(A+w)^2}+\ldots+\frac{1}{(A+[n-1]w)^2}$$

$$=\frac{1}{A^2}.\frac{n.e^{w/A}}{1+n(e^{w/A}-1)}\qquad\text{FORMULA IV.}$$

And in the special case where n is infinite,

$$\frac{1}{A^2} + \frac{1}{(A+w)^2} + \ldots \text{ ad inf.} = \frac{1}{A^2} \cdot \frac{e^{w/A}}{e^{w/A}-1}$$

EXAMPLES:

Series.	True Sum.	Sum by Formula III.	Error in parts per 100,000.	Sum by Formula IV.	Error in parts per 100,000.
$\frac{1}{10^2} + \frac{1}{11^2} + \frac{1}{12^2}$	·0252089	·0252193	+41	·0252032	–23
$\frac{1}{10^2} + \frac{1}{11^2} + \ldots$ ad inf.	·105166	·105263	+92	·105083	–79

Other Series.

By a modification of the foregoing methods approximate summations can be found for geometrical progressions, and also such trigonometrical series as $\sin A + \sin(A+w) + \ldots + \sin(A+nw)$, but as these admit of exact summation the results are of no practical interest.

My best thanks are due to Professor A. D. Ross for his assistance in putting this paper in a form suitable for publication.

ON A STOMATOPOD NEW TO AUSTRALIA, WITH A LIST OF THE WESTERN AUSTRALIAN SPECIES OF THE ORDER.

By

W. B. Alexander, M.A., Biologist to the W.A. Museum.

(Read 21st April, 1914.)

On 16th March, 1914, the W.A. Museum received from Mr. Aldrich, the Chief Inspector of Fisheries, a large Squilla obtained in King Sound. It proves to be a male example of *Lysiosquilla maculata*, Fabr., which has not hitherto been recorded from the Australian coast, though in view of its wide distribution it might have been expected to occur in our tropical water, as it ranges from Japan and Oceania to South Africa and has also been found in the West Indies. The nearest localities from which it has previously been recorded are New Guinea, Goram, Amboina, Flores, and Christmas Island.

Unfortunately the present example is in poor condition, the last four abdominal somites and the telson being missing. When perfect the specimen must have measured at least 250 mm., a size which is only rarely exceeded in this species. The most interesting feature of the present example is the form of the rostrum, which approaches that of var. *sulcirostris*, Kemp, founded on a single specimen from the Andaman Islands. The specimen has, however, nine teeth on the dactylus, whereas *sulcirostris* has only eight and typical *maculata* usually has ten and very rarely nine. The sixth abdominal somite, which also presents points of difference between *maculata* and *sulcirostris*, is unfortunately missing, but the present specimen, like *sulcirostris*, has the dark transverse bands much narrower than in Kemp's figures of *L. maculata*. The W.A. Museum collection previously contained specimens of three other species of Stomatopods from the Western Australian coasts:—

Squilla miles, Hess, without definite locality,
Gonodactylus chiragra, Fabr., without definite locality, and
Gonodactylus glabrous, Brooks, from Sharks Bay (presented by Mr. Aldrich in 1913).

Of these the first is a very rare species, the type having been found at Sydney, and the only other example previously recorded being from the coast of Victoria. *G. chiragra* is a very abundant form throughout the Indo-Pacific region and is known to inhabit the west coast of Australia as far south as Swan River. *G. glabrous* is also a widely distributed Indo-Pacific species, but the only examples previously recorded from Australia were from Sir C. Hardy's Island in the Barrier Reef.

For the identification of these species and the information as to their distribution I am indebted to Kemp's Memoir on the Stomatopoda of the Indo-Pacific Region.* This paper contains records of three other species from Western Australia:—

Gonodactylus graphurus, Miers, obtained off Baudin I., and Baleine Bank in N.W. Australia, in depths between 8 and 20 fms.;

Gonodactylus trispinosus, Dana, from Swan River and from Baleine Bank, and

Gonodactylus stoliurus, Muller, from Sharks Bay.

Thus our Stomatopod fauna as at present known comprises seven species, one of *Lysiosquilla*, one of *Squilla*, and five of *Gonodactylus*. Of these six are widely distributed tropical Indo-Pacific forms, and one appears to be confined to the southern half of the Australian coast-line.

FURTHER NOTES ON W.A. STOMATOPODS.

By

W. B. Alexander, M.A., Keeper of Biology in the W.A. Museum.

(Read 13th April, 1915.)

Since my last communication to the Society on the subject of Stomatopods, I have been allowed by Mr. F. Aldrich, Chief Inspector of Fisheries, to examine a further collection of these animals which he has received from the North-West.

This collection contained six specimens from Derby of *Lysiosquilla maculata*, Fabr., all of them large males in good condition, and they enable me to supplement my remarks on the single specimen in poor condition received before. They vary in length from 210 to 280 mms. Five have 10 spines on the dactylus, and one only 9.

The specimens all agree with Kemp's var. *sulcirostris* in the form of the rostrum; they are also remarkably uniform in colouration, possessing the minimum amount of dark colouring met with

* Kemp: Memoirs of the Indian Museum, Vol. IV., No. 1, 1913.

in the species. The sixth abdominal somite, which was wanting in the previously described specimen, is grooved in all the specimens and is wrinkled on either side as in typical *L. maculata.* If Kemp's variety had been founded on the form of the rostrum only these specimens would have had to be attributed to it, but since five out of seven possess the normal numbtr of spints on the dactylus. and the sixth abdominal somite is typical in form, it seems better to regard them as a well-marked race of the typical species.

In addition, the collection contained a single specimen from Broome of another species, which appears to be locally called "Zeppelin" and to occur in deep water.

It agrees in every respect with *Odontodactylus japonicus,* de Haan, which has previously been recorded only from the seas of Japan and China and from 55 fathoms off the Seychelles. The genus *Odontodactylus* had not previously been recorded from Australia.

In conclusion I may mention that in October last I collected a male specimen of *Gonodactylus chiragra,* Fabr., in a small rock pool on the reef at Port Hedland.

MARINE BIOLOGY IN WESTERN AUSTRALIA.

Being the Anniversary Address of the President, Session 1913-1914.

By

W. J. Dakin. D.Sc., F.Z.S.,

Professor of Biology in the University of Western Australia.

(Delivered June, 9, 1914.)

Fortunately a considerable amount of latitude is always allowed in the choice of a subject for a Presidential Address. I feel that I shall be availing myself of that latitude in my address to you this evening.

I need scarcely enumerate the events of the year; they will be in the memory of you all. A petition addressed to His Majesty, King George V. was forwarded on June 27th, 1913, asking for Royal Assent to the change of designation of the Natural History and Science Society to that of "The Royal Society of Western Australia." The petition was granted, and on December 9th, 1913, the members of the old Society were informed of the change. During the summer recess a new set of rules was drawn up, and at the first meeting in 1914 it was formally agreed that the Natural History and Science Society of W.A. should be known in future as the Royal Society of Western Australia. It will not perhaps be felt out of place if I take a glance backward at the work of the old Society, and a look ahead at the prospects before us.

The old Society was founded in 1897 as the Mueller Botanical Society, its aim being "the study of Botany and relative scientific subjects, to be promoted by periodical meetings, conversaziones and field excursions, and the formation of a library."

Previous to this date, however, the Flora of Western Australia had been studied by both visiting botanists and by the settlers. I cannot pass without mentioning the name of James Drummond, who might be styled the first colonial botanist of West Australia. Drummond died in the year 1863. The Society must have done much in its early days to stimulate and foster the study of the West Australian flora, but others better informed than myself in the history of W.A. will perhaps tell the story of those interesting times. Some of the very early papers published by the Society were rather of an elementary nature, not containing, I am afraid, much original research. It was, however, perhaps not exactly the first duty of a society in those days to publish highly technical papers, and most of the keen members—if not all—had daily work to perform which was not related to the study of plant life.

I often wish we had more of the keen old amateur naturalists of the last generation with us now. There are too few at the present day who devote themselves to the study of nature in their hours of relaxation.

About the year 1900, we find the Mueller Botanical Society with a number of ardent workers, amongst whom might be mentioned Messrs. Purdie, C. R. P. Andrews, Hursthouse, Drs. Tratman and Morrison, and the two German workers, Drs. Diels and Prietzel.

Many new records resulted from their work in the years that followed. The scope of the Society was, however, becoming wider and so, in 1904, the title was changed to that of "The West Australian Natural History Society." Under this name the Journal was published until quite recently and papers coming within the scope of Botany, Zoology, and Geology were presented. Finally, a further change was made and the title expanded to read "The Natural History and Science Society of Western Australia." The last volume of the Journal to be published under this name will be No. V., containing papers and details of meetings ending with that of March 10th, 1914.

MARINE BIOLOGY IN WESTERN AUSTRALIA.

Let me now proceed to the subject which I have taken for my address. What is Marine Biology? Perhaps at the same time I should try and answer the further question (which is still so often asked in the British Empire when you mention science), What is the *Use* of Marine Biology?

The answer to the first question is short—Marine Biology is the study of the organisms of the sea, both animal and vegetable; their relation to each other, and to the ever-changing conditions of their environment. To the second question I require to say more. In the first place I plead the study of marine biology simply from the point of view of pure knowledge; from a desire to know and understand the earth and all that exists thereon. It is not generally known, I am afraid, that very many more groups of animals from the lowest to the highest are represented in the sea than on land and in the air. Very many problems of the greatest scientific importance are to be solved by the study of the sea and all that therein is. In fact it has been ably suggested that life originated in the sea, and that the saline constituents of mammalian blood indicate even now the composition of the medium once bathing the bodies of aquatic ancestors. The famous poet Goethe makes use of his knowledge as a scientist when he puts into the mouth of Thales in "Faust," Part II., the words—

> "Alles ist aus dem Wasser entsprungen!
> Alles wird durch das Wasser erhalten!
> Ozean, gönn' uns dein ewiges Walten!

The following table indicates roughly the distribution of the chief animal groups respecting their habitat:—

LAND ANIMALS.	MARINE ANIMALS.
Protozoa	Protozoa
Sponges, (few species in fresh water)	Sponges
Coelenterata (rare in fresh water) ..	Coelenterata
——	Echinodermata (all groups)
Platyhelminthes (fresh water and parasitic)	Platyhelminthes
Nemerteans—(exceptional on land)	Nemerteans
Rotifera—(fresh water)	Rotifera
Gastropoda (land and fresh water) ..	Gastropoda
(Lamellibranchcata, few fresh water)	Lamellibrancheata
——	Cephalopoda
——	Solenogastres
——	Scaphopoda
Nematoda	Nematoda
Oligochaeta (land and fresh water) ..	Oligochaeta (few species)
Polychaeta (very few fresh water)	Polychaeta
Hirudinea (fresh water)	Hirudinea
——	Archiannelida
——	Echiuroidea
——	Sipunculoidea
——	Priapuloidea
——	Phoronidea
Polyzoa—(few fresh water)	Polyzoa
——	Brachiopoda
——	Chaetognatha
Crustacea (fresh water and land) ..	*Crustacea (chiefly marine)*
Insecta (chiefly land)	Insecta (very rare indeed)
Onychophora	——
Myriapoda	——
Arachnida (chiefly land)	Arachnida (very few examples)
——	Tunicata
——	Enteropneusta
——	Cephalochordata
Cyclostomata (few fresh water species)	Cyclostomata
Teleostomi (fresh water)	Teleostomi
Elasmobranchii, rare in fresh water	Elasmobranchii
Dipno—(fresh water)	——
Amphibia	——
Reptilia	Reptilia
Birds	Birds (at least adapted to life on sea)
Mammals	Mammals

The groups mentioned above are by no means of equal rank, but the table serves to show that representatives of most groups come under the scope of Marine Biology.

So far, however, many may urge that I have not given sufficient reason for the study of Marine Biology; the search for pure knowledge not being deemed sufficient in these busy days! I must plead that I have given above the very best reason. The facts disclosed may not be general or even seem important; they may appear to have no bearing upon human life and economics, but he would be a bold man who would venture to assert that the future would not find use for them. "To be the recipient of the confidences of nature; to realise in all their virgin freshness new facts recognised as positive additions to knowledge, is certainly a great and wonderful privilege, one capable of inspiring enthusiasm as few other things can."

In the last fifty years the discoveries of biology have perhaps affected the human race more than the wonderful attainments in any other branch of learning. There is very much more to think about than the mere classification of animals and plants. The dead bones can live in the hands of those whose observations of the living enable them to interpret the signs of the dead.

But there *is* a second reason for the study of marine biology which may commend itself as the first and more important reason to our commercial spirits. The second reason is bound up with the practical application of the science to Fisheries and other industries.

The British race has to keep up its reputation in the world of science and the fight to-day is by no means easy, nor are the other combatants likely to wait for us. In marine biology England led the world with the famous Challenger Expedition, and the volumes published on the collections made by the famous vessel still remain the foundation of any library of marine biological works. I am afraid, however, in these last few years that the Germans and Americans have taken the lead, and smaller nations like Norway and Denmark have shown that they are not behind us in fishery investigations. A glance at the history of marine biology in the State of Western Australia is somewhat indicative of the same thing. The coast of Western Australia cannot be said to be very well known biologically. In fact, compared with the Mediterranean coast of France and Italy, we might almost say we had a virgin field—at least north of Sharks Bay. Collections were often made in early days by surgeons or amateur naturalists travelling on ships of the early voyagers. Other more general descriptions were given even before this by the leaders of many long-famous expeditions of discovery, as for example, that of Dampier (1652-

1715). Large collections appear to have been made by Péron and le Sueur in 1803, and later still by Quoy and Gaimard. One of our members, Mr. Alexander, is doing excellent work in collecting the information published by many of the old collectors along our shores.

King George Sound, Albany, was quite frequently visited; other collections were made at Sharks Bay. The specimens collected by Quoy and Gaimard were all sent back to the Museum of the Jardin du Roi in Paris, and thus many West Australian marine animals were described for the first time by Lamarck himself. It was Lamarck who suggested in 1790 that the name of the Jardin du Roi should be changed to the more familiar Jardin des Plantes, when during the French revolution, everything suggestive of royalty became obnoxious to the people.

Large numbers of mulluscs, corals, anemones, and ascidia were collected by Quoy and Gaimard.

No doubt numerous odd specimens have been collected and sent from various parts of West Australia to the museums of Europe, and it is becoming increasingly important to trace these, especially such as they have been described and figured as new species.

Unfortunately, many of the early specimens must have been sent with no more information about the locality from which they came than the word *Australia.* The coastline of Australia is, however, not only of considerable length, but is washed by currents of very different origin, and extends across many parallels of latitude and meridians of longitude.

The most detailed investigation of the marine fauna of our coast was undoubtedly that of the Hamburg Expedition of 1905, under the leadership of Michaelsen and Hartmeyer. These two men received every possible help and encouragement—free railway passes, hospitality, and complete remission of duty from their absolute alcohol. They removed from our shores 49 cases of specimens—all of which were carried free to Hamburg by the German Shipping Lines. The history of modern scientific investigation in our colonies very frequently indicates this kind of thing. We have not only refused such help to our own scientific workers, but have deliberately helped a country which is not exactly contented with its present position in the world, to investigate our own grounds.

The Hamburg Expedition only visited the region between Sharks Bay and Albany, yet notwithstanding their 49 cases of specimens, there are probably hundreds of species on the grounds they explored which remain unrecorded. My own few investigations have already given new records for Western Australia, some of which are of very great interest. There is no doubt that workers on the spot can always do more in the way of collecting than those who come from abroad ; provided, of course, that they get the necessary facilities and sympathy. Unfortunately, the material obtained can only be worked up with great difficulty owing to the serious lack of literature in Perth. There is one other difficulty, too, that I must touch on here—a hindrance to the research work of our University professors and lecturers. Probably there are no teachers in the world's universities who are required to put in so much time at actual teaching—"spoon feeding" —as their Australian colleagues. Their value to the State is to a large extent lost.

I do not want it to be imagined that I have attempted above to give any more than an indication of the position of marine biology in our State. Let me now pass to a few more particular points.

Plankton Investigations.

The term "Plankton" was applied in the first case by that veteran physiologist of Kiel, Hensen, to indicate all those organisms floating in the sea which are at the mercy of currents and waves. When we have fully considered the organisms which creep about the sea bottom or are attached to it (the Benthos) ; those which roam at will through the waters as, for example, fishes, marine mammalia, some mollusca and crustacea (the Nekton), we have not exhausted the life of the sea. The voyager sails over a "marine pasture" of microscopic organisms so rich that beneath his vessel is a wealth of life more abundant than perhaps in many a tropical forest. To capture the small organisms of the plankton we need the tow-net of silk, the centrifuge, and the water bottle. Since the development of the Kiel School of Plankton Workers, our knowledge of this branch of marine biology has progressed wonderfully and the mere enumeration of species has given way to a study of seasonal change and the relationship of the plankton to oceanographical conditions. This is bringing us to the study of the ultimate phenomena of life from another point of view altogether. The study of the plankton off the West Australian coasts will be of importance in connection with our Fisheries (many fish eggs are pelagic), and also in another commercial undertaking of great value, the cultivation of the Pearl Oyster.

Up to the present time we have no knowledge of the seasonal changes in the plankton at any place South of the Equator. This is a subject we hope to take up at the University—as soon as we can find the necessary time. The few investigations already made have shown that every year about June there is a regular appearance of the Ephyrae of Aurelia in large numbers in the Swan River. Before this month (but variations have taken place probably owing to early or late rains and the consequent rush of fresh water into the estuary), the tow-net reveals the presence of the larvae of our common prawns belonging to the genus Penaeus or Metapenaeus. These larvae are particularly interesting, for it is extremely rare for the Decapod crustacea to be hatched from the eggs as Nauplii. It is known in several cases in the group Penaeidae. We have obtained the nauplius larvae of the Swan River species, and it would appear as if the complete development could be worked out quite easily from a complete series of plankton catches.

Our Swan River and Fremantle Harbour catches have also indicated the presence of Phoronis in our waters. The adults have never yet been recorded, but must occur, for we have captured Actinotrocha larvae in the plankton. Our Swan River estuary plankton and also that collected between Garden Island and Fremantle seems at times to be particularly rich in Tintinnidae. Great swarms occur, and on one occasion the presence of these organisms was found to be associated with a fine display of so-called phosphorescence. Amongst the phytoplanktonic forms the well known genera Chaetoceros, Rhizosolenia, Ceratium and Peridinium abound, but it is impossible to work out the species with the literature at our disposal.

The plankton work remains in fact untouched. The Hamburg Expedition must have made very extensive collections, but up to date nothing has been published except a small paper by Lohmann on pelagic Tunicata.

Amongst larger planktonic organisms we can record Porpita, Physalia, and Beroe. The latter genus occurred in myriads in Bunbury Harbour in May, 1913.

Mollusca.

The Mollusca are probably as well known as any marine group from the Western Coast of Australia. I should like to add a few words upon this group, which perhaps has received more of my notice in the past than any other Phylum. Two groups of molluscs are of outstanding importance, economically, on our coasts, and in very different ways. One group, that of the shipworms belonging to the genus Nausithoria, is a pest, causing the destruction of wooden piles at Bunbury, Fremantle, and other ports to the extent of thousands of pounds sterling. The other group is of value, and includes the species eagerly sought after for pearls and pearl shell.

The common species of "shipworms" (the best known genus is Teredo), found at Fremantle are *Nausithoria saulii* and *Nausithoria thoracites*, the first-named being recorded here for the first time from West Australia. Both species attack the jarrah piles. The life history and anatomy are fairly well known, and the Biology Department of the University has made some investigations into the matter at Fremantle. This is an excellent example of the most unexpected kind of connection between two subjects very rarely associated with each other—marine biology and engineering. The larvae of Nausithoria occur in the plankton. They die if they do not come up against a suitable material for attachment and boring. It does not take long for penetration of timber, and three months after immersion specimens have been found some little distance in the wooden jetty piles.

Let us now look at the other important lamellibranch on our coasts. The pearl oyster fisheries of Australia are probably the largest and best equipped at the present time in the world. The value of pearls and pearl shell is by no means inconsiderable, and the industry is without doubt a great asset to Australia. Now there is a great danger that fishing will be conducted without any scientific supervision until perhaps some serious trouble arises, such as, for example, has arisen in Ceylon. Then, of course, a scientific investigator will be called in. This, however, is more than shutting the stable door after the horse has gone ! The first thing that a marine biologist would have to do if called in, would be to make a study of the conditions under which pearl oysters had developed; you cannot call upon a biologist as you can upon a chemist or engineer, for problems in natural history are often peculiarly local. Besides there are very few marine biologists with any real knowledge of pearl oyster beds. Would it not be well worth the expenditure, therefore, as a kind of insurance, to have our pearl oyster banks studied in detail by scientists in conjunction with pearl fishers *before* there is any restriction in the supply?

We want to know something about the enemies of the oysters on the North-West Coast, the breeding season, the deposition of spat, the cause of pearl formation, and the extent to which fishing is carried out.

Hydrographical Conditions and the Marine Fauna.

As more and more extensive collections of our marine animals are made and a greater knowledge of their distribution is obtained, we find that certain species occur only in the North, others are characteristically Southern, and others again may be very local and only found on certain types of sea bottom. We have a considerable stretch of coast line which runs roughly North and South—consequently extending through many degrees of latitude. This makes the study of geographical distribution very interesting, and it is still more so because the North-West Coast fauna is probably in many ways a connecting link between the Indian and Pacific faunas.

Our large pearl oyster, *Margaritifera maxima*, does not extend down into Sharks Bay. Its place is taken there by a smaller species, more valuable for its pearls than for its shell. True coral reefs are not found South of Sharks Bay with one peculiar exception—the Houtman's Abrolhos—islands situated about 30-50 miles off the Australian coast in Latitude 28° 30′ S. The fauna of Sharks Bay is, in fact, almost tropical, but a rapid diminution in the number of these tropical species occurs as one follows the coast southward, until at Albany one meets with some typical Antarctic elements. The Abrolhos Islands occupy a rather interesting position, and Saville Kent, after a visit, stated that the marine fauna was not only a blend of tropical and temperate species, but that the tropical species were not found on the adjacent coast. The Hamburg Expedition did not visit these islands, but the members apparently agreed with the views expressed by Kent after an examination of certain collections in the West Australian Museum. With these statements in mind, and the fact that the Islands were good collecting grounds for the marine biologist, Mr. W. B. Alexander, of the West Australian Museum, and I visited the Abrolhos last November. Extensive collections were made and these will be worked up in due course by specialists on the various groups. One of the questions which calls for investigation is the problem of the Hydrographical Conditions. If an examination of the fauna of the Abrolhos supports the views of Saville Kent, then what is it that determines the Southern extension of tropical organisms at this place? The study of the hydrography of this region is but a small section of an investigation which is called for along the entire coast.

The islands are, so far as we could see, entirely composed of up-lifted and wave-heaped coral. There is no evidence whatever for the statement of Saville Kent that plutonic rocks corresponding to those of the mainland occur in the Wallaby Group. The Wallaby Islands, like the others of the Abrolhos Group, are coral formations. The rich growths of coral would certainly encourage us to look for some influential hydrographical conditions. Let me discuss some of the information that we now possess and some of the theories put forward.

Saville Kent stated that he found the sea temperature was 14°F. higher at the Abrolhos than at Geraldton on the coast at the same time, and during the month of July, 1894. He suggested that a warm current of water came down from the Tropics—a Southerly intrusion of an equatorial current perhaps not exactly reaching the islands, but approaching them. Kent did not give sufficient details of any temperature observations made by him. Michaelsen, who has stated that one must travel about 6° latitude North of Sharks Bay in order to meet a coastal fauna similar to that of the Abrolhos, believes that if a warm current *does* exist it is not the only factor. His suggestion is that an upwelling of cold water takes place along the coast which is driven outwards along the surface. Quite apart from our studies, it is important from the point of view of fishery investigation that we should know something of the movements of the water along our coasts. Now, in order to obtain a clue to these, one looks quite naturally for temperature observations. We look in vain, however, for any organised coastal records. It is rather strange that the Meteorological Department has not arranged long ago for sea temperatures at its coastal stations. We have fortunately some data collected by Mr. J. J. East, of Perth. This gentleman has worked out carefully the sea temperatures taken by the engine-room staffs on various steamers—mail and coastal—in Australian waters. The temperatures apply to the sea water as pumped into the condensers, and of course cannot be relied upon as quite as accurate as readings made with certificated thermometers and the usual oceanographical apparatus. The results, however, go some way to fill up a big gap and they are quite interesting. The coast of West Australia appears to be washed by water the temperature of which ranges from about 60°-67°F. on the South to 74°-87°F. on the North-West coast. The seasonal change is thus not very great. The highest seasonal temperatures recorded in the short period of observation occurred in February and March; the lowest in August and September.

At Geraldton, the nearest port to the Abrolhos, the sea temperatures vary from about 62°F. in winter to 74°F. in summer.

Now the temperatures taken as one leaves the coast between Geraldton and Sharks Bay indicate that the inshore waters are colder than those some little distance out, and a map showing the isotherms plotted from engine-room temperatures (June, 1911) shows a very distinct tongue of warm water passing down the coast, the tip reaching down to about the Abrolhos. A very distinct zone of cold water appears at times lying close to the coast and extending from the Leeuwin northwards, even north of Sharks Bay.

Temperatures taken by me at the Abrolhos also indicate the presence of warmer water there than was found in the harbour of Geraldton at the same time, although the difference was not half that which Saville Kent recorded in 1894. There is, therefore, a considerable mass of evidence in favour of a tropical current passing southward some distance out from the coast and gradually disappearing as the Abrolhos are approached. This would lead one to expect a curious distribution of marine organisms in that area of the Indian Ocean, including the Abrolhos Islands, and washing the mainland near Geraldton. We hope to be able to map out in some detail this distribution.

Up to date I have little, if any, evidence supporting the German contention that the upwelling of colder water along the coast might account largely for the marine fauna of the Abrolhos Islands. If such a thing took place, caused by the factors suggested by Michaelsen, it would in my opinion occur at the Abrolhos Islands themselves, for they are situated right on the edge of the continental shelf. A correct series of surface to bottom temperatures, taken as one passes out from the coast until deep water (over 200 fathoms) is reached, would doubtless settle this case. We have the apparatus and it is merely the question of obtaining the loan of a suitable steamer for a day or so, perhaps four times a year, which prevents us from obtaining the figures.

Our nearest Coral Islands—the Abrolhos.

The Abrolhos Islands have already been mentioned several times in this address. As a matter of fact it is very probable that these islands will be one of our most conveniently situated and richest collecting grounds for some time to come. They are probably the most southerly coral islets in the world, and, since the question of coral reef formation is still a much discussed problem, their close vicinity to Perth should enable us to collect some important information. I am afraid that their distance from Perth is not expressed correctly by merely referring to it in miles. It should be expressed in time, or in money, for it is not so easy to reach the Abrolhos as a resident in another land might imagine after using his atlas.

There are several groups of islets making up the Abrolhos which are separated by channels. From North to South they are as follows:—The Wallaby Islands with North Island—the Easter Island Group—The Pelsart Group. The northerly islands attain the greatest heights above sea level (maximum between 40 and 50 feet only) and appear to have been subjected to the greatest alteration by uplift and denudation. The Pelsart Group is quite atoll-like in character, and the individual islets are only a few feet above the sea level. The Wallaby Islands at least have been connected with the mainland in comparatively recent times (geologically speaking), and the land fauna is consequently rather curious now by reason of the wallabies, reptiles, and amphibia which abound on these small coral islets 50 miles away from the coast.

It is difficult to speak with any certainty about the early formation of the Abrolhos Islands, especially since theories of the formation of coral islets, where the sequence of events has not been complicated by elevation and subaerial denudation, have so far not been exactly successful.

It does not seem probable, however, that the atoll-like Pelsart Group has developed in the way suggested by Darwin. There is evidence everywhere of the action of the sea.

The two Wallaby Islands have been separated by erosion and solution, and very many of the islands are now being cut away to the mean sea level by the action of the waves and currents. Most of the cliffs overhang, and this undercutting continues until huge blocks break away.

It would appear that the islands now forming the Wallaby Group were once joined up and the coral mass was much more extensive than at present. The present condition is the result of subsidence and erosion followed by a more recent small uplift and then further erosion. There is considerable evidence for this small recent uplift, the extent of which is about eight feet. In fact, many of the small islands are probably only islands at present owing to this elevation. They had previously been cut down to sea level. One is tempted at first to assume that the Abrolhos are coral islets of past times and that the conditions which brought them into being are non-existent now at this place. I think, however, that on second thought this view will be dismissed. The Pelsart Group would hardly have retained its atoll-like structure unless the conditions favouring the growth of reef-building corals were very recently prevailing. Moreover, in suitable places in the lagoons one finds great masses of living corals, two species of Madrepora with very different growth habits being most abundant. No single theory of coral island formation is going to expain the various coral formations of our tropical seas. Every coral island or group of islets needs separate examination before its mode of origin can be explained, and the Abrolhos Islands offer problems for almost every branch of oceanographic research.

Notes on some animal groups, chiefly marine.

The following brief notes contain several new records made during the past fourteen months. In many cases it is impossible for us to determine species owing to the absence of literature. It may be of some little value to refer to the genera, especially as they are in certain cases first records of their Phyla or Sub-Phyla from the West Australian Coast.

Sponges.—Very little systematic work has been carried out on our sponge fauna up to date. The coast appears, however, to be particularly rich in sponge species. Two reports of the Hamburg Expedition collections refer only to the Tetraxonida of the South-West. At the present time Professor Dendy has our collection from the Abrolhos for the purpose of investigation. Most of the specimens of the Tetraxonida collected by Michaelsen and Hartmeyer were quite new to science.

Coelenterata.—We possess very little knowledge of the Coelenterata of Western Australia. Two papers have so far appeared on the specimens collected by the German expedition—one on the Actiniaria and another on certain Alcyonaria. Many of our corals have been named, but a revision of this work is badly needed. Although reef-building corals are stated not to occur south of Sharks Bay, except at the Abrolhos, *some* species of corals may be obtained considerably further south. Thus, Pocillopora in the living condition has been dredged up at Garden Island on one or two of our expeditions, and Turbinaria also occurs, and extends as far south as Bunbury. Almost all the Alcyonaria so far recorded came from Sharks Bay—the family Nephthyidae being well represented with species peculiar to our coast. Two Pennatulids only have been named. There are practically no records of hydroids, but a species of Sertularia occurs and is very common along the coast on the Zostera. On one of our dredging expeditions we discovered large quantities of *Tubularia sp.* on the piles of the Fremantle Jetty. This is, so far as I am aware, the first record of this Gymnoblast on our coast. I have referred elsewhere to the occurrence of Porpita and Physalia. These oceanic pelagic coelenterates were captured at the Abrolhos Islands.

Nemertinea.—Several beautiful specimens of the Heteronemertean *Cerebratulus sp.* have been dredged off Garden Island. They were, when extended, about six to eight inches long. Only one other nemertean has been obtained so far, and that has not yet been examined.

Chaetognatha.—Few chaetognaths, and those but of small size, have occurred in the plankton catches made so far. We have not made many, however, and so this may not indicate much. The genus represented seems more usually to be *Spadella sp.*

Polychaeta.—The Polychaetes are practically unrecorded from the coast of Western Australia, but fine examples occur, and a number of different species have been collected and await examination.

Echiuroidea.—In the course of our collecting at the Abrolhos Islands, two specimens of *Bonellia sp.* were obtained. Since then several specimens have been found by dredging in Freshwater Bay (Swan River Estuary) and off Garden Island. The species is moderately large but until the whole group of the Bonellida is revised it is difficult to determine the species with any certainty. The colour is the typical green. This is the first record, so far as I am aware, of this Group on our coast.

Polyzoa.—Polyzoa appear more common than Hydroids in the Fremantle district and *Retepora sp.* and a species of Bugula are fairly common as well as some encrusting forms not yet investigated. Perhaps the most striking species is *Amathia spiralis* which occurs in great masses off Garden Island and has been dredged there on almost every occasion on which I have visited the grounds.

Mollusca.—The Mollusca are on the whole better known systematically than any other marine group on our coast, and a large report has just been completed by Hedley, of the Australian Museum, Sydney. Very many of the familiar genera of the European coast are represented but by different species. About 100 species of lamellibranches at least have been recorded from the South-West alone. Probably our most important bivalve is the large pearl oyster *Margaritifera maxima*, but this is confined to the North-West. The "shipworms" (*Nausithoria sp.*) have already been alluded to.

A very large number of Gastropoda have been recorded and some are extremely common. Vermetus is responsible for great shelly tracts at Geraldton and the Abrolhos, but also occurs further south, and can be seen on the beach near Fremantle.

The Nudibranchiata appear to be well represented on our shores, and many of the species are new. Several specimens of the beautiful *Hexabranchus imperialis* have been captured at the Abrolhos, the locality where it was first discovered by Kent in 1897. Another interesting form is a species of Notodoris, recorded now for the first time from the Australian coast. The genus was instituted by Bergh for a single specimen, *N. citrina* from Rarotonga. Two other species have since then been made by Eliot for specimens from Zanzibar and the Maldive Islands. All the species are yellow in colour. It is stated in Eliot's report that nothing is known of the habits of these animals. Several specimens of Notodoris were obtained at the Abrolhos, and they may also belong to a new species. The animals were bright lemon yellow in colour, and no colouration could have been more conspicuous. Yet in all probability we missed many specimens, for they were living on a sponge of exactly the same colour as themselves, which formed encrustations on the under surface of great blocks of dead coral. The first specimen captured gave itself away by falling off a stone as it was being turned over.

About 45 species of Polyplacophora are recorded up to date from the West Australian coast.

Crustacea.—Very much work requires to be done in collecting and working out the Crustacea of Western Australia. Only about 15 species of the Decapoda are recorded for W.A. in Haswell's Catalogue of the Australian Malacostraca in 1882. Very many examples, however, must have been collected from time to time, and these have been named at various institutions, but unfortunately no list of these records is available. Our Abrolhos collections await investigation, and nothing has yet been published by the Hamburg Expedition. The only group that we can investigate with the literature at our disposal is the group Stomatopoda, thanks to the Monograph published by the Indian Museum, Calcutta. Upwards of seven species of this group have been recorded, and six of them are Indo-Pacific forms.

Specimens of *Nebalia sp.* representing the group Leptostraca occur off Fremantle. What a remarkably wide distribution this genus has! It was first found at Greenland, and it ranges from there to Chile and Japan.

The Mysidacea are but little known from our waters, and much very important work requires to be done in collecting these crustacea which have probably evaded the more general collecting apparatus used along this coast. Probably a light net—something between a dredge and a tow-net—used over the Zostera beds would result in their capture.

Numbers of Anomura have been captured, and three of the four tribes making up this section are known to occur—The Galatheidea, Thalassinidea and Paguridea. What is probably the first record of the Thalassinidea is a fine specimen of Thalassina itself, dredged in the mud of the Swan River right opposite Perth.

Alpheids appear to be abundant down the coast, and the same may be said of the Sphaeromidae, a family of Isopods. A very near relative of the family, *Limnoria sp.*, occurs in thousands in Fremantle Harbour, boring into the piles and preparing the surface for the attacks of the "shipworms." It is a species of Limnoria which works similar havoc in many parts of the world far removed from Australia, is known popularly as the Gribble, and was first discovered as a British species by Robert Stevenson, the lighthouse engineer, who found it destroying the timber used in the erection of the Bell Rock Lighthouse.

Echinodermata.—The Crinoids, Ophiuroids, Asteroidea and Echinoidea are tolerably well known from the region south of Sharks Bay, but a gap remains in our knowledge of the phylum, even in this region, owing to the absence of information on the Holothurians.

Holothurians are quite common and several genera have been collected; in some places the sea bottom is particularly rich in these echinoderms. A collection will be sent away in due course for examination by Dr. Pearson, of the Colombo Museum, Ceylon.

The other groups are better known, owing to the work of the West Australian Museum and that of the Hamburg Expedition in collecting these forms. Thirty-one crinoids have been recorded from the West coast of Australia. Thirty-two Ophiuroids are known from the South-West region of our coast, and about eighteen species of Asteroidea. This latter number certainly does not represent all the species so far collected. Some large specimens of a species of Luidia more than a foot across have been dredged near Garden Island. It is very difficult to preserve them without breakage of the arms taking place.*

Tunicata.—The phylum Tunicata is one of the dominant groups of marine animals on our coast, and the jetty piles at all the seaports are covered with these organisms.

*Since reading this address, the West Australian Museum have published a list of the Echinoderms in their collection. It is probable that the species recorded as *Lindia maculata* M. & I., is *Luidia maculata*. It is very probable that our large specimens belong to this species, which occurs at Ceylon.

No reports, however, on West Australian species are yet to hand. Out of 183 species given by Herdman as occurring on the coast of Australia, only six are definitely recorded for the West although, of course, very many more must be common to both East and West coasts. The Hamburg Expedition has, so far, only published records on the few pelagic forms captured—the genera Doliolum, Oikopleura and Fritillaria being all that were thus represented in their catches. Simple and compound forms abound everywhere and immense quantities of a *Ciona sp.* may be dredged at times in the Swan River estuary (Freshwater Bay). Our Abrolhos collections are now in the hands of Professor Herdman for examination.

Enteropneusta.—Perhaps the most interesting animal collected from the Abrolhos Islands is a new enteropneust which I have named *Ptychodera pelsarti,* after Pelsart, whose ship, the "Batavia," was wrecked on one of the islets in 1629. This is the first enteropneust to be recorded from the West coast of Australia. None have been recorded from the Southern coast, but two species are known from the East. They belong, however, to different genera, so that this is the first record of the genus Ptychodera from Australian waters.

The species resembles most closely the type generally regarded as *Ptychodera flava,* "varieties" of which are known from the Laccadive and Maldive Islands in the Indian Ocean, and from certain islands in the Southern Pacific.

The animals occur in the shelly ground in rockpools along the extreme southern part of the Pelsart Island reef, quite close to the southern extremity of Pelsart Island itself. They possess the characteristic features of the group now restricted as the Ptychoderidae (Spengel). The species differs from previously known forms in respect chiefly to the Nuchal Skeleton and other anatomical features. A paper describing the species in detail is now in the Press, and should be published shortly in the Trans. Linn. Soc., London.

I am afraid that my Anniversary address has been something of the nature of a "patchwork quilt"! I can only say, by way of excuse, that our knowledge of the marine fauna of West Australia *is* very patchy. Members of the Royal Society can do a great deal to remedy this state of affairs, for there are many people in the State who are resident on the shores of the Indian Ocean, and interesting objects are frequently washed up in the living condition after storms. Residents in the North-West might obtain many valuable specimens from the pearl fishers—valuable to the scientist, and of no possible use to the fishermen. These specimens should be preserved in spirits or formalin and forwarded to the University. We intend, of course, to build up gradually a small teaching collection, but specimens (and these will probably be the more numerous) which do not exactly come under the category of a University teaching collection will find a resting place in the West Australian Museum. This institution should house, if possible, a specimen of every species found upon our coasts. It will then be fulfilling what is to my mind its most important function, and its collection will be of value both to the scientist and the layman: to the seeker after real information, as well as to the mere curiosity-monger.

THE TIDES: WITH SPECIAL REFERENCE TO THOSE OF FREMANTLE AND PORT HEDLAND.

By

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INTRODUCTION AND SCOPE OF THE PAPER.

(Read Oct. 13, 1914.)

A short summary of what was known about the tides in early times and a brief reference to the main theories that have been advanced to account for their behaviour will be given at the outset of this paper in order that there may be a proper understanding of some of the points which are discussed in connection therewith.

As far back as the first century B.C., it was realised that there was a dependence between the moon and the tides, but the reason for this connection was not known until the seventeenth century, when Sir Isaac Newton explained it as due to the force of gravitation exercised by the moon upon the waters of the ocean, and later on postulated that the sun must exert a similar influence.

Naturally Newton was not satisfied with the bare statement of this fact but elaborated a mathematical theory which is known as the "Equilibrium Theory." It demands, in brief, that the tidal cone of water should be under the moon—reference to the sun is omitted because mention of it only complicates matters and makes a simple explanation impossible—but the sun's attraction has to be considered equally with the moon's. It was called the Equilibrium Theory because the moon is supposed to act for an appreciable time upon any single part of the ocean and therefore that portion might be treated as if it were at rest or in a state of equilibrium. It is rather peculiar that the most trustworthy records then available, namely those of Cadiz, clearly place the high water under the moon. However, when Newton came to investigate the tides of the English coasts, he found so many discordances to this necessary postulate that he became dissatisfied with and mistrustful of his original theory, though he never lived to make any material alteration to it. About a hundred years later, however, Laplace formulated his famous Dynamical Theory which, as far as the then known tides were concerned, brought about satisfactory harmony between theory and actual fact. And yet, had tidal records from America, India, and the southern hemisphere been available, it is highly probable that the dynamical theory would never have been evolved, for the great majority of these tides do not conform to it. Whereas the equilibrium theory does offer a reasonable explanation of what actually takes place or at any rate enormously reduces the number of anomalies.

It is difficult to explain in a few words what is meant by the dynamical theory, but speaking generally the position of the tidal cone according to this theory depends mainly upon the rotation of the earth upon its axis, and the cone of water would be in great part due to a heaping up of the water owing to centrifugal force and would of necessity travel along lines parallel to the equator. In contradistinction to this the equilibrium theory, as already mentioned, demands that the cone of water is drawn up by the gravitational attraction of the moon and sun.

This main distinction between the two theories must be carefully borne in mind, especially in the case of the Port Hedland tides, so that the arguments in favour of the equilibrium theory may be appreciated when these tides are examined in detail.

A glance at Plate VIII., Fig. 1, entitled "Diagram explaining Diurnal Irregularity," will make one of the arguments in favour of this theory quite clear. The central circle represents the earth and the shaded area an imaginary shell of water—enormously exaggerated in proportion to the size of the earth. The moon is supposed to be at M, at its furthest distance from the equator and the maximum bulge of water is occurring under and opposite to M. Now it can be readily seen that a port at H where a high tide is taking place, will be carried by the earth's rotation on its axis, SN, through a low water at L to another high water at H^1 and here, owing to its being nearer to the major axis of the ellipsoidal shell of water, the tide is higher than at H. As the moon approaches the equator, it carries the tide-bulge with it and the difference in height between the H and H^1 becomes less and less, until at the equator it vanishes. It should be further noticed that as the moon travels to the other side of the equator, the H tide becomes higher than the H^1 tide. When the tides of Port Hedland are examined it will be found that their behaviour can be explained by reference to this diagram, and to a lesser extent the action of the Fremantle tides. So much by way of introduction.

Before, however, discussing in detail the Fremantle and Port Hedland tides, a brief reference to the history of tidal observations in Western Australia will not be out of place.

Tidal Observations in Western Australia.

Probably on no coast in the world is there less exact knowledge of the tides than on the coast-line extending from Wyndham in the far north to Eyre in the extreme south-east, and therefore it will not be surprising to learn that satisfactory records have been taken at only one port, namely Fremantle.

As far back as 1873 the Admiralty recognised the importance of a knowledge of the tides on the Western Australian coast and caused a series of observations to be carried out at Fremantle. The work was performed chiefly by Staff-Commander Archdeacon, R.N., the officer in charge of the Admiralty Survey of the coast and per-force only extended over a comparatively short period, but long enough to prove that the Fremantle tides were extremely interesting from a scientific point of view and called for a series of observations extending over many complete years before a correct interpretation of their numerous anomalies could be given. In spite of this, however, on the discontinuance of the Admiralty work nothing further in the way of tide-recording was attempted for many years.

In 1900, following on recommendations by Captain Irvine, the Chief Harbour Master, and by Mr. Cooke, the Government Astronomer, a number of Bailey's tide recorders were purchased and in the course of time gauges were established at Fremantle, Bunbury, and Albany, and later on at Port Hedland. For a long time the records from these gauges were stored away and put to no use—the result showed what a mistake this was.

In 1911, however, a very progressive step was taken—the appointment of a computer to undertake the compilation of these records. The work was commenced at the Observatory under my supervision, owing to absence of Mr. Cooke who was at the time in England. A start was made on the Fremantle figures, which, as it turned out, were the only ones that had been properly kept. When the records from the other ports came to be examined at the Observatory, it was found for various reasons that it was impossible to obtain satisfactory readings from them.

This was much to be deplored and only proves how essential it is that constant and expert supervision should be kept over work of this nature. The figures obtained from the Fremantle records for the years 1908 to 1912 were compiled and finally treated according to the method of harmonic analysis proposed by Sir George Darwin and the one now universally adopted. A brief explanation of this method and the results of the analyses appear at the end of this paper.

The Port Hedland Tide Gauge and Records.

As already mentioned, the records taken at the above port were found to be valueless, not only on account of the number of breaks in the records, but because the scale of the Bailey tide gauge was far too small and proved quite inadequate for the registration of such a wide range of tide as is experienced at Port Hedland. It was therefore decided to have a gauge of more suitable design constructed, and Messrs. Jones & Co., of Perth, under the supervision of Mr. Yeates, of the Observatory, were entrusted with the work. The new gauge—a photograph of which is reproduced (*vide* Plate IX., Fig. 1)—departs somewhat from the usual form of tide-recording instrument, in that it is the pencil, and not the drum, which is operated by clock-work. The drum itself is directly attached to the tide-float and turns backwards and forwards as the float rises and falls with the tide. In order to eliminate wave action the float is free to pass up and down an enclosed cylinder which at Port Hedland consists of a heavy iron tube over 20 feet in length, weighing at least a ton. In the photograph may be seen the cord, with weight (invisible) attached, passing over the small pulley-wheel on the left, and connecting on to the pencil carrier which moves along two parallel slides. Attached to the other side of the carrier is the other cord, passing round the small wheel on the right, and thence up to the clock—an ordinary "Ansona." At the back of the clock it winds round a cylinder fixed to an extension of the centre-arbor. As the clock gradually runs down, the weight draws the pencil carriage along the slide a distance of approximately twelve inches in the twenty-four hours. A long chain, made from bicycle chains, passes over two gear-wheels, and attaches to the float on the right-hand side (neither float nor any portion of the well appears in the photograph). The top gear-wheel engages in a small cog-wheel on the end of the axis of the drum, and gives the rotary movement to it. It is so geared up that a foot rise or fall corresponds closely to half-an-inch turn of the drum. The chain passes down over a lazy-pulley and is made fast to a counterpoise weight. The cylinder or drum is fifteen inches long and six inches in diameter. It is placed horizontally on a solid stand beyond which one end of its axle projects, engaging by the system of gear-wheels mentioned above upon the eight-inch B.S.A. wheel.

In the majority of tide-gauges the pencil is operated by the float and the drum, with its axis placed either horizontally or vertically, is driven round by clock-work. By introducing the above radical change in the Port Hedland gauge a more easily decipherable tide curve was ensured and a distinct improvement in the adjustment of time was expected. For it can be readily understood that it is not necessary to depend upon the clock which draws the pencil-carriage along, for the time. This is marked on the sheet at the beginning and end of a day's run, and may be obtained from the local post-office. The sole purpose of the clock is to give uniform motion to the pencil, and so long as its rate does not materially vary during each twenty-four hours it is possible to fix with great accuracy the exact instant of any point on the tide curve. Thus, if the sheet were put on at nine o'clock and taken off at the same time next morning, then it is only necessary to divide the horizontal line between these two marks into twenty-four equal parts and we have every hour of the day marked on the sheet. Two examples of the tide curves registered at Port Hedland on this instrument are reproduced (*vide* Plate IX., Fig. 2, and Plate X.) to show what a clear, widely-spaced trace is obtained. It must be borne in mind that they are on a scale considerably reduced from the original sheets, which measure thirteen inches in length; the height being correspondingly increased. Incidentally, the photographs are examples of "spring" and "neap" tides respectively and clearly indicate the marked difference between the two types. It will be noticed that the high waters appear at the bottom of the sheets, which is rather confusing, perhaps, but owing to the nature of the gauge it cannot be avoided.

The records for the year 1913 have been tabulated and analysed; the tidal constants thus evolved appear at the end of this paper.

Before leaving the Port Hedland tides it will be interesting and instructive to examine in detail the tidal trace for the month of June, 1913, of which a copy is reproduced (*vide* Plate XI.). It should be explained that this is not an absolute copy but is plotted from the actual times and heights obtained from the original sheets. This procedure was adopted in order that the confusion resulting from the high water appearing at the bottom might be obviated, for in plotting it was quite a simple matter to arrange this without in any way altering the curve.

It will be noticed that the curve is divided into four parts, each part representing the record for one week. Thus the first line commences at 6 a.m. on the first (Sunday) and finishes at 6 a.m. on the following Sunday, while the second line commences where the first line terminated, namely at 6 a.m. on Sunday (8th) and so on with lines three and four. The curves for the corresponding days of the week are thus found in the same vertical line. The height scale is shown at either end and runs from 5ft. to 25ft. Only the even hours of the day and night are marked along the top—"Day 12" being noon, while "Night 12" stands for midnight and the commencement of the day. Along the 25ft. line the approximate times of transit of the moon for the meridian of Port Hedland are noted with short black lines, the lower transits being distinguished from the upper by small extensions at the bottom of the line. Along this line the phases of the moon are also shown, the black spot standing for "New Moon," the spot darkened on the right-hand side being the "First Quarter," the white spot "Full Moon," and the spot darkened on the left-hand side representing "Last Quarter." Along the 5ft. line the day on which the moon was furthest north, on the equator, and furthest south is marked, as also the times of "Perigee" and "Apogee," namely when the moon was nearest and farthest away from the earth.

The first striking peculiarity noticeable in connection with these tidal curves is the difference between the two high tides or the two low tides of each day. In nearly every instance the night tide is from six inches to almost two feet lower than the day tide. Reference to the diagram "Diurnal Irregularity," Plate VIII., Fig. 1, will explain how this comes about.

Continuing the investigation and bearing in mind the changes in position of the ellipsoidal shell of water resulting from alterations in the moon's position, it will be found, as would be expected, that when the moon is at its greatest distance north or south of the equator the maximum difference between alternate high waters occurs, amounting to 1ft. 10in. and 1ft. 6in. on June 6th and 19th respectively and more than that, the highest of the two falls on the 6th when the moon was between one and two days old and consequently the two bodies, the sun and moon, would be close together when passing the upper meridian. This point lends additional weight to the equilibrium theory under which, as I have stated before, the cone of water attempts to place itself under the sun and moon and according to which that tide would be greatest which is directly under and not opposite to the two bodies—notice how the tides of the 6th conform to this argument. And if these tides are compared with those of the 19th additional weight is given to the theory from the fact that on the 6th when the sun and moon are both north of the equator, the tide is higher than on the later date when the sun is north but the moon south.

Another feature of the tides, familiar to everyone, namely its daily retardation, is also clearly brought out. Just as the moon, owing to its movement eastwards along its orbit, rises later every day, so the tidal cone, since its progress is governed in great part by the moon, suffers retardation. The mean retardation of the moon for these 28 days in June amounts to 50 minutes and for the same period the tidal retardation works out at 49 minutes. This agreement is very striking and proves how closely the progress of the tidal wave depends upon the moon. Turning to the tide curves for June once more and noting the times at which the alternate high tides occur, it will be observed that on June 1st the high tide took place at 8.15 a.m.; on June 2nd at 8.44 a.m.; on June 3rd at 9.48 a.m.; on June 4th at 10.16 a.m., and so on—the crest of the morning wave gradually becoming later every day, until by June 15th the retardation amounts to over 12 hours, and naturally the high tide which occurred in the morning on June 1st has now become on the 15th the evening tide. It will also be noted that the times of high and low waters on the 15th are very nearly the same as on the 1st. If the cruve could be followed to the end of the month, it would be found that this evening tide became in turn the morning tide of the 29th.

From all this it will be seen at once that so far as the times of high and low water are concerned the tides repeat themselves very closely every fortnight, or, more exactly, every half of a lunation.

Other interesting features come to light on inspecting the curve. Thus, during the first fortnight, the range of tide was greatest on the 6th and 7th—the largest variation in level between consecutive high and low waters being 18 feet, namely between the mid-day high tide and the afternoon low tide; while the smallest variation occurred between the evening high tide of the 14th and the morning low tide of the 15th, when the difference amounted to 7½ feet. From this time on the range increases until the 19th and 20th, when it was approximately 17 feet and then it begins again to diminish, reaching a minimum of 5½ feet on the 28th.

A glance at the moon's phases shows that it was "New" on the 5th and "Full" on the 19th, while "First and Last Quarters" fell on the 12th and 26th respectively. The tides which occur about the time of new or full moon are termed "spring" tides, while those which happen near the time of first or last quarter are called "neap" tides. The information that has just been obtained from the curve clearly discloses the relationship existing between the spring and neap tides and the phases of the moon.

Still another point must be noted: the tides of the 10th, roughly a day before "First Quarter," are higher than those on the 25th, a day before "Last Quarter"; whereas, conditions being the same, tides of the same height would have been expected. The reason for the discrepancy is not hard to find: on the 10th the moon was in perigee or at its nearest distance to the earth, while on the 25th it was in apogee or further from the earth than at any other time during the month, and hence the moon's attraction on the 25th would be less than on the 10th and consequently the tides would be lower.

Summarising what has been so far discovered from an examination of these June curves, the connection between the moon and the tides has been demonstrated beyond doubt. It has been clearly shown that the height or range of the tides depends chiefly upon the phase of the moon and in a minor degree upon the distance of the moon from the earth. The highest tides of all would therefore be expected when these two causes act together, namely when new or full moon occurs at a time when the moon is also nearest to the earth or in perigee. To verify this, it will be necessary to run through the whole year's records and pick out the readings on the days when the above coincidences take place. The following dates, picked out at random, must suffice:—On September 1st the moon was "New" and nearest to the earth, the high water was 26ft. 9in. and the low water 3ft. 11in.; while on the 15th, when the moon was "Full," the tide only rose to 25ft. and fell to 5ft. 1in., but on this date the moon was in apogee. Again, on February 7, new moon occurred at apogee and the tides were 24ft. 4in. and 6ft. 3in. high and low water respectively. With which contrast the 21st, the moon being "Full" and in perigee, when there is a high tide of 27ft. and a low of 4ft. 7in. according to the tide trace. It should be remarked that owing to the tide gauge being about 9ft. above the datum line, this quantity must be taken from the readings given to obtain the exact height of the water level.

The relationship between the tides and the phases of the moon would at once prove that the sun, even if the fact were not already known, plays a very important part in tidal phenomena, and an examination of the constants for Port Hedland at the end of this paper shows that the mean solar is responsible for a tide about one-third that of the mean lunar. And this is exactly what we would expect from theoretical reasoning. It can be understood in a general way when it is realised that the tide-generating force varies directly as the mass and inversely as the cube of the distance of the tide-generating body. Thus, although the sun is enormously larger than the moon, its tide-lifting force is only one-third that of the moon. It is quite easy to demonstrate this from the known distances and masses of the two bodies. Full information on this point and many others dealing with the tides can be obtained from almost any text-book on the tides, and perhaps for preference *The Tides,* by G. H. Darwin. Without, however, going into these points it will be seen from the curves that at new and full moon when the sun and moon are in line, the maximum tides occur and are known as "Springs"; while at first and last quarter the tidal range is only about one-third that of the springs, and these are called "Neaps." Under ideal conditions this would probably apply but in practice, as in the Port Hedland tides, the spring and neap tides occur one or two days after the changes of the moon. Reference has already been made to good examples of spring and neap tides in October (*vide* Plate IX., Fig. 2, and Plate X.). At the time of the Equinoxes the highest springs and the lowest neaps of the year will generally be found. The ready explanation being that the sun is then on the equator and consequently the new and full moon must be on the equator also, and thus towards the end of March and September the highest tides may be looked for simply because the two great tide-generating bodies are exerting their respective pulls along exactly the same line.

So far these tidal curves have borne out what would be expected to take place according to the Equilibrium Theory except that the height of the tide is considerably greater than what would be looked for under ideal conditions. There are, however, a number of factors which singly or collectively would account for this apparent anomaly. The chief of which would be, firstly, the depth of water; secondly, the speed of the wave—this is simply a corollary of the first; thirdly, the configuration of the coastline, and fourthly, the direction of ocean currents caused by the earth's rotation and by the distribution set up by the difference in temperature between equatorial and polar waters. (There are probably other causes, but these must suffice.)

Now it is a fact well known to everyone that an ordinary ocean roller gradually becomes steeper as it approaches a shore which shelves upward—Cottesloe Beach for instance. And so with the tide-wave: in the open ocean it has a maximum of about three feet, but when the ocean bed shelves upwards, then the height of the tide-wave is increased. The shallow, shelving ocean floor along the North-West coast is undoubtedly the main cause of the high tides there. At many places the height is still further augmented by the shape of the coast-line, as for instance at Derby, situated at the head of King Sound, where tides of 36ft. occur. However, there is not sufficient data available to adequately discuss the reasons for the high tides along the North-West and Kimberley coasts.

Returning once again to the tide-curve for June, at first glance the crest of the wave or high water comes fairly well under the moon, namely, coincides with the moon's transit at new and full, as the equilibrium theory demands, and gradually lags behind as first and last quarter is approached. A closer inspection shows that the high water is twelve to nine hours after the moon's transit. If figures from other ports on the coast were available, it would probably be found that this interval between the moon's meridian passage and the time of high water varied widely—so widely that it would seem impossible to reconcile the equilibrium theory with the discordant results. However, the four factors just mentioned would be quite sufficient to account for all the different intervals that may exist, and hence it is not fair to say that the theory breaks down because the crest of the wave does not occur approximately under the sun and moon at all places about the time of new and full moon. In connection with wave transmission it is worth remembering that a wave travels faster in deep water than in shallow, and hence the lag of the tide-wave behind the moon must vary directly with the different depths of the ocean along the coast. At some future time, when the importance of tidal work has been recognised in Western Australia and observations taken at all the ports, a complete discussion it is hoped will be undertaken.

The time that elapses between the moon's meridian passage and high water is termed the Luni-tidal Interval, and if these intervals are plotted, using the moon's meridian passage as an argument, a curve results which is known technically as "The True Establishment of the Port." Plate XII., Fig. 1 shows the Establishment for Port Hedland. To make use of the diagram the time of the moon's transit, taken from the Nautical Almanac, is noted on the top or bottom line, and then the point on the curve vertically above or below. From this point the horizontal line is followed to the time scale on either side, giving the luni-tidal interval, which, added to the time of moon's transit, gives approximately the time of high water. To obtain a more accurate result corrections for the sun's position, the moon's declination, and the time of the year must be added.

It stands to reason that this rough and ready method is only applicable at places where the tides are fairly regular; it would break down in cases where the tides are irregular or do not depend in the main upon the moon. Thus at Fremantle, as will be found later on in this paper, it would be impossible to determine any definite curve.

Just as a rough rule for finding the time of high water can be made out, so in the same way curves can be drawn, having the moon's meridian passage as argument, from which the approximate heights may be estimated. Thus Plate XII., Fig. 2 provides a means of finding the height of high and low water and consequently the range of the tide at Port Hedland.

The Fremantle Tides.

Turning now to the Fremantle tides it will be found that the matter becomes very much more complicated and not nearly so easy of elucidation. As mentioned above it is impossible to make a curve of the luni-tidal intervals; nor is it possible to show on a diagram the height or range of the tide depending upon some determinable argument. It will be found from observations that there is no such thing as spring or neap tides as would be naturally expected. In fact, there are few places in the world where tidal complications are so pronounced as at Fremantle. I cannot do better than repeat some of the remarks that I made when publishing the Fremantle tide tables for 1913.

They (the Fremantle tides) are not marked by the comparative simplicity that obtains in the tides of British and European waters, where in many cases the interval elapsing between successive meridian passages of the moon and the time of high or low water is almost invariably a constant quantity or closely approximates to such and where the heights of consecutive high waters and of consecutive low waters follow a fairly constant law, but on the contrary the differences in heights and the inequalities of successive intervals appear to the casual glance to be governed by no fixed law, but seem to be as variable and capricious as the weather. This peculiarity can very probably be accounted for by the disturbing influences of the wind and weather on the comparatively small range of tide prevailing at Fremantle which, except at certain short periods during each month, when it exceeds two feet six inches, rarely averages more than eighteen inches, thus should a strong easterly or nor'-easterly wind be blowing the theoretical time of high water is almost certain to be delayed and the height also diminished. On the other hand, the sou'-wester or sea breeze banks up the water to a greater or less degree, dependent upon its intensity, accelerating the time of high water, augmenting its height and prolonging its duration. This would be especially noticeable during a westerly blow, and the exceptional height often reached by the tides during the winter months is almost solely due to the banking up of the water against our western coast line; although in this connection, it must be remembered that the great tide wave which travels along the South coast of the continent from east to west is retarded by a westerly wind, and its height necessarily increased, and consequently there occurs an additional banking up of the water of the ocean off Cape Leeuwin, which makes its effect felt to a greater or less extent northwards.

These reasons explain why a continued and perhaps exceptionally high tide often heralds the approach of a cool change in summer or of a Nor'-West storm in winter. In this respect it must be borne in mind that the ocean is affected by atmospheric pressure to a slight extent, the surface of the sea rising with a low and falling with a high barometer. Theoretically there is an alteration of level corresponding to one inch for every one-twentieth inch of mercury.

But it must not be imagined that the absence or elimination in some way of these disturbing elements would cause the Fremantle tides to be marked by the same regular law or laws that appear to prevail in the case of those in European waters. On the contrary, it is almost safe to say that their peculiar irregularities would be just as much in evidence. The use of the words "peculiar irregularities" in connection with them is, perhaps, inaccurate, and is only justified by comparison with the tides of the North Atlantic, which are really exceptional in their simplicity. There are probably many other ports in the world where the tides are just as uncertain.

Although the luni-tidal interval, namely, the time that elapses between the moon's meridian passage and the following high tide, is subject to every possible variation, to such an extent that no reliance can be placed upon this method of predicting the time of high or low water, still an examination of the Fremantle tides bring some interesting features to light.

Thus when the moon is in Perigee the tides are invariably higher and the range greater than in Apogee. This is only to be expected, for its attractive force is then at a maximum. So in this respect, at all events, the Fremantle tides conform to the generally recognised law. On the other hand, we might expect to find some regular sequence of change existing between the tides and the phases of the moon, but a comparison between the times and heights of high and low water with the age of the moon fails to disclose any existing connection, in fact, it only still further serves to emphasise the complications present in the tide-governing forces, and to demonstrate the difficulties likely to be met with in an attempt to accurately explain them. For the greatest and least ranges occur both at the change and full of the moon alike.

It should be noted in this comparison that at about the time of first quarter and again at last quarter the diurnal tide, namely one high and one low during the day, is almost invariably in evidence. It also may be taken as a general rule that the highest tides and greatest range occur about the time of moon's first quarter, although this sometimes breaks down. At the time of full or new moon the semi-diurnal tides often make their appearance, marked by small range and great irregularity. But it sometimes happens, as mentioned above, that the highest tides and the greatest range take place at these times, with the almost certain prevalence of a diurnal tide.

A comparison, however, with the moon's position in declination shows that when the moon is on the Equator, the least range occurs, the variation in water-level being about one foot, and also great irregularity in the times of high and low water is apparent. Very little reliance can be placed upon the tidal predictions at this period. Often for quite a considerable length of time the water remains unchanged in level. The semi-diurnal tides, namely, two highs and two lows during the twenty-four hours are also in evidence, but the secondaries are sometimes barely perceptible, the difference between the heights of this inferior high and low water being only a few inches.

As the moon moves North or South of the Equator, the range gradually increases and the tidal curve becomes regularly diurnal in character. More dependence also may be placed upon the predicted times as the moon's distance from the Equator increases.

Contrary to what might be expected the highest tide and greatest range happen when the moon is at its farthest North point, and not at its greatest South declination, when the moon would be almost directly over Fremantle, and would thus be in a position to exercise the maximum attractive force on the water.

It may be stated, therefore, with some degree of certainty, that the Fremantle tides depend to a large extent upon the moon's declination, and from its position the range of tide may be gauged fairly accurately, but the irregularity in the occurrence of successive highs and lows, although most marked when the moon is on the Equator, is still to be expected when the moon attains her greatest North or South declination.

On Plates XIII. and XIV. copies of the Fremantle tides for June and October, 1910, have been plotted in the same way as the Port Hedland curve for June, 1913, shown on Plate XI., so it is not necessary to repeat the explanation of the different lines and figures.

The first thing that strikes the observer is the unevenness of the trace compared with that of Port Hedland. The same gradual rise and fall of the water level is absent and in addition there is generally only one high and one low during the twenty-four hours. This affords perhaps the most striking difference between these two tides, for whereas the tides of the northern port are almost without exception semi-diurnal, namely two highs and two lows every twenty-four hours, those of Fremantle are, as just noted, diurnal. The semi-diurnal sometimes puts in an appearance but it is only a very half-hearted attempt. A close inspection shows that some of the arguments in favour of the equilibrium theory hold even with these tides, but they are not nearly so self-evident.

It will be noticed that in June, when the tides are diurnal, the high water seems to follow the sun by an hour or so, and consequently the low tide occurs at night, but this is not invariably the case, for a glance at the October trace shows that, when distinct diurnal tides take place, the high water occurs at night.

In order that the effect of the weather upon the tides may be appreciated, along the bottom line for each day the barometer reading and the wind with its velocity are inserted. The north-west and west winds, which along the west coast generally spell stormy conditions, will be found to cause an appreciable uplift of the water level; for an example of this notice the abnormal heights of both high and low tides from the 5th to the 8th and again on the 26th and 27th. The same result is apparent in October, especially on the 16th. And many of the other points in the main remarks on the Fremantle tides may be verified by reference to these charts, but nothing of the same convincing nature is brought to light as in the case of the Port Hedland tides.

Tidal Computations and Predictions.

A brief explanation of the method of analysing the figures obtained from the records and of making out predicted tide tables for any place will constitute a fitting conclusion to this paper.

First of all from the remarks that have already been made when explaining the "Establishment of a Port," it can be perhaps realised that it would be impossible to calculate a tide table for any port unless observations had been taken there beforehand. This is a point that is overlooked by many people and only goes to prove how inadequate all the theories of the tides really are. From the tide curve, which for preference should consist of a complete year starting from January 1, though this is not absolutely necessary, hourly readings of the heights are extracted and summed in various ways. The figures resulting from this summation are then analysed with the object of determining the actual semi-range of each tide and its phase at some definite epoch.

A brief digression must be made here to explain this last statement. Owing to the earth's revolution round the sun, the earth's rotation on its axis and the moon's revolution round the earth, the two tide-generating bodies, the sun and moon, are continually occupying different positions, not only with regard to the earth but also relatively to one another. And further, owing to the eccentricities of the orbits of the earth and moon, the moon moves at varying speeds round the earth, while the former travels at changing rates round the sun, or in other words the sun *appears* to do so. Realising what this means, some idea of the difficulties to be overcome in a solution of a tide table for any port may be better imagined than described.

If the earth's path round the sun were circular and the moon's motion quite regular, then the prediction of tide tables would be a comparatively easy problem.

And yet it was by applying this principle that Sir George Darwin overcame the difficulty met with in Nature. He split up the sun and moon, as it were, into a number of small bodies and imagined each one to be travelling at a certain fixed rate round the earth. The problem then simply resolved itself into finding the tide produced by each of these imaginary bodies. And, therefore, keeping this point in mind, the actual curve traced from day to day by the tide-gauge pencil may be considered to result from the combination of a number of separate curves drawn by pencils travelling along at different velocities and each one moving through different heights or amplitudes. The question is thus reduced to one of simple harmonic motion and a glance at Plate VIII., Fig. 2, will explain this. Let the point P move regularly round the circumference of a circle and let perpendiculars be continually dropped upon a fixed diameter DD. Then as P moves round the cicle, M will move up and down with a speed varying from zero at either end of the diameter to a maximum at the centre. This movement of M is called "Simple Harmonic

Motion" and, if the length of the diameter and the position of P, measured by the angle MOP, are known, then the distance of M from O can be computed.

Now, applying this reasoning to the solution of any one of these simple tides:—The speed is known and therefore the rate at which P travels round the circle. For example, the main solar tide is caused by a sun moving uniformly round the equator at the rate of 15° per hour, namely 360° or once round in one day; the main lunar by a moon moving in the equator at the rate of 14.4° per hour, namely 360° in 25 hours; while the rates of the other fictitious tides are given in the tables of constants. For each tide the semi-range is determined and therefore the diameter of the circle is known. The phase or angle MOP is worked out for a certain epoch—say January 1st, 0hrs. Then from the known speed the alteration of the angle MOP, after any interval, can be estimated and, knowing this angle, the height OM for any instant can be found for each tide. The algebraical sum of all the tides gives the resulting height of water.

This same principle is elaborated in the construction of tide-predicting machines, except that the procedure is reversed.

Analyses of the figures for 1908-12, Fremantle, and 1913, Port Hedland, were completed at the Observatory and appear in the following table:—

THE TIDAL CONSTANTS FOR FREMANTLE AND PORT HEDLAND.

Short Title.	Speed per hour.	Name.	Rough Period.	H. or Semi-Range.				K. or Phase.			
				Fremantle.			Port Hedland.	Fremantle.			Port Hedland.
				1874. Thomson	1908–10. Cooke.	1911–12. Curlewis.	1913. Curlewis.	1874. Thomson	1908–10. Cooke.	1911–12. Curlewis.	1913. Curlewis.
	°			feet.	feet.	feet.	feet.	degrees.	degrees.	degrees.	degrees.
K_1	15·041	Luni-Solar declinational	Diurnal ..	0·611	0·445	0·389	0·791	..	319	285	295
O	13·943	Lunar	do. ..	0·430	0·322	0·314	0·499	..	324	303	284
P	14·959	Solar	do. ..	0·156	0·144	0·090	0·195	..	313	196	289
M_2	28·984	Mean Lunar	Semi-diurnal	0·154	0·116	0·113	5·509	..	325	303	319
S_2	30·000	Mean Solar	do. ..	0·145	0·109	0·110	3·352	..	318	318	19
Q	13·399	Greater Lunar Elliptic Decl.	Diurnal ..	0·114	0·083	0·066	0·102	..	333	301	271
S_1	15·000	Mean Solar	do. ..	0·039	0·059	0·046	0·115	..	268	259	257
K_2	30·082	Luni-Solar Declinational	Semi-durnal..	0·051	0·033	0·032	0·800	..	318	338	0
N	28·440	Greater Lunar Elliptic	do. ..	0·040	0·030	0·034	0·868	..	20	7	292
J	15·585	.. ..	Diurnal ..	..	0·030	0·022	0·036	..	316	61	302
S_4	60·000	Mean Solar	..	..	0·002	0·008	0·041	..	225	114	189
S_6	90·000	Do.	..	..	0·001	0·001	0·024	..	167	83	193
T	29·959	Larger Solar Elliptic ..	..	..	0·028	0·008	0·214	..	89	86	99
R	30·041	Smaller Solar Elliptic	..	..	0·024	0·005	0·096	..	237	255	154
M_1	14·492	Mean Lunar ..	..	..	0·025	0·018	0·030	..	293	304	251
M_3	43·476	Do.	..	..	0·006	0·002	0·007	..	236	264	233

M_4	57·968	Do.	..	..	0·009	0·008	0·121	..	312	302	91
M_6	86·952	Do.	..	..	0·002	0·001	0·065	..	282	327	216
L	29·528	Small Lunar Elliptic ..	..	..	0·010	0·009	0·462	..	328	323	340
V	28·513	Larger Lunar Evectional	..	..	0·009	0·007	0·212	..	85	113	294
U	27·968	Compound	..	..	0·010	0·013	0·224	..	24	356	337
2SM	31·016	Do.	..	..	0·007	0·005	0·101	..	200	206	336
MS	58·984	Do.	..	..	0·008	0·010	0·073	..	356	321	278
Sa	0·041	Solar	Annual ..	..	0·326	0·402	0·372	..	249	226	172
Ssa	0·082	Solar	Semi-annual	..	0·132	0·075	0·148	..	151	225	75
Msf	1·016	Luni-Solar	Fortnightly	..	0·093	0·052	0·048	..	54	33	187
Mf	1·098	Lunar	do. ..	..	0·050	0·024	0·022	..	184	212	307
Mm	0·544	Do.	Monthly ..	..	0·107	0·085	0·091	..	218	200	86
A_0	..	Mean Sea Level ..	..	..	2·055	2·186	16·151	..	..	..	..

An examination of the above figures shows that the Fremantle tides are mainly controlled by the two diurnal tides, K and O, and that the ordinary semi-diurnal lunar and solar ones are comparatively unimportant. This, of course, accounts for the tides being generally diurnal. It should be pointed out that the two tides, K and O, are not exactly diurnal but nearly so, their periods being 23 hours 56 minutes and 25 hours 49 minutes respectively. This gives one of the reasons for the irregularity of the Fremantle tides.

With regard to Port Hedland, it will be seen that the mean lunar and the mean solar quite overshadow all the other tides, and hence the semi-diurnal character of these tides is not surprising.

The diurnals K and O are next in importance but are so small that they only have a chance of making their presence felt about the time of first and last quarter of the moon and are only partially successful.

It has only been possible to analyse the records for this one year, for the simple reason that the services of the tide-computer have been dispensed with, and consequently the work of collecting the hourly readings and performing the preliminary computations has come to a standstill. This is a very great pity and should be remedied as soon as possible. The subsequent year's records are urgently awaiting compilation and in addition observations should be extended to other ports, in the tropics at all events, in order that tide tables from them should be available to shipping.

NATROJAROSITE FROM KUNDIP, PHILLIPS RIVER GOLDFIELD.

By

Edward S. Simpson, B.E., B.Sc., F.C.S., and Maurice A. Browne, B.A.

(Read April 13, 1915.)

Before entering upon a description of the mineral Natrojarosite from Kundip and its mode of occurrence, it will be well to give a short outline of the history of the species Natrojarosite and its potassium homologue, Jarosite. This is advisable since, whilst both are comparatively rare minerals, the subject of this paper is so little known that even its name does not appear in any but the most recent text books.

HISTORICAL.

1838. C. F. Rammelsberg described a "Yellow Iron Ore" (Gelbeisenerz) from Luschitz, Bohemia, where it occurred in brown coal. The composition was that of a basic sulphate of iron and potassium, for which the author calculated the formula, $K_2O.4Fe_2O_3.5SO_3.9H_2O$. —Pogg. Annal., 43, 132.

Later in the same year, Scheerer published an analysis of a similar mineral occurring in alum-slate at Modum, Norway. In this, sodium entirely replaced the potassium of the Luschitz mineral, the calculated formula being $Na_2O.4Fe_2O_3.5SO_3.9H_2O$.—Pogg. Annal. 45, 188.

1847. J. A. F. Breithaupt first used the specific name Jarosite for the basic potassium iron sulphate from Sierra Almegrera, Spain, and other similar minerals of rhombohedral crystallisation.--Berg. u. Hutt. Zeit. 6, 68.

1866. A yellow mineral from Paillieres, France, thought to be a basic sulphate of iron without alkalies, named Pastreite by Dr. Normann.—Verhan. n.-h. Ver. Rheinl., 17.

1864-1890. Typical potash-bearing Jarosite, described by various authors from Spain, Saxony, Urals, Arizona, Colorado, Utah, Mexico, and Peru.

1893. W. P. Headden described as Jarosite a mineral occurring in auriferous quartzite at the Buxton Mine, Lawrence Co., South Dakota. According to a subsequent recalculation of Headden's figures this mineral contained soda, 4.86 per cent.; potash, 1.65 per cent. It was, therefore, not Jarosite but its sodium homologue. —Amer. Jour. Sci., 46, 24.

1896. Scheerer's analysis of the sodium-bearing mineral from Norway quoted by Dana under Jarosite. He gave the formula for the latter as $K_2O.3Fe_2O_3.4SO_3.6H_2O$.—Sys. Min., VI Edit., 975.

1899. Headden's description of the sodium mineral from South Dakota quoted by Dana under Jarosite.—1st App. to Sys. Min., 37.

1901. H. W. Turner recorded the occurrence at Soda Springs Valley, Nevada, of a large quantity of a golden brown micaceous mineral, which Dr. Hillebrand reported was the practically pure sodium salt corresponding to Jarosite.—Amer. Jour. Sci. 13, 345.

1902. Hillebrand and Penfield described, with analysis and complete crystallographic details, the yellow rhombohedral mineral from Soda Springs Valley, Nevada, collected by Turner. The analysis was that of an almost pure sodium species corresponding to Jarosite. This they recognised as being thereby distinct from Jarosite, and gave it the new specific name Natrojarosite, assigning the mineral to the Alunite Group. The formula given is $Na_2[Fe(OH)_2]_6(SO_4)_4$, which may be written in the same form as that given by Dana for Jarosite. They also described an identical mineral from Cook's Peak, New Mexico.—Amer. Jour. Sci., 14, 211.

1903. L. J. Spencer in his "Third List of new Mineral Names" gave Hillebrand and Penfield's "Natrojarosite."—Miner. Mag., 13, 373.

1910. "Pastreite" from France shown to be normal Jarosite, by Azema.—Bull. Soc. Franc. Min., 33, 130.

1911. W. T. Schaller discussed the rhombohedral Alunite-Beudantite Group, including therein Jarosite and Natrojarosite.—Amer. Jour. Sci., 32, 359.

From the above brief notes it is plain that Natrojarosite was first discovered in 1838 in material from Modum, Norway, but that it was at that time included in the species Jarosite. It was not till 1902 that its independent specific character was recognised and the present name given to it.

OCCURRENCE.

Natrojarosite has previously been recorded from the following four localities:—

Modum, Norway.
Lawrence Co., South Dakota.
Soda Springs Valley, Nevada.
Cook's Peak, New Mexico.

A search has failed to reveal any record of its discovery in Australia. To the locality list given, however, must now be added as a new locality, Kundip, in the Phillips River Goldfield of this State.

In February, 1914, three parcels of oxidised gold ore, amounting altogether to 172 tons, were sent in to the State Smelter, at Ravensthorpe, near Kundip, from the "O.T." Tribute on the Harbour View Mineral Lease, at Kundip. This ore, when "bedded," showed a number of light yellow fragments, which proved to consist largely of ferric oxide and sulphuric oxide, and were afterwards identified as Natrojarosite. The total quantity of this mineral was estimated at well under one per cent. The parcel of ore as a whole contained 0.52 per cent. of SO_3, which if it were all present as Natrojarosite would indicate 1½ per cent. of that material, but some was, no doubt, present as epsom salts and gypsum carried into the ore by the ground water, which is highly saline, as the following figures show:—

TABLE I.

Analyses of Kundip Groundwater.

	Medic Mine.[1]	Flag Mine.[2]	Flag Mine.
	Parts per cent.		
$CaCO_3$	0·0482	0·0553	0·0595
$MgCO_3$	...	·0084	·0015
$FeCO_3$	trace	trace	*Nil*
$CaSO_4$	·0470	...	...
$MgSO_4$	·3275	·1910	·2016
$NaNO_3$	*Nil*	*Nil*	trace
$MgCl_2$	·4088	·1627	·1896
NaCl	2·5882	1·3485	1·3742
KCl	...	·0198	·0129
NaBr	...	·0002	·0002
NaI	...	*Nil*	*Nil*
SiO_2	·0032	·0024	·0026
Al_2O_3	·0030	·0014	·0038
Total Solids ...	3·4259	1·7897	1·8459

The shaft from which the ore was obtained is in an area of hornblende schist near the northern corner of the Harbour View Lease[3]. This shaft was inspected in October, 1914, and whilst some Natrojarosite could be seen lying on the surface, none was discoverable underground. According to Mr. Charles Grant, of Kundip, the mineral is found not only in this shaft, but also in other neighbouring ones, in lenses or irregular masses in the oxidised por-

1. From shaft 10 chains W. of Natrojarosite deposit. 2. Half-mile N.E. of Harbour View Lease. 3. *See* G.S.W.A. Bull. 35, Plate VII., p. 96.

tion of an auriferous lode. The matrix is a gossan composed of iron hydrates, quartz, and clay. No sulphides were visible in the first shaft, but they were expected to be reached at a depth of about 140 feet. In the 103ft. and 112ft. levels and elsewhere a number of samples were taken of the soft, kaolinised rocks, which dipped at a high angle, and were dark reddish brown to white in colour. These were found to yield sulphuric oxide in small proportions from traces upwards. This has been found to be characteristic of the larger proportion of all rocks in the Phillips River Goldfield which have recently been tested. In this connection it is to be noted that several sulphides, chiefly pyrite, pyrrhotite, and chelcopyrite are widely distributed in large quantities throughout the district below the zone of oxidation.

A considerable quantity of a similar basic sulphate was found in a sample of the weathered greenstone schist carrying streaks of a yellow ochreous material from a depth of 60ft. in a new shaft on the Coronia Lease in Sutherland's Gully in the Ravensthorpe Range, near Kundip, as well as in a cliff on the Jerdacuttup River. Finally on testing the ironstone used as a flux at the State Smelter and quarried in the Ravensthorpe Range at Iron Knob, 0.30 per cent. SO_3 was found in poor specimens containing 62 per cent. Fe_2O_3 and 10 per cent. SiO_2, and 0.52 per cent. SO_3 in picked specimens containing 75 per cent. Fe_2O_3 and 3 per cent. SiO_2. This ironstone represents possibly the outcrop of a large lode in which pyrites, pyrrhotite, and magnetite are abundant below water level. A similar lode, outcropping at Mt. McMahon, 2½ miles to the North-West, was pierced by a bore at some depth below the zone of oxidation, and portions of the core on analysis gave:—

Table II.

Sulphide Lode, Mt. McMahon, Ravensthorpe.

	(A)	(B)
Fe	44·37 %	45·68 %
Cu	·03	·02
Ni	·06	trace
Sb	·02	·01
S	35·91	30·70
SiO_2	14·70	9·33
Al_2O_3	trace	trace
MnO	·97	1·55
CaO	·72	1·53
MgO	3·73	4·10
O etc.	traces	(7·08)
	100·51	100·00

The chief metallic constituents of A were pyrrhotite, and pyrites with traces of magnetite; of B, pyrites, pyrrhotite, and magnetite in roughly equal proportions. The normal weathering of such material would give rise to large quantities of sulphuric acid and sulphates.

PHYSICAL PROPERTIES.

The specimens from the Harbour View Lease consist of practically pure mineral in irregular masses from a few grammes to ¼ kilo in weight. They are bright ochre yellow to brownish yellow in colour, dull in lustre, porous, and at times more or less cellular. They vary in coherence from very friable to moderately tough. In one specimen the mineral encloses a small vein of quartz.

An examination of the powder under the microscope discloses the fact that this is wholly in transparent crystalline grains, of which many are perfect crystals, varying in diameter from 3 to 5 μ. The crystals are disc-like, with a thickness equal on the average to one-third of the diameter. Many possess a small turbid core, the exact cause of which was not determinable. By pressing some of the powder, mounted in cedar oil, between cover-glass and slip, a number of crystals were flattened against the glass. In the more perfect crystals the outlines of upper and lower basal planes were then seen to be equilateral triangles in alternating position. As the crystals in this position proved to be singly refracting, the crystal system is evidently rhombohedral, and the form the combination of rhombohedron with two truncating basal planes. The refractive index was high, birefringence strong.

The specific gravity was determined by immersing several small fragments (previously washed in small quantities of distilled water, alcohol, and ether, *vide infra.*) in methylene iodide of density 3.32 and gradually diluting this with measured quantities of a mixture of xylol and methylene iodide of density about 1·5. The sinking point was noted as compared with that of test minerals whose specific gravity had been determined with great care. By thus interpolating between spodumene of density 3·14 and rubellite of density 3.01, the Kundip mineral was shown to have a density of 3·11 at 29° C.

The melting point was indeterminate owing to the mineral dissociating at a low temperature.

CHEMICAL PROPERTIES.

Preliminary experiments proved, as was expected with such porous material, that about one per cent. of water-soluble salts deposited by the saline ground water (*vide supra*) were present. These were chiefly common salt and epsom salts. Further it was proved that Natrojarosite itself was apparently entirely unaffected even by long continued contact with boiling water. For analysis, therefore, a seemingly pure fragment of mineral was selected, broken to pass a 20-mesh sieve and washed rapidly with a few small lots of cold, distilled water to remove all associated salts, then in succession with

6 : 1 alcohol, absolute alcohol, and ether to remove water and ensure rapid drying at a low temperature. Finally the mineral was dried at 50° C., crushed to pass a 90-mesh sieve, and bottled. The material so prepared was found to contain 0·04 to 0.08 per cent. of hygroscopic water, and from *nil* to 0.20 per cent. of insoluble matter.

The results obtained on three separate specimens were:—

Natrojarosite, Kundip.

	Theory. %	A %	B %	C %	mols.
H_2O	11·15	...	...	10·93	606
Na_2O ...	6·39	...	...	6·32	102 } 109
K_2O	...	...	...	·68	7 }
Fe_2O_3 ...	49·42	49·99	49·98	49·86	312
FeO	...	...	...	·16	2
SO_3	33·04	33·08	32·13	32·30	403
P_2O_5	...	...	...	·20	$1\frac{1}{2}$
	100·00			100·45	

All results in the case of "C" are the means of two concordant estimations, using only vessels of quartz and platinum, and reagents of "Guaranteed Reagent" quality, whose purity had been confirmed.

None of the water was removed at temperatures up to 150°C., from which it would appear that none of it is water of crystallisation.

The empiric formula for minerals of the Alunite Group is

$$6H_2O.R_2O.3R_2O_3.4SO_3.$$

For Natrojarosite this becomes

$$6H_2O.Na_2O.3Fe_2O_3.4SO_3.$$

This may be written (Hillebrand and Penfield)

$$Na_2[Fe(OH)_2]_6(SO_4)_4$$

The results obtained for the Kundip mineral give slightly high results for alkalies and ferric oxide and correspondingly low results for water and sulphuric oxide. The departure from the theoretical ratios is, however, quite small, viz.:—

	Theory mols.	Found mols.
H_2O	6·00	5·94
Na_2O	1·00	1·07
Fe_2O_3	3·00	3·06
SO_3	4·00	3·95

The presence of traces of phosphoric oxide (previously observed in similar minerals) and of ferrous oxide is doubtless to be ascribed to the co-existence of an isomorphous mineral of the Hamlinite or Beudantite type, viz.:—

$2RO.3R_2O_3.2P_2O_5.7H_2O$	Hamlinite Type.
$2RO.3R_2O_3.2SO_3.P_2O_5.6H_2O$	Beudantite Type.

The molecular weight and molecular volume for the Kundip mineral and other minerals of the group are:—

	Molecular Weight.	Specific Gravity.	Molecular Volume.
Natrojarosite, Kundip	971·5	3·11	312·3
Natrojarosite, pure ...	969·4	(3·10)	(312·4)*
Jarosite	1001·6	3·20	313·0
Alunite	829·2	2·66	311·8

* Assumed. being mean of figures for Jarosite, Alunite, and the Kundip mineral. From this figure the specific gravity of pure Natrojarosite, unknown in nature, is calculated to be 3·10.

Kundip Natrojarosite is insoluble in water. Some of the finely powdered mineral was shaken with a little cold water to dissolve the associated salt and magnesium sulphate and then washed several times on a filter with small lots of water until the filtrates gave no reaction for chlorine. Subsequent treatment with cold water yielded filtrates giving no reaction for sulphate ion with barium chloride, nor for ferric ion with ammonium sulphocyanide. On boiling with water no change could be observed in the mineral. The water remained neutral in reaction to methyl orange and litmus, and no sulphate ion could be detected in solution.

Cold, strong, hydrochloric acid (10 E) had no immediate effect, though, doubtless, complete solution would result on long continued digestion. On heating almost to boiling, solution was moderately rapid, 0.5 gramme of the mineral dissolving completely in about 15 minutes. Dilute hydrochloric acid (5 E) acted extremely slowly even when boiling.

Dilute sulphuric acid (5 E) had practically no effect even at boiling point. On concentrating the acid in contact with the mineral by evaporation on a sand bath, the powdered mineral remained almost unaffected till the acid reached the strength of about 10 E, when solution was more rapid, and was complete just short of fuming point.

The mineral is very slowly attacked by hot concentrated (16 E) nitric acid.

Boiling for a few minutes with a mixture of one part of 22 E hydrofluoric acid and two parts of 10 E sulphuric acid gave a perfect solution. This was found a convenient method of solution for the estimation of ferrous iron.

Digestion of the powdered mineral with weak caustic potash (1 E) in the cold (18° C) resulted in somewhat slow decomposition. The colour of the powder had changed after five minutes from yellow to orange, and after 30 minutes to light red, the colour gradually deepening. Contact with alkali of the same strength at a temperature of 50° C resulted in rapid decomposition, all SO_3 and Na_2O going into solution and leaving a bulky dark red residue of ferric hydrate. The instability of the mineral towards moderately concentrated alkalis is further illustrated by the fact that if a slight excess of ammonia or fixed alkali is added to a solution of the mineral in hydrochloric acid, the resulting iron precipitate contains no trace of either sulphuric oxide or alkali.

At the suggestion of Mr. Alex. Montgomery experiments were made on the effect of the mineral on weak potassium cyanide solution, 0.2 gm. of the powdered mineral was digested in the cold with 50 cc. of a 0.5 per cent. solution of potassium cyanide. After 1½ hours no weakening of the solution was determinable, after two days, however, the strength of the solution was reduced by 10 per cent. This fact has an obvious bearing on the problem of successful extraction of gold from oxidised ores, in which this mineral, or a similar one, may be present without having been detected.

Effect of dry heat.—On heating the mineral for an hour at 100°, a minute loss (0.01 to 0.04 per cent.) of hygroscopic water was noted. Further successive heatings for an hour each time with rises of 10° up to 150° caused no further alteration in weight whatever. None of the water, therefore, is water of crystallisation. At a temperature below red heat, acid water was evolved and at a very low red heat fumes of SO_3 were observed to come off. On heating over a mecker burner in a platinum crucible, practically constant weights were reached with a loss of 35.36 and 35.50 per cent. This is equal to all the water plus three-quarters of the sulphuric oxide. Cold water extracted sodium sulphate from this ignited mineral, the residue being practically pure ferric oxide. Blasting produced a slow reduction in weight, doubtless due to dissociation of the alkali sulphate. After 30 minutes it amounted only to 0·8 per cent., after which the process was discontinued.

On heating a small fragment of the mineral in an open bunsen flame an intense soda coloration was produced.

Heating in a closed tube gives white fumes which condense to a strongly acid sublimate of sulphuric acid and water, leaving a dark red residue.

GENESIS.

The proved chemical properties of the mineral form a basis upon which to build up the steps by which the mineral has been formed, though no theory of origin can be considered final until the deposit in which the mineral occurs has been traced below the zone of oxidation.

The genesis of alunite, the commonest mineral of this group, is usually ascribed to solfataric action on rocks containing large quantities of orthoclase. Thus:

$$\underset{\text{Orthoclase.}}{6KAlSi_3O_8} + 6SO_2 + 3O_2 + 6H_2O =$$

$$\underset{\text{Alunite.}}{6H_2O.K_2O.3Al_2O_3.4SO_3} + 2K_2SO_4 + 18SiO_2$$

In the customary presence of other aluminous silicates, such as oligoclase, etc., no free potassium sulphate would be produced, the whole of it combining with aluminium sulphate to form alunite. It is to be noted that a mixture of sulphur dioxide and oxygen are necessary to produce this effect. Such a mixture has indeed been recorded in gases from two volcanoes, Hekla and Vulcano*, but must be far from common in sub-surface fissures.

On the other hand alunite might well be produced by the weathering of an "alum slate" containing much sericite and pyrites or marcasite, thus:

$$\underset{\text{Sericite.}}{2H_2O.K_2O.3Al_2O_3.6SiO_2} + 2FeS_2 + 7H_2O + 15O =$$

$$\underset{\text{Alunite.}}{6H_2O.K_2O.3Al_2O_3.4SO_3} + Fe_2(HO)_6 + 6SiO_2$$

The Kundip Natrojarosite is almost certainly not the result of solfataric action, but the product of the weathering underground of pyritous ore in the presence of sodium-bearing rocks and ground waters.

The normal equation for the first stage in the weathering of pyrites† in a quartz reef or elsewhere, where easily decomposed rock silicates and carbonates do not come into action, is

$$2FeS_2 + 2H_2O + 7O_2 = 2FeSO_4 + 2H_2SO_4.$$

With additional penetration of atmospheric oxygen, further oxidation of the ferrous sulphate takes place, thus:

$$2FeSO_4 + 2H_2SO_4 + O = Fe_2(SO_4)_3 + H_2SO_4 + H_2O.$$

It is seen that the oxidation of ferrous sulphate to ferric sulphate reduces the acidity of the solution to one-half, thus increasing the tendency to formation of basic salts.

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* F. W. Clarke, Data of Geochemistry, Edit. II., pp. 249-251.

† Van Hise, Treatise on Metamorphism, p. 214, does not give this equation. He gives, however, five others as representing probable reactions, during the sub-surface weathering of pyrites. One of these gives H_2S and SO_2, two incompatibles, as simultaneous products of the reaction; a second gives ferric hydrate with a considerable excess of SO_2; a third, ferric hydrate with abundant sulphuric acid! These equations appear to require some explanation.—E.S S.

Contact of this oxidised solution with excess of alkaline ground water would, from the experiments described above (p. 53), result in the precipitation of ferric hydrates, leaving all alkali and sulphuric oxide in solution. This is the result usually observed in weathered lodes.

Many of the lodes of the Kundip district, including the one under discussion, are impregnations of amphibolites or other rocks carrying sodium-bearing silicates. Were some portion of the oxidised iron solution for some abnormal reason to remain out of the reach of the main underground circulation, the free acid would gradually attack such silicates, a neutral or faintly acid solution remaining, which contained ferric sulphate and sodium sulphate. Hydrolysis of this solution would then give rise to the formation of the basic salt Natrojarosite, since this compound is insoluble in such a solution, thus:

$$3Fe_2(SO_4)_3 + Na_2SO_4 + 12H_2O = \underset{\text{Natrojarosite.}}{6H_2O.Na_2O.3Fe_2O_3.4SO_3} + 6H_2SO_4.$$

Perth, 12th April, 1915.

AN ACCOUNT OF THE ABORIGINALS OF SUNDAY ISLAND, KING SOUND, KIMBERLEY, WESTERN AUSTRALIA.

By
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W. H. Bird.

(Read April 13th, 1915.)

The following account is the outcome of a visit to Sunday Island in June, 1908, by Mr. W. D. Campbell, who was the geologist member of the survey party from the Mines Department, Perth, on its way to survey mining leases and inspect the magnetic iron ore deposits at Yampi Sound. It has been written with the assistance of Mr. W. H. Bird, who was for several years a resident of Sunday Island in the capacity of schoolmaster to the Mission Station that had been founded by Mr. Sydney Hadley for the benefit of the aborigines.

Sunday Island, or "Ewenu," is about 8,000 acres in extent, and is situated at the entrance to King Sound, and about 70 miles, in a direct line, from the town of Derby, which is at the head of the Sound; it is the largest of the islands forming the Buccaneer Archipelago, but is divided into three parts by water channels. Between Sunday Island and the western side of King Sound there are several small islands, and there is a deep channel, known as Escape Pass, between them, which is used by the coasting steamers calling at Derby; there is always a fierce current running through this channel, and the water eddies and swirls in a violent way that is dangerous to small craft; this current is caused by the great rise and fall of the tides along this coast, and it makes communication between the mainland and the island difficult, which fact has tended to the preservation of the islanders. On the eastern side of the island, there is a stretch of about seventeen miles of more open water, see Plate I., which is reproduced from Nautical Chart No. 1052. Most of the islands are more or less mountainous and have a very picturesque appearance. Sunday Island and those adjacent are flatter than the others. The outlying portions of the coast throughout are mostly bare granite and gneiss rock.

The Sunday Islanders are the furthest north-westerly branch of the "Barda" tribe that live on the western side of King Sound, while further south-westerly are the "Nyool Nyool" of Beagle Bay. The islanders are known as "Ewenu;" they are smaller in stature than the inhabitants of the coast north and east of the Sound, who are known as "Oen;" they also differ somewhat in language. The latter race, being the most powerful, have practically exterminated the smaller race on all the islands which they could reach by means of their rafts, and only a few individuals now remain, and they live mostly at Sunday Island, which became a place of refuge through it being more remote from the eastern shore. The adult population is at present 112, including about 30 children; the males and females are about equal in number, but they are not increasing. The general height of the men is 5ft. 8in. and weight 10st. 5lb.

Plates II.-IV. represent one of the islanders called "Cockroach," about 22 years of age, 5ft. 5in. in height, and 11st. weight. He is decorated with feathers of the white cockatoo, and wears the novitiate's head band, "joodoor," (Plate V., Fig. A) with three or four bones vertically on the forehead, and wears suspended from the waist belt, a pearl shell ornament before and behind; he was in the final degree of initiation, called "algora"; his chest is ornamented with cicatrices composed of horizontal cuts, the edges of which had been pinched up while healing, so as to form permanent ridges of flesh. These apparently constitute the tribal design. The back of the body is not marked. Generally speaking, the upper parts of the body throughout the tribe are well developed, more so than among the inland tribes, probably through their use of the muscles of those parts when paddling their rafts which remind one of the "catermarans" of India.

The head dress of a fully initiated man is called "jualul." (Plate V., Fig. B.) It consists of a conical arrangement of the hair, with grass stiffening; it is bound round at intervals of about 1½ inches, the cone is about 9 inches in length, and projects slightly backward; this head dress is never worn by the women. The head ornament (Plate V., Fig. C) shown between the heads is used by the men at corroborees, and is made of two cross sticks with hair strings wound round them as shown, with tufts of feathers; they vary slightly in design; similar ornaments are used by most of the tribes in the State.

The large pearl shells that are worn at the waist belts are ornamented on their bright inner side with incised patterns. Plate VI., Fig. 1, represents one from Sunday Island. Figs. 2-4 are others from the Carnarvon (or Gascoyne River) district tribes, nearly 1,000 miles coastwise to the southward. These show a general resemblance of pattern, but these shells were probably conveyed there by barter, as the pearl shells found there belong to a different species and are only half the size of the northern kind.

The spear, or "errol," is the principal weapon; it is plain pointed, being without barbs, and the islanders are very skilful with it, spearing fish and turtle in the waters with great precision, allowance being made for the refraction of objects in the water. The wood of the spears is obtained on the island; it is a species of wattle, which is called ''ling-middi.'' The spears are thrown by the hand without the use of the "womera" or "yangal."

A broad and flat ''kylie'' is used, having a more acute angle of bend, and with straighter arms than usual, and fish are killed by means of these kylies when near the surface of the water. The islanders have discovered that kylies made out of thin iron, such as ships' tanks, are the most serviceable, and they show great dexterity in making them (see Fig. 6). The one represented is $16\frac{1}{2}$ inches wide between the extremities, $3\frac{1}{2}$ inches wide at the elbow; the inner and outer edges have a curvature of $3\frac{1}{8}$ and $6\frac{3}{4}$ inches from a line between the extremities. Fig. 5 is a fish kylie of wood, from Swan Point, on the mainland, west of Sunday Island; it is 2ft. $0\frac{1}{4}$in. long, and $4\frac{1}{2}$in. wide at the elbow, and the inner and outer edges have a curvature of $5\frac{5}{8}$in. and 10in. Those used at Sunday Island are similar in shape, but smaller in size. Fig. 7 represents an ordinary kylie of Sunday Island; it is broad, but thin. Fig. 8 represents a war kylie from Mount Marmion, about 50 miles east of Derby, and is similar to those used at Sunday Island. None of these forms are returning kylies. The war kylies are too thick and straight to soar in the air, and none of them have the twist peculiar to returning kylies.

Plate VII. shows part of the main aboriginal camp, the "mias" or huts are circular, and are partly dug-outs, the superstructure is dome shaped, composed of sticks and boughs and thatched with grass, the inside diameter is about six feet, and inside height from floor to roof about four and a-half feet.

The rafts are similar to those in use along the coast and consist of one or two series of poles, about five inches diameter, tapering to two inches, and nine to eleven feet long, of mangrove pine, the scientific name of which could not be ascertained. It is called ''choolboor,'' and is a very light, pithy kind of wood; a cone-shaped point is given to the thick end of each pole. Each set comprises usually 5 to 7 poles, the thin ends being laid side by side, they are then pegged together by flat pegs of a hardwood. When one set only is used, the paddler sits near the smaller end, with the thick ends forward. When two sets are used, one is built upon another, with the ends reversed, and they are pegged vertically together; this double decked raft is, however, a luxury, for they have to go to the mainland or across the Sound for the wood, the islands having a very poor supply of timber. A receptacle for any turtle or fish that may be speared or caught, is made at the forward end, by a few upright pegs. The paddle used is a single-bladed paddle, in length five feet, which includes the blade, two feet long, and five inches wide, with a rounded tip; the paddler makes strokes on either side alternately.

No rock markings or carvings have been noticed on the island, the rocks are unsuited for them.

The islanders do not seem to have any knowledge of smoke signalling of any sort, nor gesture language, nor of masonic signs. Cannibalism appears not to be known among them.

The islanders' food consists largely of fish, turtle, and sea fowl eggs; they have several edible roots also, of which the yam called "coolugarrie," "carringum," and "errelm" is the principal; these are cooked among hot stones, they do not boil their food. There are a number of native fruits, of which the following are the principal kinds:—

"Illara," a large tree, 20-30 feet high, with silver grey bark and glossy leaves and a round fruit, resembling apples in appearance, but with one large stone inside.

"Carroll," or "Koroll," a small shrub, 5-8 feet high, with a green fruit, about ⅝in. long, with a seed about half that length. The root is edible and is called "Woolnga;" it is baked in the fire until tender.

"Murdoor" is a large shrub with broad leaves and fruit that grows in clusters; it is pear-shaped, but with the stalk at the large end.

"Koorie" is the wild fig, and "Albay" is another kind of fig.

"Ngoorarra" is a small "yam," having a yellow flower on top, the root is shaped somewhat like a parsnip.

"Ngoor-ngoorloo" is the seed of the white mangrove "Ranja." Though not really a fig, it has fruit somewhat similar.

"Coolay" has luxuriant foliage, the fruit is nearly as large as a "passion fruit," and has a green hard skin, and the juicy centre is squeezed out.

"Joongena" is a shrub 12 to 15 feet high, with small leaves and an abundance of red fruit, plum-like in shape.

Fire is made by whirling a piece of wood, called "Ngulangungil," held upright between the palms of the hands, while pressed upon another piece held on the ground by the feet.

Aboriginal remedies for wounds, sickness or fever, include eucalyptus leaves ground into a paste, for pains; they have also massage for acute pains.

The ceremonies of initiation are always held about the beginning of March, and are participated in by both men and women and children to a large extent. The principal ceremony begins with a series of circular dances or corroborees which take place every night for about a week previous to the operation of circumcision, and it is a time of great rejoicing. At the end of this time, the boy to be initiated is taken away by the men and circumcised, and, in the company of half-a-dozen young men, he keeps away from the camp for ten days; these companions are older than himself and they all camp together at some remote spot till that period is complete, and they return for the blood-drinking "Lerribug," and are met, when about half-a-mile from the camp, by all the men of the tribe. These have belts that have been prepared for each of the lads, including the newly circumcised boy. These belts are composed of bark, bound round with string made of human hair. Two large troughs of bark are placed side by side, over which the lads recline; all the men then puncture their own arms by means of a kangaroo bone, and their blood soon spurts all over the lads until they are covered with blood. Some of the men faint from loss of blood, but they soon recover. The blood which has flowed into the bark troughs is now congealed and is eaten by all. The troughs are then turned over and an imposing song is sung round them, after which the whole company return to the camp singing.

In the corroborees in connection with these initiations, a circular arrangement is used, the old men fully armed, sitting in the centre and the children encircling them, while the women are in a circle outside of them, with men fully armed beyond them. This order was probably symbolical, but the present day islanders can explain nothing, not even the words of the songs they sing.

These ceremonies include the knocking out of two teeth from the upper jaw, and circumcision when about fourteen years of age, and sub-incision in the following year or less; during the interval the probationer is not allowed to eat fish.

There is also blood drinking two or three times a year, when the arms are ligatured and the veins pierced, and the blood is caught in bark troughs as above described. An extension of the sub-incision is made at least once a year afterwards, apparently out of sympathy with the new novitiate.

The islanders thoroughly believe in the power of evil thoughts, the practice of which they call "kowedan." To carry out this mischief, a number of men will select a sandy spot and scoop out a hole in the sand and form it in the centre into a rude representation of a man whom they wish to affect; they then sing a curious chant, and the individual represented develops a fever, but if he realises that he is being bewitched, he calls for water, which is sprinkled over him, and this is said to break the charm. Rain or dew is also said to render a charm ineffective. Spirits of those who have departed this life are called "Ngyries," and the aborigines are very much afraid of them. They have a dim knowledge of a place called "Loomern," where spirits dwell, and point to the westward as its position.

The mode of burial of the dead is to place the body on a platform in a tree, and reclining on its side, with the head to the south and face to the east; after the body has remained there till thoroughly decomposed, a party of men light a huge fire beneath, bringing the body and frame to the ground and reducing the body to ashes; these are gathered and put away into a crevice in a rock and covered with stones. No goods or chattels of the deceased are buried with these ashes.

Periods of time are reckoned thus:—

Day, ''algar,'' by the sun.

Month, ''koweddie,'' by the moon.

Year, ''lalleen,'' by the summer.

LEGENDS, ETC.

The "Kurrada-kurrada" is a horrible monster, who catches men and makes a small incision in their abdomens, through which he draws their entrails and eats them with gusto; he then closes the wound, telling the man that he will not live more than four days.

The "Lerraway" is the children's bogey, which is represented sometimes by a woman, who masquerades in a weird grass costume, and strutting about the camp frightens the children, to the amusement of their elders.

''Kallaloong'' was the father creator of the tribe. He lived among them for some time, and could transport himself through space, and could bring fire down from the clouds. He introduced the boomerang and was so expert in its use that he threw one up in the evening and it never descended till the next day. He gave them their laws and punished the violation of them. On one occasion when three boys on the neighbouring island of Tyree, who were probationary between the rites of circumcision and sub-incision, had eaten of the food (fish) forbidden them at that period, they were seized with hiccups, and "Kallaloong" asked them the cause, and they confessed to having eaten fish. Then ''Kallaloong'' was very angry and determined to punish them for it. He crossed over to Sunday Island in the evening and the next day the terrified islanders saw a huge cloud of fire approaching with ''Kallaloong'' pushing behind. As it approached, it grew hotter and hotter, till they fled to the caves and into the sea, but they were all, except two or three, destroyed. These went under the pendant-rooted trees (Banyan-like trees) and bruised the bark, the sap from which ran over them and thus protected them. A bold and bare rocky island, called ''Kadjerding,'' on the west side of Sunday Island, was pointed out to the writer by Mr. Hadley as the place where the aboriginals assert that the spirit left the island.

"Padalool" was a beautiful and good woman of the tribe, but some of the ''Oen,'' aboriginals from the ''Graveyard,'' a large bay on the east side of King Sound, between "Whirlpool Pass and Cone Bay," which is so named on account of the great mortality there among pearl divers, caused, it is said, through changes of water pressures there. These men, who were visiting the island, decided to abduct her, which they did, but were pursued by her tribe. The abductors then jumped into the sea, taking the girl with them. When they re-appeared their hands were changed to fins. They dived again, and their legs developed into a tail, they dived again and they were all changed into "dugongs."

The Bower-bird introduced the spear in the following manner: he called all the other birds to a corroboree, and when he had them all in a line, he ran a spear through the lot of them. The "Barry-arra," or Turkey (Bustard), however, was late upon the scene, and as he approached, he was just in time to see the awful deed. He, therefore, went away quietly and made himself a shield, by which he could defeat the cunning of the bower bird.

THE MISSION.

The aboriginal mission at Sunday Island was founded on 11th June, 1899, by Mr. Sidney Hadley, who had for twenty years previously been employing members of the tribe there in pearl shell and bêche-de-mer fishing. When starting the mission, he had the voluntary assistance of Messrs. Ormerod and Kelchter, one for eight and the other for twenty months; after they left, Mr. Hadley carried on the work alone with his private funds, and the Aborigines Department reserved the island for the purposes of the mission at his request, and he has been allowed the usual blankets, and ninepence a day for the aged and infirm. He employed a schoolmaster for seven years, and the Education Department has made a grant of £100 a year to the mission, on Dr. Roth's recommendation. Mr. W. H. Bird was schoolmaster there for three years, but left in the year following the writer's visit; he was succeeded by Miss Jose and she again by Mr. and Mrs. Horace Smith, who are now there as missionaries until Mr. Hadley's return. None of the churches have contributed anything towards the mission. There is a substantial stone cottage and a commodious schoolhouse, and two dormitories, one for boys and another for girls, built of timber and corrugated iron. The garden yields bananas and vegetables, and there is a rubber plantation now with many hundreds of trees. The live stock consists of cows and goats.

There is now a roll of nearly thirty scholars, who are in two classes. Some of the boys have become fine craftsmen, and one is teaching the Junior Class in the school. These children are taught school discipline and cleanliness, to read and write from dictation, and to recite, also ordinary mental arithmetic and geography; in the latter they show wonderful aptitude. Bible lessons are given and the principles of Christianity, but the teaching is otherwise unsectarian. The boys are further taught by Mr. Hadley cultivation in the garden and the management of live stock, and are trained to work as crew in the fourteen ton cutter, "Rita," belonging to the mission, for pearl and bêche-de-mer fishing. Mr.

Hadley himself was trained for the sea, on H.M.S. "Worcester" on the Thames, and was messmate with Admiral Togo. There are two other small boats used for tortoise catching. The attendance at school and labour is voluntary. The training of the lads appeared to be on sound, practical lines, for they sometimes form the entire crew of the cutter, which is very creditable, as the craft requires constantly skilful and smart handling in the intricate navigation of the sound and its swirling waters.

The produce of the work amounts to about £400 annually, which Mr. Hadley states more than half supports the mission, and he claims that his mission earns more than any other mission in Western Australia. Negotiations were made a few years ago with the Church of England to take control, but they fell through.

Mr. Hadley emphasised the fact that the comparative isolation of the island was a most important factor to the success of the mission. The children, he believes, are free from evil habits; among them are two half-castes, born before the mission was started. To the writer, all looked contented and happy, bright smiles and laughter come from the children all day long, making the place joyous, and Mr. Hadley says it is music to his ears. The modest bearing of the women was very noticeable. Their daily routine is as follows:—Several of them assemble at the mission in the early morning and prepare the men's breakfast; after this is eaten, the men return to their camp, and then the women have their breakfast; a similar division is maintained during the other meals.

Regarding the non-increase of the population of the island, Mr. Horace Smith attributes it to polygamy, the men cohabiting more frequently with the older, stronger, but not more motherly women, and often leaving the younger wives childless; other reasons may exist, and contribute in a minor degree, such as abortion, when intercourse with pearlers, etc., has taken place.

Mr. Hadley, who has now returned after a fifteen months trip to England, states that up to the end of 1913, the increase of births over deaths was normal with the white population of Australia. Since then there has been one birth only, while there have been six deaths; four of these were due to old age, but two were young married men, who wasted away; he says there is no disease, there are only two on the sick list and they are old women long past child bearing; he has married three couples since his return; he considers that on the mainland a similar change of birth rate has occurred.

LANGUAGE.

The following vocabulary has been compiled by Mr. Bird, it is in the form prepared under the direction of the Registrar General, Malcolm A. C. Fraser, in 1904, for use in this State, and he kindly supplied the writer with a copy for compiling this information.

In the spelling, French vowels and English consonants are used.

Accents are used to indicate the stress put upon syllables.

Hyphens are used to asist the pronunciation.

The ng is sounded soft as in our "ing," but coming as it often does as the initial sound, it is difficult to pronounce until one becomes accustomed to it.

In nearly all cases where the Infinitive Mood is asked for, Mr. Bird has given the Indicative Mood in the third person, as he has not yet found the Infinitive in this language. Abstract ideas are generally lacking in this as in many other native languages.

The 1st, 2nd and 3rd personal pronouns are indicated by *nun, min,* and *in* respectively, as:—

I desire, Leean nunman.
You desire, Leean minman.
He desires, Leean inman.

The indicative mood and nominative case is shown by "nim" after the personal pronoun, thus:—

I fall, "ngi nim nunjalgoo."
You fall, "jou nim minjalgoo."
He falls, "kinging nim injalgoo."

The "nim," however, is often left out, understood only.

The imperative mood is shown by the prefix "an" to the verb, thus:—

Help, "analong."
Throw away, "anamoor."

The potential mood being "neen" and "neengarra."

The negative changes the "n" into "l" in the prefix, thus:—

I will come back, "ngi tarroongarra."
I will not come back, "ngi arra tarroolarra."

The heads into which the subject of inquiry have been divided are as follows:—

MAN, HIS RELATIONSHIPS, ETC.

Aunt	Irmor	Husband ..	Umber
Baby	Malba	Man	Umber
Blackfellow ..	Umber	Mother ..	Injib
Blackwoman ..	Umberin	Mother-in-law..	Allorr
Boy	Boogana		
Brother ..	Borla	Orphan ..	Loomie
Brother-in-law	Allaballa		
		Sister	Marrie
Child	Bower	Son	Alla (to Father), Boar (to Mother)
Daughter ..	Alla (to Father), Boar (to Mother)	Son-in-law ..	Allor (to Mother-in-law)
Daughter-in-law	Allorr (to Father), Boar (to Mother)	Uncle	Kara
Father ..	Koola	Virgin	Paraoor
Father-in-law ..	Allorr		
		Widow ..	Ellarra
Girl	Mudjengool	Widower ..	Kulkurra
Grandfather ..	Jum	Wife	Mullar
Grandmother ..	Corley	Woman ..	Hoarang

PARTS AND FUNCTIONS OF THE BODY.

Ankle	Talagerra	Eyeball ..	Nimmie
Arm	Niniaila	Eyebrow ..	Larban
Back	Neear	Face	Neeingalla
Back-bone ..	Neearda	Fat	Neardoding (stout), Li, fat of animal
Beard	Jeetee		
Blood	Ilgar	Fatigue ..	Pooljie
Bone	Kanjee	Finger ..	Nemalla
Bowels ..	Ngoojenny	Finger Nail ..	Owo
Breast	Nemarra	Foot	Nembal
Breath ..	Leean	Forehead (your)	Nangarra
Breathe, to ..	Leean-inma	Forehead (my own)	Ngungarra or Nangarra
Calf of leg ..	Jangalla	Frowning ..	Janjalla
Cheek ..	Lamarda		
Chest	Nemarra	Generative Organ (Female)	Neewar
Chin	Neeodie		
Chin (my own)	Ngoyodie or Ngnodie ?		
		Hair	Moan
Cry, to ..	Ingalgin	Hand	Nemalla
		Head	Nalm
Drink, to ..	Ineep	Hearing ..	Ingamongen
		Heart	Wale
Ear	Neelanurr	Heel	Joonda
Eat, to ..	Inalee	Hip Bone ..	Birie
Elbow ..	Neelangoon		
Eye *	Neemmie	Jaw, lower ..	Jango
Eye (my own)	Ngummie	Jaw, upper ..	Kanjie

* Portions of the body are prefixed by *nee*, those of one's own body by *ngu*.

Parts and Functions of the Body—*continued.*

Kidney	Jeelba	Shin	Kanjie
Knee	Nimeedie	Shoulder ..	Langan
Kneecap ..	Waleroo	Sinew	Meelga
		Skeleton ..	Kanjeungarra
Leg	Neelarra	Skin	Burdoon
Legs	,,	Skull	Nalm
Lip, lower ..	Neelel	Sleep	Ingamoolga
Lip, upper ..	,,	Smell, to ..	Imboolma
Liver	Allan	Sneeze, to ..	Jerbunjeringa
Lung	Ingoodoo	Sole of the foot	Ngoonoin
		Speak, to ..	Inganjen
Moustache ..	Jeetee	Spit, to ..	Jooboolinda
Mouth ..	Neemanyie	Stink, to ..	Emboolma
Mouth (my own)	Ngumanyie	Stomach ..	Noonga
Muscle ..	Bungà		
		Taste, to ..	Ingalinjenna
Nape of the Neck	Porta	Tears	Angoor
		Teeth	Jaroong
Navel	Nooroonjooroong	Temple ..	Nangarra
Neck	Koorobal	Thigh	Nanmurro
Nipple of breast	Numana	Thirsty ..	Munyarra
Nose and Nostril	Neemal	Throat ..	Koorbal
Nose (my own)	Ngumal	Thumb ..	Thulingmurra
		Toe	Owo
		Toenail ..	Oral
Palm of the Hand	Nungarie	Tongue ..	Neeingalla
		Took	Ingenya
Penis	Narnda		
Perspiration ..	Noondoo	Urinate, to ..	Inanmerrie
Pregnant ..	Poogoinjoon	Vein	Jarlang
Puberty (age of)	Ballel		
		Walk, to ..	Jumool
Rib	Airie	Windpipe ..	Koorbal
Rump	Nimangool	Wink, to ..	Mulganjie
		Wrinkle ..	Koonboor
		Wrist	Tallagoora
Seeing	Injal		
Semen ..	Minga	Yawn, to ..	Peelil-nanna

ANIMALS.

Animal (generic)	Perr-anan	Horse	Yowardie
Bandicoot ..	Bunki	Kangaroo (generic)	Pooroo
Bat	Lerr-ìngbing		
Bull	Bulliman	Kangaroo, young, in pouch	Owa
Dingo, female	Koar-ading joon		
Dingo, male ..	,,	Mouse (generic)	Koolngan
Dingo, puppy ..	Owa		
Dog, female ..	Ella	Opossum, Grey	Langorr
Dog, male ..	,,	Opossum, Flying	Poolngoor
Dog, puppy ..	Òwa		
Dugong ..	Ùrdorr	Porpoise ..	Balbarr
Flying Fox (Bat)	Nimànbor	Rat, House ..	Meejor

BIRDS.

Bee-eater, Golden Swallow	Baw-baw	Gull, large, white	Allorgie
Bird (generic) ..	Karrabel	Hawk, Fish (Osprey)	Aleer
Bird's Egg ..	Logorr	Heron, Black, with white neck	Lilalil
Birds' Nest ..	Malbanda	Heron, Egret (white)	Enalgorr
Bittern, Little Mangrove	Charloo	Honey - eater (generic)	Jinjing
Bustard, Wild Turkey	Bargarra	King-fisher ..	Dindin
Cockatoo (generic)	Ngally	Magpie-Lark (Pugwall)	Teedee
Cockatoo, Black, red tail	Lirrimer	Native Companion	Koodarrawan
Cormorant, small black	Nallamboo	Owl, Common ..	Goolgooroolgoo
Crane, blue (reef heron)	Cooloo	Parrot ..	Chilliling
Crow	Angedee	Pelican ..	Thullingmurra
Dove, barred shoulders, blue eyes	Joogogo	Pigeon, Bronze-wing	Manbing
Dove, Little ..	Kooradooda	Quail, Brown ..	Peralool
Duck (generic)	Jeebilyie	Silver Eye ..	Poordoordingangoon
Eagle Hawk ..	Arryan	Swallow ..	Korala-korala
Eagle, Wedge-tailed	Dinjalla	Terns (marsh) ..	Noordijen
Eagle, Whistling	Biddeep	Terns (crested)	Kareel
Emu	Ininie	Wattle Bird ..	Chewalgor
Falcon, Brown Hawk	Kirrgidje		
Falcon, Kestrel	Joongilbil		
Finch, Spotted	Nargulul		
Flycatcher (Fantail, Shepherd's Companion, Wagtail)	Jinderberry		

FISHES.

Catfish ..	Nooloorla	Oyster (small Pearl)	Lee
Cockle ..	Chingalie	Parrotfish ..	Kolan
Crab	Narroong	Porpoise ..	Talbarr
Crayfish ..	Tharrawin	Rock Cod ..	Piddeep
Fish (generic) ..	Arlie	Schnapper ..	Mardelling
Flatfish ..	Koonjal	Shark	Loolooloo
Flounder ..	Jangolor	Silver Bream ..	Cheealinjoon
Mullet ..	Minumburra	Sole	Armal
Oyster (large Pearl)	Quan	Stingray ..	Yowie
Oyster (Rock) ..	Neewarda		

REPTILES.

Frog (generic) ..	Karrijal	Sea-snake ..	Parr-gudda
		Snake (generic)	Toora
Iguana (generic)	Myalla	Turtle, sea ..	Koolel
Lizard (generic)	Boolabool		

INSECTS.

Ant (common, small)	Boi	Grasshopper ..	Ding-a-ding
Ant's Nest ..	Jeeden		
Ant (white) ..	Damban	Hornet ..	Mooroond
		Housefly ..	Noora-noora
Bardie (a grub)	Keeanjoo		
Bee	Chooroo	Louse	Moola
Beetle (generic)	Marrga		
Blowfly ..	Peerie		
Butterfly ..	Umbarna	Mosquito ..	Joonjoonboo
		Moth	Umbarna
Caterpillar ..	Alboolboor		
Centipede ..	Murrgal	Sandfly ..	Ang-orr
		Scorpion ..	
		Silverfish ..	
Dragonfly ..	Urdorr	Spider (generic)	Ung-arra
Flea	Moola	Wasp	Al-wa
Fly (generic) ..	Nooranoora	Worm	Toora

TREES, SHRUBS, PLANTS, ETC.

Black Wattle ..	Lingmiddie	Paper-bark Tree	Parl Karnborr
" ..	Illarra		
" ..	Carroll or Koroll	Scrub	Pindan
" ..	Murdorr	Scrub (dense) ..	Poordan
Box	Ngalngoroo	Silver Wattle ..	Wongi
Bush (wild country, scrub)	Pindan		
		Tree	Burdog
Fig (wild) ..	Koorie	White-gum ..	Maroolul
" ..	Albay	White Mangrove	Ranja
		" ..	Coolay
		" ..	Joongena
Gum Tree ..	Maroolul		
" ..	Ngalngoroo	Yam	Ngoorarra

THE ELEMENTS, ETC., ETC., VIZ., THE EARTH, AIR, FIRE, WATER, HEAVENLY BODIES, ETC.

Afternoon	Joolooloon	Hole	Rewee
Beach (open)	Parnga	Hollow Place	Karden
Blossom	Maroo	Island	Inalla
Bough of a tree	Nemalla	Land	Boara
Breeze (land)	Burdoona	Leaf (shrub or tree)	Peelel
Breeze (sea)	Talga	Light	Joombal
Cave	Karden	Lightning	Kalroo
Chasm	Rewee	Manna	Kooarjarra
Clay	Ngeal	Meteor	Myarra
Clay, red	Peedamurra	Midday	Kand-algar
Clya, white	Monga	Midnight	Noora
Cloud	Arrol	Mist	Poorgudda
Cold	Ingoor	Month	Koweddie
Country (burnt)	Lalgar	Moon, Waning	Koweddie Inangoola
Country (desert)	Logal-boara	Moon, Waxing	Koweddie Kalingardie
Country (hilly)	Rarrga-rarrga-karraingorr	Morning	Mooyoon
Country (open)	Kallingboara	Mountain	Karrain
Country (swampy)	Ngeal	Mud	Ngeal
Creek	Ianda	Muddy	Noomba
Crystal (rock)	Jungalung	Night	Edangnoora
Dark	Moiee	Noon	Kandalgar
Dawn	Mamga	Nuts, Edible (Pandanus nuts)	Kumba
Day	Algar	Orion	Ming-Middie
Daylight	Joombal	Pleiades	Berring
Days	Algar	Pool in River	Woongoorra
Dew	Noondoo	Precipice	Alal
Drizzle, to	Jeerinung	Quartz	Talledallel
Dusk (sundown)	Algar-ingardie	Rain	Orla
Earth, the	Kara	Rain (heavy)	Janjalla
Echo	Ingamilbra	Rainbow	Arlingoin
Evening	Joolaloon	Road	Maur
Feather	Tolorr	Rock	Kolborr
Fire	Marrja	Rockhole	Oongorr
Flowers	Maroo	Root, of tree	Nimingool
Foam	Karloo	Running Water	Ianda
Fog	Poorgudda	Sand	Parnga
Foliage	Peelarra	Sandhill	Tadda-garra
Forenoon	Mooyoon	Sea	Kara
Fruit	Mi	Sea-shell	Umboola
Gorge	Edarr or Edarboara	Sea-weed	Noomool
Granite	Koolbor		
Grass	Kooljar		
Gum	Goombie		
Heat	Moola		
Hill	Karrain		

THE ELEMENTS, ETC.—*continued.*

Seeds, of plants	Logorr	Twilight ..	Marnga
Shade	Barlie		
Sky	Koarwell	Valley ..	Goon
Spinifex ..	Paljarra	Vegetable Food	Mi
Spinifex Gum..	Karnda		
Star	Inderie	Water	Kowra-coornga
Stone	Moolgorr	Water (deep) ..	Koaran
Stream ..	Wongorra	Water (fresh) ..	Koornga
Sun	Algar	Water (running)	Ianda
Sunrise ..	Algardan	Water (salt) ..	Kara
Sunset ..	Algar Ingardie	Water (shallow)	Manjel
Surf	Alalgoordie	Weather (cold)	Ingoor
Swamp Country	Arramboara	Weather (hot)	Moola
		Weather (wet)	Koarda
Thunder ..	Jeedoom	Well	Peedean
Thunderstorm	Janjalla	Whirlwind ..	Adjiebungoroo
Tide	Loo	Willy Willy ..	Oongoongoon
To-day ..	Bannagarra	Wind (East) ..	Bardoon
To-morrow ..	Nooridjie	Wind (South) ..	Almbunna
Track	Maur	Wind (West) ..	Rerral
Tree	Burdog		
Tree, Bark of ..	Burdoon	Yam	Koolngarie
Tree, Gum of ..	Dumoodoo	Yesterday ..	Perdy

GENERAL VOCABULARY.

A.		Always ..	Murday
Abduct, to ..	Inarga	Ambush ..	Ungarjalga
Able	Nimungoong	Am I ? ..	Nunja Nungalj
Abscond, to ..	Injoogooroo	Among ..	Poonja Ungaraljie
Absent ..	Poonanin	Amuse, to ..	Koara
Abundance ..	Neemana	And	Kal
Abuse, to ..	Inagarnboo	Anger	Peladie
Accompany, to	Umboon	Another ..	Arring
Accuse, to ..	Injagaljie	Anxious ..	Ingalbalba
Across ..	Wawie-arnan	Any	Oongoong
Adorned ..	Inganbarnbidje	Apart	Nyoonin Noordingen
Adultery ..	Innaminjie		
Afraid	Injoorig	Approach, to ..	Jerrinin
After	Lamboo	Arise, to ..	Ngararnnie
Again	Peelagidgee, Peeladan (when dissatisfied)	Arrange, to ..	Annorlarlun
		Ascend, to ..	Lugal Ngynya
		Ashes	Kadgerdoo
Aged	Nyoongool	Ask, to ..	Injanarrga
Agree, to ..	Koraljie Corna	Assault, to ..	Pelly
Aim, to ..	Ineedie	Astray, to go ..	Ingoodally
Alarm	Marmorinjedie	At once ..	Kinyingamurra
Alive	Noynjie	Attentive ..	Ingallamongen
All	Poonja	Avoid, to ..	Jinba
Alligator ..	Lingorr	Away	Poonoin
Alone	Noordingen	Awkward ..	Narnan
Also	Kal	Axe, stone ..	Neelamurra

B.	
Back, to go	Barda
Back, to bring	Bullubanna
Bad	Logal
Bag (in which a child is carried)	Orladda
Bald	Balbarr
Bandy legged	Moogamoog
Bare	Koordagie
Bark, as a dog, to	Wurr-wurr
Bark (used for food vessels)	Ngarrawin
Bark (used for making huts)	Paarl
Basket	Orladda
Bathe, to	Kalgorin
Battle	Pelly
Beat, to	Inambie
Beautiful	Ninbella
Before	Meelon
Beg, to	Injarganjarrie
Behind	Biber
Belch, to	Inaning
Bellow, to	Ingalerrima
Below	Larda
Belt	Barlie
Betray, to	Ngunjoolnguly
Between	Poolngoroo
Beware!	Jah
Big	Poodajie
Birth	Injalgoo
Bite, to	Innabundarra
Bitter	Linja
Black	Marnga
Bleed, to	Ilgar Lalindan
Blind	Bamboor
Blow, as the wind, to	Toora narie imbiljie
Blow with the mouth, to	Boar nungarmar
Blue	Jibe
Blunt	Noomba
Board, for throwing spear	Yangal
Body	Neearda
Body (dead)*	Ngyrie
Boggy ground	Ngeal
Bony	Inbal
Boomerang	Jeewa
Born (fell)	Injalgoo
Both of us	Ijon
Brand (fire)	Marbalng
Break, to	Injakoolie

Breath	Lean
Breathe, to	Lean ngunya
Bright	Ninbella
Bring me!	Anangi bullub
Bring, to	Ngi Nungar
Brown	Lamarr
Bruised	Korbinjie
Bundle	Toornandoo
Burns, it	Ingamallie
Burn it	Annamallie
Burnt	Kalingamallie
Bury, to	Nunabundie
Bush	Pindan
Bush walk	Maur
Bye-and-bye	Journdie
C.	
Call him back!	Ngulerrimin
Call, to	Ingalerrima
Camp, native	Baloon
Cannibal	Pindanolie
Care, to take	Injalal
Careful	Oomballa
Careless	Ngoorinban
Carry, to (on the shoulders)	Kondanjie
Cataract (film over eye)	Koolorr
Cauterize, to (a wound)	Anjoobarra
Certainly	Gardoo
Change, to	Ungar-pendanj
Charcoal	Rerrga
Charm, to (by a spell)	Kowedan
Cheat, to	Meela
Chew, to	Ngorgillabun
Choke, to	Innaminga
Cinder	Kadjerdoo
Circle	Itil
Circumcision	Chobanya
Clasp, to	Badena
Clay	Ngeal
Clay, white lime	Munga
Clean	Nangree
Clear (as water)	Nangree
Clear away, to	Innagorra
Clear, to (make a clearing)	Raanyenumbie
Climb, to	Lugal-ngynya
Cloak, to	Inornding
Close (near)	Ung-ana
Close, to (stop up a hole)	Injoogoogorra

* See also ghost, spirit, and devil.

GENERAL VOCABULARY—*continued.*

Clothe, to ..	Ngorla
Club	Norla
Cold, a ..	Kornbie
Cold, to be ..	Ingoor
Collect, to ..	Ingoringorrima
Colour	Raàmoo
Come in, to ..	Bullub inna poorgoin
Commence, to	Unjarimbarra
Conceal, to ..	Ingalga
Concealed ..	Kalingalga
Confused ..	Narnan
Conqueror ..	Innagoolboo
Construct, to ..	Innamogera
Continually ..	Murday
Convalescent ..	Haninjoon
Cook, to ..	Ingamurra
Cooked ..	Kalingamurra
Cooked meat ..	Arlie
Cool	Penjun garrda
Corroboree ..	Koppa-koppa
Couple ..	Kooyarrinjoon
Courage ..	Arroolaraga
Covered ..	Inorrding
Coward ..	Pindallie
Crack in the skin	Lorlor injodee
Creep (to creep on game)	Yardabinjoo
Crime	Malgan
Crippled ..	Moogamoog
Crooked ..	Jardoo
Cruel	Jinin, injun
Cry, to ..	Ing-algin
Cry out, to ..	Ingalerrima
Cunning ..	Narrie nimungoong
Cure, to ..	Poodenda
Cut, to, with a knife	Keernunga
Cut, to, with native hammer	Kutan

D.

Damp	Koarda
Dance	Burbur
Dead	Injibee
Deaf	Arra alalamongen
Decayed ..	Poolman
Deceit ..	Meela
Deceive ..	"
Deep	Koaran
Defy, to ..	Peladee
Dense, scrub ..	Poordan
Dense, stupid ..	Narnan
Depart, to ..	Barda
Desert, to ..	Injoogooroo
Desire to ..	Leean nun man
Destroy, to ..	Injakoolie
Devil	Ngyrie
Die, to ..	Nungeemba
Different ..	Arrneembella
Dig, to ..	Ingalba
Digging stick ..	Moondorr
Direct (in a straight line)	Tooroong
Dirty	Ngoonba
Disappoint, to	Pindalla
Disguise, to ..	Inangoindee
Displease, to ..	Arra noongoong
Distance ..	Mara
Distend, to ..	Moorgudda
Disturb, to ..	Coolarrameele
Divided ..	Kalinjakoolie
Divide, to, amongst several persons	Poonja nim joogara
Do that! ..	Burninmjoo
Dog's tail, head-dress	Ella jungarda
Down (below)..	Jimpongoin
Down (short hair)	Mardagor
Drag along, to	Ingoolngarra
Dread, to ..	Injoorig
Dream ..	Inaburra
Dried, parched ground	Lalgarboara
Dried up ..	Lalgar
Drink	Aneep
Drink, to ..	Incep
Drive, to ..	Inolbolb
Drown, to ..	Ingardie
Dry	Talboor
Dry, withered, applied to leaves	Lalgar
Dying	Meelarra injibee

E.

Earache ..	Eger neelamurr
East	Ardie
Echo	Ingamilbra

GENERAL VOCABULARY—*continued.*

Edge of a Knife	Neelel
Effaced	Kalinamoorgalj
Effects	Jeewa marka moor
Egg-shell	Ellengarra
Embrace, to	Badena
Empty	Kalembanya
Enclose, to	Innabunding
Enemy	Injarair
Enough	Kalla
Erect	Tooroong
Evil	Logal
Evil Spirit	Ngyrie
Examine, to	Injal
Exchange	Ungarpendanj
Excrescence	Poolgoorda
Expose, to	Lambadan
F.	
Faint, to	Jangalla lindogie
Fall, to	Injalgoo
Family or Tribe	Moogelman
Far away	Mara
Fast	Wowerwerri
Fasten, to	Inorgand
Fear, to	Injoorig
Feed, to	Inalee
Fetch, to	Bullubinna
Few	Talbooro
Fig	Kooree
Fillet, for the head	Karoo
Find	Nuninya
Finish, to	Embanya
Fire-stick	Ena
Firm	Deewar
Fish bait	Bingarra
Fish trap	Weerie
Fixed	Deewar
Flame	Ngulla ngulamya
Flat	Alaling
Flat, to lie	Alalingoin
Flee, to	Terrdinjoo
Flesh (of animals)	Arlie bunga
Float, to	Inanarga
Flour	Mi
Food	Mi
Food (forbidden)	Neeam
Forbid, to	Arraminya
Forcibly	Yarranunga
Forward, to go	Alboroo jou
Four	Koojarra Koojarra
Fresh (lately made)	Nangree
Friend	Jallanda
Friendly	Pindalie
Frightened	Injoorig
Full (filled up)	Albooroo
Full (satisfied)	Kallamoorgudda
Full of holes	Nemana reewie
Fur	Larban
Further	Korngidge burnin
G.	
Game, a	Koara
Gently	Oomballa
Get up, to	Ngarramie
Ghost	Ngyrie
Girdle of opossum hair	Kumbarlie
Give, to	Inya
Glitter, to	Inalinya
Glutton	Murday charlindar
Go astray, to	Mam ingoodally
Go away, to	Barda
Go back, to	Jarinjoo
Go in, to	Barda poogoin
Go out, to	Barnbarnjou
Good	Korna
Good, no	Logal
Grave	Yeerarra
Graze, to	Inalee
Grease, to	Meeo
Great	Poodagie
Greyheaded	Jubulj
Grief	Angorr
Grind, to	Neeler neelerinjie
Grip, to	Inya
Grow	Imbungen
Growl, to (as a dog)	Ngoreninna
Gum, edible	Dumoodoe
Gun	Jeelamon
H.	
Half-caste	Kiarr
Half	Talboor
Halt, to	Oongan
Handle	Argudda
Handsome	Neenbella
Hang	Inorgand
Hard	Deewar
Harmless	Koorgeja
Harsh (rough)	Rarrga-rarrga

Hatchet ..	Neelamurra
Hate	Arra noongoong
Haunch ..	Malbarra
Haunt ..	Hoara
He	Kinying
Head-cover ..	Tangorr
Heap, a ..	Ardboon-umboon
Hear, to ..	Ingalamongen
Heaven ..	Koarwell
Heavy ..	Rampan
Her	Kinying
Here	Jeebilbra
Hers	Kinying jenna
Hidden ..	Injalga kallo
Hide, to ..	Injalga
High	Kandie
Him	Kinying
His	Kinying jenna
Hold, to ..	Ingordininna
Honey ..	Moonga
Hop, to ..	Joorginna
House	Mia
Hungry ..	Munjal
Hunt, to ..	Ingolbolb
Hurt	Arrarra
Hurt, to ..	Inambie
Husband ..	Umber

I.

I	Ngi
Idle	Ngorinban
Ill (sick) ..	Eger
Imitate, to ..	Iningalung
Immediately ..	Kinyingamurra
Immovable ..	Deewar
Improper ..	Logal
Injure, to ..	Inambie
Injury ..	Arrarra
In (within) ..	Poorgoin
Incest	Wongoo
Increase, to ..	Imbungen
Indeed ..	Gardoo
Inform, to ..	Injoolneidgie
Initiate, to (man making)	Choabanya
It	Kinying
Itch	Mulingarra

J.

Jagged ..	Rarrga-rarrga
Jealous ..	Ingamonjie
Jealousy ..	,,
Jeer	Inagarnboo
Jest, to ..	Inarnga
Journey, to make a	Barda chooding
Joy	Kornalean
Jump, to ..	Wearingerrim
Just, to be ..	Turrgal

K.

Keep	Injalal
Kernel ..	Tale
Kick	Joonmoogana
Kill, to ..	Innamboo
Kind, to be ..	Narrie jenna anja
Kneel	Choolinarr
Knife	Jimborairie
Knock, to (down)	Inganjeddima
Kylie (Boomerang)	Jeewa

L.

Languid ..	Ngoorinban
Large ..	Poodagie
Last, of anything or anyone	Budjerie
Late, or too late	Yanbaran
Laugh ..	Ingamar
Laughter ..	Koolgar
Lay, to eggs ..	Inàrgoola
Lazy	Ngoorinban
Lead, to ..	Alligie
Leak, to ..	Reewie
Lean (thin) ..	Inbal
Lean, to ..	Yardeena
Leap, to ..	Wearinerrim
Leave (to go away)	Bardajenna
Lie (to lie down)	Eelagor
Lie (to tell a lie)	Meela
Lift up, to ..	Inamongera
Light (not heavy)	Bybie
Light, fire ..	Noora
Light a fire, to	Inaloora
Like (similar) ..	Errganbanomil
Line (a straight mark)	Tooroong
Listen, to ..	Mallendoo
Little	Morrol
Living, alive ..	Noinjie
Locality ..	Boara
Loiter, to ..	Oomballa

General Vocabulary—*continued.*

Lonely ..	Noordingen
Long	Neewandie
Long ago ..	Arronjerry
Long hair ..	Newandie mowan
Longing for (wanting)	Narrie leean nun man
Look for, to ..	Numeijie
Look out, to ..	Jar
Look, to (to see)	Injal
Loose	Roginna
Lose, to ..	Ingoodally
Lost	Kalingoodally
Love, to ..	Narrie noongoong
Lover	
Low	Larda
Lying (down)	Darkonyarr

M.

Mad	Narnan
Magic	Kòvedan
Make, to ..	Inamogera
Many	Neemana
Marriage in the right line	Jimbingarie
Master, a ..	Nullen
Matches ..	Noora
Matter (from sore)	Mandoo
Me	Ngi
Meat	Arlie
Medicine ..	Mullen
Meet, to ..	Kalle tarra ngungerrinjen
Melt, to ..	Orlalla
Mend, to ..	Injiegoogooroo
Merry	Corna indoojie leean
Message ..	Chowal ingorage
Mia (native hut)	Barlie
Middle ..	Poolngooroo
Milk	Numana
Mimic, to ..	Innagalong
Mind, to ..	Injalal
Mine (my own)	Ngi jenna
Mistake ..	Allig
Misunderstand, to	Arra nimungoong
Mix, to ..	Umboolalum
Monster (fabulous)	Liardoo
More	Peelagidge
Motherless ..	Loomie
Mouldy ..	Peenie
Mount, to (on a horse)	Injerrim
Mourning ..	Angoor
Move, to ..	Koona
Much	Nemana
Murder ..	Jumanjoon inamboo
Must	Kardajie poodanum
Must not ..	Arra Milinya
My	Ngijenna

N.

Naked ..	Kordajoo
Name	Ninga
Narrow ..	Joondooloo
Native Well ..	Peden
Near	Ungana
Netting ..	Jargaroo
Never	Arrajen
New	Janjarairair
News	Chowal
Nice	Corna
No	Arra
Nobody ..	Ungaborda
Noislessly ..	Oomballa
None	Arragidge
North	Allang
Nose-piercing ..	Kardambie
Nose-stick ..	Larra-larra
Not	Arrajenna
Nothing ..	Numarda
Now (at once)..	Kinyingamurra
Number, a ..	Neemana

O.

Off	Parnbie
Offended ..	Peladie
Offensive ..	Allig
Oh!	Wah
Old	Nyoongool
On	Enin
Once	Arrinjing
One	Arrinjio
Open	Lambadan
Opening ..	Reewie
Open, to ..	Lambajoon
Other	Arr
Our	Arradoo jerrda
Out	Poonoin
Over	Nyoon
Ownerless ..	Loomie

General Vocabulary—*continued.*

P.

Pain	Arrarra
Paint, to	Inoreddie
Pair	Kooyarrinjin
Pant. to	Ngarra ngarra
Parched up	Lalgar
Part of, a	Arrung
Pass, to	Inangoola
Path (track)	Maur
Paw	Nimbal
Peaceable	Ngorn
Pearl-sholl	Quan
Pebbles	Moelgor
Penetrate, to	Tale-nganna
Perhaps	Neenga
Pick up, to	Inya
Pierce, to	Tale-nganna
Pinch, to	Korban
Pinion (wing)	Neemalla
Pit	Korang
Place	Boara
Place, to	Inama
Plain	Alaling
Plant, to	Inorndornda
Play, to	Koara
Playing	Koaràngun
Pleased, to be	Korna indojie leean
Plenty	Narrie
Pluck out Feathers, to	Tolorr robanya
Plume, a	Tolorr
Point of land	Mangarra
Point, to	Narngan millajong
Pointed (finely)	Neelidge
Pointed Spear	Karja
Poise, to (spear)	Mard mardinjoo
Pole (rod, or stick)	Burdog
Portion, a	Arrung
Possessing	Jenna
Pounding Roots (act of)	Doodoolinjoo
Powerful	Pandoreddy
Presently	Karama
Pretty	Ninbella
Prickles	Mungalla
Proper	Korna
Property (personal)	Jeewa markamoor
Provisions	Mi
Pull, to	Yarr-ana
Pursue, to	Inangooriba
Push, to	Inoonboo
Put in Order, to	Timba timbanam
Put it through	Talana
Putrid	Peenie

Q.

Quick	Joongoongoor
Quickly	Wowerwerrie
Quiet	Oomballa
Quietly	,,
Quit, to	Barda
Quiver, to	Imbarmarmar

R.

Raise, to	Inamongore
Rapid	Wowerwerice
Raw	Karnga
Ready	Ngunja chooro
Really	Turrgal
Recover, to	Numja
Red	Peedamurra
Refuse, to	Arra earillum
Rejoice, to	Korna indoojie leean
Relate, to	Ingoujee
Relation, a	Iarra
Remain, to	Oongan
Remember, to	Nullenjenna
Restrain, to	Inorndermar
Retaliate, to	Inambin
Return, to	Jarinjoo
Right (proper)	Korna
Ring (circle for enclosing game)	Neeal
Rob, to	Langbie
Robber	Langbieinjoon
Rogue	,,
Roll over, to	Ordol-ordol
Rope	Meridjie
Rot, to	Chalaloo
Rough	Rarrga rarrga
Roundabout	Bungor-bungor
Rubbing	Innagorbor
Rub, to	,,
Run away, to	Injoogooroo
Run, to	Joongeninna

S.

Sad	Ingalbalba
Safe	Kalla korna nunjoo
Salt	Moolgor-moolgor
Same (the)	Errganbanomil
Satisfied	Mingoonunjoo
Scab	Imbindee
Scar	Lanbair
Scold, to	Inagarnboo

General Vocabulary—*continued.*

Scrape, to ..	Injarairbee
Scratch, to ..	Innagandandie
Scream, to ..	Injoodoo wahrah
Search, to ..	Numeijen
Secrete, to ..	Inagoolboogal
Secretly ..	Mulgen
See, to ..	Injal
Separate, to ..	Noordingen nordingen ingama
Shadow ..	Nimingarra
Shake, to ..	Ingalarlab
Shaking (quivering)	Imbarmarmar
Shallow ..	Manjel
Shame ..	Rarajen
Shank	Neelarre kanjie
Share, to ..	Joogerainum
Sharp (edge), a	Neelije
Sharp (point) ..	Neelerr
Sharpen, to ..	Innahallie
Shavings ..	Jee
She	Kinying
Shield	Marrga
Ship	Burdog
Shiver, to ..	Imbarmarmar
Short	Narda
Shout, to ..	Ingallerrima
Shut, to ..	Poondinum
Shy	Joorgoon
Sick (ill) ..	Eeger
Side, the ..	Oin, as Jeroin (that side); Kandoin (top side)
Silent, to be ..	Oomballa
Silly	Narnan
Sinews of kangaroo's tail (used for sewing)	Jarlang
Sing, to ..	Jerrima
Single	Noordingen
Sink, to ..	Ingalarda
Sit down, to ..	Ingalanda
Slippery ..	Argalyargay
Slow	Oomballa
Slowly ..	,,
Small	Moroll
Smear, to ..	Imborinjie
Smile, to ..	Ing-aima
Smoke, of fires	Koongoodor
Smooth ..	Kioor
Snap, to ..	Terrdal
Sob	Ingalgin
Soft	Norboo
Some	Arrung
Somebody ..	Arrunga
Song	Elma
Sorcery ..	Kòwedan
Sore (or boil) ..	Punditti
Sorrow ..	Arrarra
South	Barnal
Sparkle, to ..	Inalinjen
Sparks ..	Teedulinjoodie
Spear (generic term)	Errol
Spear (hunting)	,,
Spear, to ..	Inamboo
Spear, to throw a	Ineedie
Spear (war) ..	Errol
Speedily ..	Wowerwerrio
Spider's web ..	Ungarra
Spill, to ..	Inamoor
Spin, to (weave)	Innagoodallie
Spirit (or devil)	Ngyrie
Split, to ..	Injakoolie
Spring (native well)	Peeden
Spring, to ..	Wearingerrim
Squeeze, to ..	Badena
Stale (old) ..	Nyoongool
Stalking game	Arlingen
Stamping ..	Boor boor injoo
Stand, to ..	Jidjerinjoo
Stare at, to ..	Narrie nimanie
Startle, to ..	Marmarinjoodie
Steal, to ..	Langbie
Steep (high) ..	Al-al
Step (footstep)	Nimbal
Stick	Burdog
Stiff	Orrarinjoo
Still (quiet) ..	Oomballa
Sting	Inambee
Stir, to ..	Bungor-bungorinum
Stir up, to ..	,, ,,
Stolen	Kalla-langbie
Stoop, to ..	Kordinjoo
Stop!	Jidjeranjoo
Stop, to ..	Jidjerinjoo
Story	Chowal
Straight ..	Tooroong
Straight, to put	Tooroong narrinama
Stranger ..	Marayon *
Strangle, to ..	Koorbool inninooridjen
Strayed (stock)	Ingoodally
Strike, to ..	Ingajedima
String, of a bag	Albay
Strong ..	Pandoreddie
Struggle ..	Innabarairelly
Stuck (fast) ..	Deewar

* Literally, one from afar.

General Vocabulary—*continued.*

Stunted ..	Narda
Sufficient ..	Kalla
Sulky (cross) ..	Pelladie
Summer ..	Laleen
Superstition ..	Ngoolngoola
Surround, to ..	Neeal
Sweat	Noondoor
Sweet	Kiarr
Swell, to ..	Moorgalla
Swim, to ..	Kalgoorin
T.	
Take care! ..	Jah
Take care, to ..	Injalal
Take in the hand, to	Inya nemaloon
Take, to (or he or she takes, you take)	Inya or minya
Tall	Newandie
Tame	Ngorn
Tattoo, to ..	Bowerr
Tattooing ..	,,
Teach to ..	Injoolneejie
Tear, to ..	Larrinambie
Tease, to ..	Innagooloola
Tell me ..	Anjan ngi
Tell, to ..	Injoojie
Temper ..	Pelladie
Tether ..	Inorgand
That very thing	Jarradajeeber
Their	Yerra nim jerra
Them	Yerr
Then	Jum
There	Nyoonbinee
They	Yerr
Thief	Langbinimjoon
This	Jeeber
This one ..	,,
This way ..	Burnabadan
Those	Yerr
Thrash, to ..	Ingajeddima
Three	Edjar
Through or Between	Talè-nganna
Through, pierced	,,
Throw, to ..	Ineedie
Throwing ..	Yoomanoon
Throwing board	Yangal
Tickle, to ..	Gil-gil inum
Tie, to ..	Inorgand
Tie up, to ..	,,
Tired	Pooljie
Tiresome ..	Koelalla
Tobacco (native)	Loobur-loobur
Together ..	Umboon
Tomahawk ..	Neelamurr
Top (of anything)	Kandoin
Touch, to ..	Injooding
Track (footprint)	Nimbal
Track, to ..	Inorlbalba
Trackless ..	Arrajenne nimbal
Trap, a ..	Werric
Tread, to ..	Boor-boorinjoo
Try, to ..	Inna lingina
Tuft (ornamental)	Tolorr
Turn, to ..	Pongoin
Turn back, to ..	Jarinjoo
Turn over, to ..	Pongoin
Twirl round, to	Inna barail
Twist, to ..	Bungor-bungorr
Two	Kooyarra
U.	
Ugly	Allig
Unable ..	Arra nimungoong
Uncooked meat	Karngaarlie
Uncovered ..	Kalanjoon
Under	Jimpen
Underneath ..	Jimpengoin
Understand, to	Nimungoong
Uneven ..	Rarrga-rarrga
Unfasten, to ..	Rogina
Ungainly ..	Allig
Unwell ..	Eeger
Upright ..	Tooroong
Upside down ..	Rangoon
Upwards ..	Lugal
Us	Arradoo
Use, to be of ..	Narrie nimungoong
Useless ..	Allig
V.	
Very	Narrie
Very bad ..	Narrie logal
Very good ..	Narrie korna
Vessels (bark, etc.)	Orladda
Vicious ..	Peladee
W.	
Wait, to ..	Journdie
Wander, to (off the right track)	Werra

General Vocabulary—*continued.*

Warm	Moola	Witchcraft ..	Kòwedan
Wash, to ..	Unjulalook	Wither, to ..	Lalgar
Wasted ..	Inbal	Within ..	Poogoin
Watch ..	Boar injalal	Without ..	Pocnoin
Weak	Koolalla	Wood	Noora
Weapons ..	Jewa marrga moor	Work	Moorgool
Weighty (heavy)	Rampan	Worn out ..	Embanya
Well (not sick)	Libe	Wound, to ..	Inambie
West	Koolarr	Wounded ..	Kalinambie
Wet	Koarda	Wrong ..	Allig
What	Unga		
Where ..	Jennar		
Which ..	Tenarr		
Whistle ..	Elborinjo	Y.	
White	Poolgarra		
Who	Ungabor	Yam-stick ..	Moongoor
Whole ..	Poonja	Year	Lalleen
Whose ..	Ungaborjenna	Yellow ..	Koonbil
Why	Ungoinjie	Yes	Ungieardi
Wicked ..	Logal	Yet	Doolie
Wide	El-el	You	Jou
Wild native ..	Pindanolio	Young ..	Morool
Will, I ..	Nunja ngi	Young (of animals)	Malba
Will they ? ..	Nunja yerr	Your	Joujeer
Will you ? ..	Nunja jou	Yours	Jouardajeer
Winter ..	Bargunna		

SHORT SENTENCES.

As the Australian language does not obviously admit much refinement in the rules of grammatical construction, the sentences given below are written grammatically only for the sake of euphony.

A.	
Afraid, I am not, of you	Ngi arra nulorig
Afraid, What are you, of ?	Unga minjorig
Asleep, He is	Kinying ingamoolga
B.	
Bad, That is very	Jarralogal
Bad, You are	Jou logalgidge
Brother, He is my	Kinging ngi jenna borla
Brother, That is my	Kornba ngi jenna borla
Bury him, to put the body in a tree	Marbagoin enim kandie

SHORT SENTENCES—*continued.*

C.	
Care, Take, of	Anjalal
Carry this	Anamongera jeeber
Cattle, Bring in the	Anundie boolamon
Cattle, Did you see the ?	Nunja minundie boolamon
Children, Where are your ? ..	Jenna bra jou jeer alla
Come from, Where do you ? ..	Jenna bra tarrminarr
Come here	Apra jou
Come, I, from	Ngi tarringarra
Come in	Apra poogoin
Come, I will	Ngi tarroongarra nungeer
Coming, They are	Kalla tarroongarra yerr
Coming with you, I am	Ijou
Cook that fish	Anamurra jeeber arlie
Country, Where is the name of your ? (They always say "Where is the name" not "What is the name"	Jennabra ninga jee boora
Country, Where is your ?	Jenna bra jeer boora
Coward, You are a	Jou minjoorig
D.	
Daughter, Is that your ?	Jou arda jeo alla
Dead, He is	Kalla injibee kinying
Deceiving me, You are	Jou meela mindun
Dingoes, Are there many ?	Nemanada koarading joon
Direction, In this	Nunamba maur
Doing, What are you ?	Najirra min digen
E.	
Eat, Can you, this ?	Jou nunjanalee
F.	
Father, He is my	Kinying ngijenna koola
Find, Where did you, them ? ..	Jenna kaminya
Finish this	Jeeba anoinya
Fire, Make a	Noora analoora
Fire, Make, by friction	Ena anayerr
Fish, Catch some	Arlanya
Fish, Cook that	Anamurra arlie
Flour, I want some	Flour leean nunman
Food, Give me	Mi ana ngi
Food, I cannot get	Ngi arra millorlie
Food, I have no	Arragidge jenna mi
Food, I want	Ngi mi leean nunnan
Food, I will give you	Mi nunja jour
Food, Where shall I find	Ngi jenna bra nungamie mi
Friend, I am your	Ngi kal jenna jallander

G.	
Get along	Koonajee
Get up	Ngarramie
Give me	Ana ngi
Give it to me	Ngi anangi
Go away	Barda jee
Go before me	Barda jee albooroo
Go behind me	Biberoin jee
Go, I will, now	Ngi kalla jenna barda
Going away, I am	,, ,,
Going to—, I am	Ngi barda jen
Gone, He has just	Bannagarra gidge andangal barda
Gone, He has, to	Kalarndangal
Gone, Where has he ?	Nyirra bra
Good, That is no	Jarra logal gidge
Good, That is very	Jarra korna gidge
Good, You are no	Jou logal gidge
Good, You are very	Jou korna gidge
Go, I, to	Ngi barda jen
Go quickly	Barda wowerwerrie jee
Go quietly	Barda oomballa jee
Go there	Nyoon ngunbidgee
Go, You	Bardajee
H.	
Here it is	Jeebanin
Hill, What is the name of that ? ..	Jenna bra ninga karrain
Horses, Bring in the ?	Bullul ana youardie
Horses, Did you see the ?	Nunja minjal youardie
House, Am I near a ?	Mia ungana eerng un
House, Are we getting near the ? ..	Mia nunja arraren ungana
Husband, Is that your ?	Jarra jouardi jeeumba
Husband, Where is your ?	Jenna bra innen jee umba
I.	
Ill, I am	Ngi eeger
Ill, You are	Jou eeger nimada
Is that your——	Jarra jouardi jee
K.	
Kangaroo, Are you hunting ? ..	Jou pooroongun barda nim
Kangaroo, Where shall I find ? ..	Ngi jenna bra nungamie pooroo
Killed, He has been	Ingaroijee
Killed, Who has, him	Ungaba nim inamboo
Killed, You have, him	Jou nim minamboo
Know, I	Ngi kall ngumingoong
Know, I do not	Ngi arra ngumingoong

Short Sentences—*continued.*

L.	
Lake, What is the name of that ?	Jenna bra ninga wongera
Lake, Where is the ?	Jenna bra wongera
Lazy, You are	Jou ngoorinban
Leave me	Poonajee
Let it alone	Pirairunjoong
Lie down	Ngaralgoo
Listen to me	Nulla mongen ngi
Long time ago, That was a ..	Arrangungarra
Look out	Jah
Lying, He is, down	Nyooninin eelagor
M.	
Mother, She is my	Kinying-ngi jenna piree
Mother-in-law, She is my	Kinying-ngi jenna allorr
N.	
Name, Who is your ?	Ungaba ninga jou
Natives, How many are there ? ..	Nunja goodoo erral umba
Natives, Where are the ?	Jennabra errel umber
Native, Who is this ?	Jarr ungabor
Noise, What is that ?	Ungay
P.	
Put, Where did you put them ..	Jenna bra-minya
R.	
Relation, What, are you to ? ..	Unga jeer
River, Where is the name of that ?	Jennabra ninga river
Roots (edible), Find some	Koolngario ngumeidjie
Roots (edible), Where shall I find ?	Jenna bra nungamie koolngarie
Run away	Poonajee
S.	
Sea, Am I near the ?	Nunja ungana kara ngi
Search for that——	Ngumeejie
Shoot that——	Jou anna najedima
Sleep, I shall now	Kalla jenna nungamoolga
Slow, You are very	Jou oomballa gidge
Speak, Do not	Arramilla narnga
Spear, Where is your ?	Jenna brajee errol
Springs, Are there any native, here ?	Jeer orla nunjenin ungana
Station, Are we getting near the ? ..	Kallarda ungana ungarrie mioon
Stay with me	Jou jarungan ngi
Stay, you, here	Jou jarumgan bilbra
Steal, From whom did you ? ..	Ungaba jenna langbie inama jou
Stolen, You have, that	Langbie minyaja
Stop here	Jou jarrimgan

T.

Take this to	Anunga jeeba
Tell..............to come to me ..	Unjan..............bullubidjee an
That, I want	Yarr ngi leean nunman
Tired, I am	Pooljie nunjoo ngi
Track, Where is the ?	Jenna benin maur
Tree, What is the name of that ? ..	Yarr unga burdog ninga
Tribe, To what, do you belong ? ..	Jenna bra jou jeer boora
True, That is not	Jan arra turrgal
Turkey, Where shall I find a ? ..	Jenna bra nungamie burrgarra

U.

Understand, Do you ?	Jou nunja nimungoong
Understand, I do not	Ngi arra ngumungoong

W.

Want, What do you ?	Jou unga leean minman
Water, Am I near ?	Orla minja ungana
Water, Boil some	Anamurra orla
Water, Give me	Orla ana ngi
Water, Have you found ?	Jou nunja minjal orla
Water, I cannot find	Arra gidge orla nullal
Water, I want some	Orla leean nunman
Water, Where shall I find ? ..	Jenna bra nungamie orla
Waterhole, Where is the ?	Jenna bra peeden
Way, Come this	Bullubidgee
Way, Go that	Koona bidjie
Well, Where is the ?	Jenna brapeeden
What is it ?	Bidje ungie
Where are you going ?	Nyirra bra ar miudun
Where do you come from ?.. ..	Jenna bra tarrminarr
White man's house, Where is the ? ..	Jenna bra mia
Who is that ?	Nyoon ungaba jarra
Who is there ?	Nyoon ungaba
Wife, Is that your ?	Jarra jouardaje mullar
Wife, She is my	Kinying ngi jenna mullar
Wife, Where is your ?	Jenna bra jeer mullar
Wood, Find some	Noora ngumedje
Work, Go to	Barda jee moorgooloon

Y.

You and I	Ijou
You two	Goor gardio

HISTORY OF ZOOLOGY IN WESTERN AUSTRALIA.

PART II.—1791-1829.

By

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(Read 13th July, 1915.)

In a former paper[1] I brought together all the information as to the Zoology of Western Australia which had been gleaned by the Dutch and the Englishman, Dampier, up to the close of the 17th Century.

During the 18th Century, very little further information as to the Fauna of our State was obtained. We know that some dozen ships visited our coast, but of these only two left any record of their observations, namely, those commanded by Vancouver and d'Entrecasteaux which visited our south coast in the last decade of the century, and to which I shall refer shortly.

Meanwhile, however, the famous voyage of Captain Cook had revealed to the world the more fertile eastern shores of the continent, and the discoveries of Sir Joseph Banks and Dr. Solander at last drew the attention of scientists to the peculiarities of the fauna and flora of the new land. The fact that an altogether new type of mammal existed in Australia was emphasised by the introduction of the name kangaroo, though Banks did not give nearly such a complete description of the animal as Pelsart had done many years earlier.

The settlers in Port Jackson soon began to collect and send to England specimens of the new and curious mammals, birds, fish and insects with which they met, and the general characteristics of the fauna of Australia rapidly became known to the scientific world. For a long time, however, no attempt was made to record from what part of the continent the specimens came, consequently most of the species described were recorded as from New Holland, and even up to the present time we are ignorant of the exact habitats of many of the New Holland insects collected in the period with which I propose now to deal.

In the year 1791, Captain George Vancouver, in command of H.M.SS. "Discovery" and "Chatham," passed along the south coast of Australia on his way to the Pacific Ocean. On September 28th he discovered a fine harbour which he called King George the Third Sound, and on the following day "a small, high island was called Seal Island, being a great resort of those animals." The two ships

[1] Journal of Nat. Hist. and Sci. Soc. of W.A., Vol. V.

remained in the Sound till the 11th of October, and the officers devoted much of their time to exploring and surveying the neighbourhood and especially the two inner harbours. "In our way out of the north-eastern harbour," says Vancouver, "the boats grounded on a bank we had not before perceived; this was covered with oysters of a most delicious flavour on which we sumptuously regaled; and loading, in about half-an-hour, the boats for our friends on board, we commemorated the discovery by calling it Oyster Harbour."

On October 7th, "as we proceeded to the upper part of Oyster Harbour, our attention was directed to several large black swans[1] in very stately attitudes swimming on the water, and when flying discovering the under parts of their wings and breasts to be white; this is all the description we were enabled to give of them, since they were excessively shy, and we very indifferent marksmen."

In his general summary of the results of his observations he writes as follows:—

"Of the animal kingdom, so far as relates to the tenants of the earth, little information was derived. The only quadruped seen was one dead kangaroo; the dung, however, of these or some other animals feeding on vegetables, was almost everywhere met with, and frequently so fresh as to indicate that the animal could not be far removed.

"Of the birds that live in or resort to the woods, the vulture may be said to be the most common, as we saw several of this species, or at least birds that were so considered. Hawks of the falcon tribe with several others of that genus; a bird much resembling the English crow, parrots, parroquets, and a variety of small birds, some of which sung very melodiously, were those which attracted our attention the most; but all were so excessively wild and watchful that few specimens could be procured.

"Of the waterfowl, the black swan seemed as numerous as any other species of aquatic birds in the neighbourhood of Oyster Harbour, but they were seen in no other place. There were also black and white pelicans[2] of a large sort, seen at a distance; and though ducks were in great numbers, we were very unsuccessful in taking them. A very peculiar one was shot,[3] of a darkish-grey plumage, with a bag like that of a lizard hanging under its throat, which smelt so intolerably of musk that it scented nearly the whole ship. There were also many grey curlews,[4] and sea-pies[5]; of the latter we procured a few which were excellent eating. The aquatic birds before enumerated, with shags, the common gull[6], two or three sorts of tern, and a few small penguins[7] of a bluish colour, included the whole of the feathered tribe in the vicinity of the shores.

[1] Chenopis atrata, Latham.
[2] Pelecanus conspicillatus, Temm.
[3] Biziura lobata, Shaw (named from this specimen.)
[4] Numenius cyanopus, Vieillot.
[5] Haematopus ostralegus, Linn.
[6] Larus novaehollandiae, Stephens.
[7] Eudyptula minor, Forster.

"With the productions of the sea we were not much more acquainted, which is rather to be attributed to our want of skill as fishermen than to its want of bounty. Some of the few fish we caught were very excellent, particularly of the larger sort; one much resembling the snook, and another the calipevar of Jamaica, both of high flavour; as was a kind of fish, not unlike, nor inferior in quality to, the English red mullet.[1] These with the common white mullet, rock fish, mackerel, herrings, and a variety of small fish, were those we procured, though not in any abundance.

"Whilst on the coast, whales and seals[2] were frequently playing about the ship; of the latter we saw about a score at one time on Seal Island. The little trouble these animals took to avoid us indicated their not being accustomed to such visitors. The throat and belly of these seals, which were of a large sort, were nearly white; between the head and shoulders the neck rises in a kind of crest, which, with the back, was of a light brown colour; their hair was exceedingly coarse, the carcase very poor, and afforded little blubber, which, however, may be imputable to the season.

"Reptiles and noxious animals seemed by no means to be numerous, as only two or three yellow and bronze-coloured snakes were seen, which were good eating. These, with a few lizards of the common sort, and some about eight or nine inches long of a thick clumsy make, dark colour, and altogether excessively ugly, were what composed that race of animals. Some beautiful beetles, common flies, and muskitoes were occasionally met with, but not in such numbers as to produce inconvenience."

This summary, which was probably compiled by Menzies, the botanist, who was naturalist to the expedition, mentions all the creatures noted in the journal of daily events; except that on one occasion they found on the top of a native hut "a fresh skin of a fish commonly called leather-jacket."

After leaving King George's Sound, Vancouver followed the coast eastward as far as Termination Island, near Esperance, where on October 22, they "noticed more coast and oceanic birds than they had seen on any other part of the shores; as, besides gunnets,[3] and two or three different sorts of tern, albatrosses and petrels, particularly the black and sooty, were in great abundance."

Presumably Menzies took some specimens back with him to England, but there seems to be no record of what became of them.

In August, 1791, the French Government despatched two ships, the "Recherche" and the "Espérance," under the command of d'Entrecasteaux, to search for La Perouse. After touching at Teneriffe and the Cape of Good Hope, they reached Tasmania in April, 1792, then visited New Caledonia and a number of other islands as far as

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[1] Upeneichthys porosus, Cuv. and Val.
[2] Zalophus lobatus, Gray.
[3] Sula serrator, Gray.

the Moluccas. Leaving Amboyna in October, they sailed down the coast of Western Australia which, however, they did not sight till they reached the neighbourhood of Cape Leeuwin on December 7th. The expedition was accompanied by two naturalists, the zoologist Riche, after whom Cape Riche on the South coast was named, and the botanist Labillardière. The latter and Captain d'Entrecasteaux both wrote accounts of the voyage, from which the following information as to the animals they met with is taken.

On the islands of the Recherche Archipelago, which they discovered, they found "many seals of the species which Buffon denominates *petit phoque*, and Linnaeus *phoca pusilla*,[1] which basked quietly in the sun upon the rocks and the sandy beach, and some of them allowed themselves to be knocked on the head." They were of various colours—white, grey (more or less deep), and brown (bordering upon black). They were, however, all of the same species. Labillardière fired at one, which lay at a distance from him. Finding himself wounded and distrusting his strength, he durst not take to the water. Immediately another very large one, hearing the cries of that which had been wounded, came and licked the blood with apparent satisfaction, but at the sight of a long-boat, which was steering towards them, they plunged into the sea. "Soon afterwards, more of these animals were seen advancing towards the beach. Before they ventured upon land, they never failed to raise their bodies nearly half out of the water, and they remained some time in that attitude, smelling and gazing all round, in order to discover whether or not they could safely come and repose upon the rocks." D'Entrecasteaux tells us that they appeared to him, as to everyone else, not at all disagreeable to eat.

"On the same islands there was a numerous flock of geese,[2] several of which allowed themselves to be taken by the hand; but the rest, apprized of the danger, immediately flew away. This new species is somewhat smaller than our wild swan, and of an ash-coloured grey, a little lighter on the belly. The bill is blackish with a tumour of sulphur-yellow at its base. The legs are slightly tinged with red. Riche named them *Anas Terrae Leeuwin.* D'Entrecasteaux tells us that their flesh was much more delicate than that of European geese.

"Two sea-gulls,[3] a male and a female, of the species called by Buffon *bourgmestre*, and by Linnaeus *Larus fuscus*, perched upon the heights at a small distance from us," says Labillardière. "The female having been shot, the male, frightened by the noise of the explosion, took to flight, but presently returned, and being determined not to abandon his mate, was killed by her side. On one of the islands I killed the charming yellow turtle dove, remarkable for six or eight golden feathers towards the bases of its wings, and

[1] Zalophus lobatus, Gray.
[2] Cereopsis novaehollandiae, Latham (Cape Barren Goose).
[3] Catharacta lonnbergi, Mathews (Australian Skua).

which induced White to call it the golden-winged pigeon.[1] (*See* page 43 where he has given a good figure of it.) I had before found the same species at Cape Diemen.

"There we also caught many penguins,[2] of the species called *Aptenodyta minor*, and which Captain Cook likewise met with at New Zealand. They were in the same manner concealed in very deep holes in the rocks, from whence it was frequently very difficult to expel them." "Penguins occur in great numbers on all the islands," says d'Entrecasteaux, "I did not eat them, but our crews lived on them during our stay at this anchorage, and found them better than the seals."

The sharks there are of an enormous size. One followed our boats as if he longed for one of us. They were of the most common species, the *Squalus carcharias*.[3] On board the "Esperance" they caught one which was about thirteen feet in length and of more than proportionate bulk.

Some fishes were caught with the hook, among which were the *Labrus cyprinoides,* and several new species of the genus *perca.* During the first days of their stay they only caught small numbers, but at the end the fish became much more abundant, doubtless owing to the fragments thrown over from the frigates attracting them.

A party landed in Esperance Bay, which they discovered, and Riche having got separated from the rest was lost in the bush. Search parties were sent out for him without success, but ultimately he found his way back to the beach after 54 hours without food.

In the course of his wanderings he saw a large cassowary[4] which escaped behind some tall bushes. He tells us "I encountered three kangaroos of the large species (*Didelphis gigantea*, Lin.) They were of different ages, only one being adult; they were not very frightened of me, for having run very quickly for a distance of fifty feet, they sat down on their haunches in front of me. It appears that the young follow their mother for a long time, and do not leave her even when she has given birth to another young one. I had already encountered on the previous evening one of these animals followed by a young one about two-thirds of her size. Nothing is more remarkable than the manner in which these animals run; they do not go upright, nor do they run on four legs; but in advancing the animal holds its body curved forwards and bent horizontal as in other quadrupeds, without however resting on the front feet, which are very short and folded against its chest; in this way it ambles, if I may thus express it, on its two hind feet. It was always in this attitude that I saw six individuals of this species running at different times, while I was lost on this coast. The great muscular strength of their thighs explains how, in running, they can hold themselves

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[1] Phaps chalcoptera, Latham (Bronzewing Pigeon).
[2] Eudyptula minor, Forster.
[3] Prionace glauca, Linn. (Blue Shark).
[4] Dromiceius novaehollandiae, Latham (Emu).

in a position which is impossible for all other quadrupeds; and the inspection of their skeleton proves that they cannot run upright.

"There also exists in this neighbourhood a carnivorous animal of the genus or at least of the family of dogs.[1] I met with its tracks on the sandy shore of the lake, and it would appear from the footprints that it is at least as large as a wolf.

"A large variety of birds enlivened the scene; I specially noted the large white parrot with a red crest,[2] which Linnaeus described under the name of *Psittacus moluccensis.* The mosquitoes fatigued me much. The species were the *Musca domestica,* the *Stomoxis irritans* and the *Culex pipiens* of Fabricius.

"The Oyster-catcher (*Haematopus ostralegus*), and several species of Charadrius, covered the shore. I found large numbers of limpets, turbos, and haliotis."

Labillardière, who was a member of one of the search parties, only saw two species of birds, "a muscicapa, which I afterwards met with in the Moluccas, and the fine species of red-breasted cockatoos, *Psittacus moluccensis,* which are met with in the same islands, in flocks of many hundreds. When I attempted to approach them they always removed to a great distance, flying rapidly, with sudden starts, and emitting loud and disagreeable shrieks. M. Mérite, leader of another of the search parties, killed a snake five feet long. His party also roused several partridges, as well as numerous flocks of parrots.

The collections made by Labillardière were taken to the Musée d'Histoire Naturelle at Paris, and some of the species were subsequently described by the French zoologists of the period.

In the first three decades of the Nineteenth Century English and French navigators completed the survey of the whole coast of Australia, which thenceforth has appeared on our charts with little alteration. All the most important of the expeditions were accompanied by professional naturalists who made collections which were taken to Europe and were described by authorities in the different groups. At this period the scientific study of the Western Australian fauna really commenced, and the work has continued up to the present time.

The first of these surveying expeditions to arrive on our coast was accompanied by Francois Péron, perhaps the most distinguished naturalist whose discoveries we shall have to chronicle in this history. Péron was zoologist on board the "Géographe," which, in company with the "Naturaliste," reached the south-west coast on May 27, 1801. As showing the zeal and energy of this great man we find that on the same evening he and Maugé took a haul of the dredge. "We hoped to obtain, by its means," he said, "the first

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[1] Canis dingo, Blumenb. (Dingo).
[2] Cacatua leadbeateri, Vigors (Pink Cockatoo).

objects of our Australian collection, and our attempt was rewarded as richly as we could desire."

The next day "several whales passed very near our vessels. At midnight, we dredged again, and brought it up filled with a crowd of interesting objects, in describing and drawing which Lesueur and I worked all the rest of the night."

On May 31st they discovered Cape Naturaliste and entered Geographe Bay. Next day a considerable party landed, and it being low tide, Péron walked along the shore. "I quickly collected a fairly large number of new objects," he says, "amongst which was a charming living species of Orbulites.[1] It is known that the Orbulites are a small kind of solid zoophytes, confounded, previous to the time of Lamarck, with the true Nummulites, and these singular animals were only previously known in the fossil state. This discovery is not the only one of its kind that we shall have occasion to relate in the course of this narrative, and the shores of New Holland will furnish us frequently with new proofs of the catastrophes of nature.

"Crossing the dunes I came upon a marsh whose banks were everywhere covered with Salicornia, and on the brackish waters of which I saw several troops of black swans swimming with elegance.

Having waded across the water (named the Vasse River) and struck into the forest he remarks: "The saline quality of the soil seems to repel all animals; at least, I could see none, and the traces of kangaroos which I noticed in the sand, were very few. Insects even seemed exiled from these parts, always excepting ants, whose black legions, particularly on the slopes of the dunes, were everywhere as innumerable as they were disagreeable. I recognised several new species among them, of which one, remarkable for its great size, closely resembles the *Formica gulosa* of Fabricius; but the account of these animals will be treated more in detail in another part of my works."

Unfortunately Péron did not live to write this portion of his work to which there are frequent references and which was evidently intended to be a Natural History of Australia. The scientific descriptions of all the new animals met with were to have been given in this volume and only the names of the more striking species are mentioned in the general account of the voyage, which was the only part completed. From this it results that almost all the new names given by Péron remain *nomina nuda* and cannot be referred with certainty to the species to which he gave them.

A storm coming on drove them out of Geographe Bay, and during the night the two ships became separated. The commander, Baudin, had arranged that Rottnest Island should be the first rendezvous and Sharks Bay the second, but for some unexplained reason he failed to call at Rottnest where he might have rejoined his consort, but went straight on to Sharks Bay.

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[1] Orbitolites complanata, Lamk.

To return to Péron's narrative, we are told that on June 16th, in lat. 32deg. 42min. 57sec. S., "M. Maugé and I profited by a moment of calm weather to make another haul of the dredge along this coast. This attempt procured us new treasures, notably a species of sponge remarkable for its clear purple colour; a liquid of the same shade could be squeezed from it by a slight pressure, and this liquid, spread on different substances, resisted the action of the air perfectly, and even that of several alkalies."

On June 27th they were off Bernier Island. "On every side we were surrounded by great shoals of Salpa, Doris, Medusae, Beroës and Porpitas, genera of molluscs and zoophytes. . . . . . The prodigious numbers of these animals, their changing and curious shapes, their delicate colours, the elegance of their movements, and the agility of their evolutions, formed an agreeable spectacle for all our companions; and for my friend Lesueur, my colleague Maugé and myself, such an abundance was a great subject of pleasure and enthusiasm.

In the midst of these innocent and graceful legions appeared large numbers of dangerous reptiles which, gliding easily over the surface of the waves, appeared to be hunting a troop of little clupeas which fled precipitately towards the high seas.

These marine snakes, of which we shall often have to speak later, have been so badly observed by naturalists up to the present time that I think I must enter here into some detail as to their structure. All these marine animals differ from terrestrial reptiles by their flattened tail, which has the form of a small oar, and by their body compressed like that of an eel and almost angular below. They are of very various and sometimes very brilliant colours. Some have the body of a uniform tint, either grey or yellow or green or bluish; others are ringed with blue, white, red, green, black, etc.; some are marked with large more or less regular spots; others only have minute spots, elegantly distributed all over the surface of their body. One of the species is especially remarkable for the colour of its head, which is red with purple reflections: it is the 'sea-snake with a red head' of Dampier, who recognised it first in this locality. Like terrestrial reptiles, some are quite harmless, others are armed with venomous fangs. As to size, we found them from a length of 30-40cms. (12-16ins.) up to 3 or even 4 metres (9-12ft.).

"Their habitat is not confined to the sea-shore; we observed several at a distance of 300 or 400 miles from all land; and what is more extraordinary we never saw any on the continent or the islands. From this observation, I doubtless cannot conclude that they do not inhabit the land; but yet we never encountered them there; and in connection with animals so singular and so little known, the impartial observer should not omit any important fact, even though he cannot give any explanation of it.

Marine serpents breed exclusively in the warmest seas of the globe, especially in the Indian Ocean, in the Persian Gulf, in the

Red Sea, and in that which bathes the coasts of the N.W. and N. of New Holland; at least this is the conclusion I have reached from my own observations and from the numerous researches on this subject which I have made in the narratives of travellers. The high temperature of these seas, the calm which they habitually enjoy, and the multiplicity of the animals which swim in them and on which these snakes feed, appear to me to be the principal reasons for their predilection for equatorial seas.

On opening the stomachs of several animals of this genus, I have found them chiefly filled with small fish and with divers pelagic crustaceans, but they, in their turn, become the prey of numerous sharks which live in these seas. Several times, in fact, I found sea-snakes more or less altered by digestion in the stomachs of these scavengers.

"At first I found it difficult to conceive how such nimble animals could become the prey of these large sharks whose movements are so clumsy and stupid, but afterwards, from observing more of these reptiles, I believe I discovered in one of their habits the cause of this phenomenon. Often these snakes may be seen asleep floating on the surface of the water; their sleep is then so profound that our ship passing sometimes quite near them did not waken them by the sound of its movement, nor by the considerable waves it produced, nor by the customary cries of the sailors. Doubtless it is in this state of lethargy that the clumsy sharks manage to seize them; at least it seems to me impossible to imagine any other solution. As to the cause of this sleep itself, perhaps it depends, as in several terrestrial reptiles, on the species of stupor which, in the animals of this family, so frequently accompanies the process of digestion.

"These marine reptiles swim and dive with equal facility; often at the very moment when we thought we could seize them with our net they disappeared from sight, and diving to great distances below the waves, they remained for half-an-hour or more before returning to the surface, or only re-appeared at very great distances from the point where we had seen them dive.

"All these curious habits and all these differences of structure, uniting to separate the pelagic snakes from those of the land, have led me to create a distinct family for them. It will be seen in another part of my work what are the more special reasons for this division.

"Whilst the general interest was still engrossed by so many varied objects, a great number of whales were suddenly observed advancing towards us with all the rapidity of which these animals are capable. On no other occasion did such a spectacle come under my observation. . . . . . The multitude of the cetaceans, their enormous size, their rapid evolutions and their playful frolics all appeared to me less astonishing than the sight of these powerful colossi leaping perpendicularly from the waves, standing, so-to-say, on the tips of their tails, spreading out their vast flippers, falling back on the waves, bursting them asunder and finally disappearing amidst torrents of foam and spray. . . . . Sometimes a numerous troop of these whales seemed to advance in a long line; one would have supposed that they were then competing in suppleness and velocity; at other times on the contrary, one behind the other in single file, they swam with a sort of deliberatiou, alternately plunging beneath the waves and reappearing on the surface. Frequently we saw them performing their evolutions in pairs with a sort of mutual complacency, which made us suspect that it was the breeding season.

"In the midst of these great objects of observation, the evening appeared to come on very rapidly, and when the night fell, forcing us to let go the anchor, the whole company still had their gaze riveted on the whales.

"Redoubtable though these animals may be from their mass, from the strength of their flippers and tail, as well as from the speed with which they swim, nature has nevertheless opposed rivals to them, and the terrible sawfish breeds on these shores to carry on an implacable and murderous warfare against them. This Australian sawfish[1] differs from that of the north, especially by the possession of two long fringes or flaps, from 25 to 30 cms. in length, and 8 to 10 mms. in breadth, which, placed on the sides of the saw, towards its middle part, float freely in the water. Like that of the North, the Australian sawfish is capable of attaining large dimensions, and several of them appeared to me to be not less than 4 or 5 metres (12 to 15ft.) in length. I have already spoken, in the chapter on the Land of Leeuwin, of the battle between one of these animals and a whale. We were not long in seeing another in Sharks Bay. It took place during the night, under a beautiful clear moon, quite near our ship. The two adversaries appeared to fight with equal ferocity. The whale, especially, made prodigious leaps, hurtled from the water almost uninterruptedly, and appeared much tired from the attack which it had to sustain. We could not see the result of the combat, the two champions gradually became more distant.

"This extraordinary abundance of whales in Sharks Bay must some day give it considerable importance in this fishery: in fact it will be as easy as profitable. Strangers to all species of attack on the part of man, the whales in these regions have not yet learned to flee his presence or to mistrust his traces, and such was their indifference to our presence that, in navigating the interior of the Bay, we were often afraid of seeing our boats smashed by these enormous animals which rose close beside us in search of the air which they need."

On the 28th of June they anchored off Bernier Island, and on the following day Péron landed on the island. "The substance of

[1] Pristiophorus sp.

the island itself is composed, in its lower strata, of a shelly limestone, sometimes white, sometimes reddish, deposited in horizontal beds, whose thickness varies from 2 to 3 decimetres (7 to 11 inches). The shells encrusted in this rock-mass are almost all univalves; they belong chiefly to the genus *Natica* of M. de Lamarck and agree closely with the species of *Natica* which are found living at the foot of these rocks. Doubtless they have been petrified for many centuries, for, besides the difficulty of extracting them whole from the matrix owing to their intimate adhesion with it, they may frequently be found more than 50 metres (150 feet) above the present sea-level." The islands Dorré and Dirk-Hartighs are similar in structure to Bernier Island, and the remarks which I shall make on the vegetable and animal products of the latter are applicable to the two others also."

"The human species does not exist on these lands, and we found no positive trace of his presence or of his visits."

"A single species of Mammal occurs, namely the Banded Kangaroo[1] (*Kangurus fasciatus*, n.sp.), the smallest and most elegant species of this extraordinary genus of New Holland animals, which is characterised chiefly by the conical form of its body, by the disproportion of its feet, by the pouch in which the young are carried and nourished, etc. The present species is distinguished at first sight from all those known at present by 12 or 15 transverse bands on the back, narrow, of a light brown tint, less regular and less decided on the top of the shoulders where they begin to appear, but becoming much more distinct and browner as they descend towards the tail, at the base of which they terminate. These stripes disappear on the sides and cannot be traced on the ventral surface; the face and the feet are light yellow, whilst the abdomen is pale grey and sometimes almost white; the rest of the fur is grey varying in darkness in different individuals. The ears in this species are proportionately shorter than in any other of the genus; the same is true of the tail, which is also much more feeble, and which, being without hair, closely resembles that of a very large rat. The other characters, the conoidal form of the body, the disproportion between the fore and hind limbs, the distribution of the toes, nails, etc., are the same as in all the other kangaroos. But all these details, which will be given in the zoological part of our work, do not belong to this account; it will suffice to have indicated the principal characters of the pretty little animal with which we are concerned, and M. Lesueur's picture will sufficiently supply those particulars which I must here pass by in silence.

The Banded Kangaroo peoples the three islands of Bernier, Dorre, and Dirk Hartigs, but we did not find it on any part of the continent or on any of the other islands which we afterwards surveyed. We shall see in the sequel the same phenomenon for all

[1] **Lagostrophus fasciatus, Peron.**

the species of kangaroos, namely, that each is limited by nature to certain islands or certain portions of land, whilst no individuals extend beyond the particular limits of their species.

Deprived of all means of attack or defence, the present species of kangaroo, like all feeble folk, and particularly like the hares of our clime, are extremely wary and timid. The slightest noise alarms them; the whistling of the wind is often sufficient to put them to flight. Consequently, in spite of their great number on Bernier I., hunting them was at first very difficult and precarious. In the impenetrable scrub these animals could endure with impunity the attacks and activity of our hunters. When forced to leave one of these retreats, they left it by some unforeseen route, speedily made for some other neighbouring patch, where it was impossible to conceive how they entered and disappeared so readily in the impenetrable thicket; but we soon learnt that in each patch of scrub they had numerous little covered runs, which, from different points of the compass, converged to the centre, and which they could use as different outlets, according to the point from which they were menaced. From that time their ruin was assured; our hunters joined forces, and whilst some of them beat the bushes with long sticks, others stood at the outlets of the little runs, and the animals, deceived by their experience, did not fail to fall under the almost inevitable blow. The flesh of this animal seemed to us, as to Dampier, very similar to that of the rabbit, but more tasty than that of the latter, which is perhaps due to the special nature of the plants on which it feeds almost all of which are aromatic. It is easily the best kangaroo flesh that we obtained, and on this account, the acquisition of this species would be a benefit to Europe.

At the time when we were in this locality all the adult females carried in their pouch a fairly large young one, which they endeavoured to save with a truly admirable courage: when wounded they fled carrying their young one in the pouch, and never abandoned it unless when too worn out by fatigue or too enfeebled by loss of blood they could not support it any longer. Then they stopped, resting on their hind legs and with their fore-feet helped it to leap out of the maternal sack, and endeavoured to show it a place of retreat in which it might hope to save itself; they then continued their flight as quickly as their strength would allow; but if the hunter's pursuit ceased, or only lessened, they were observed to return to the bush which protected their offspring; they called it with a kind of grunting which is peculiar to them; caressed it affectionately as if to dissipate its alarm, made it once more enter the pouch, and sought with this precious burden, some new retreat where the hunter could not discover or attack them. The same proofs of intelligence and affection were exhibited in a still more touching manner by these poor mothers when they felt themselves mortally wounded, all their care was for the safety of their offspring; far from endeavouring to save themselves, they remained under the blows of the hunter, and their last efforts were devoted to the preservation of their little ones. . . . A generous devotion of which the history of animals offers so many examples, and which we are often forced to envy them!

During our stay on Bernier Isle, we captured several of these young kangaroos; but the majority, doubtless too feeble, did not long survive their captivity. Only one endured and throve; this animal ate bread with pleasure, and especially appreciated water sweetened with sugar which was given it. The last taste seems extremely curious, since, on the barren island inhabited by these animals, every species of fresh water is completely lacking. This young kangaroo was accidentally killed at Timor; we did not regret its loss so much, since as we had only one individual we could not hope to naturalise it in Europe; but this first attempt conclusively proves that the species will accustom itself to captivity; and I repeat that it would be a great acquisition to our farm yards.

If we except certain useless or disagreeable kinds of which we shall not stop to speak, all animals are rare on the sterile soil with which we are dealing; the class of birds, for example, is only represented by melancholy cormorants, by several species of noddies, petrels, gulls, sea-eagles and oyster-catchers, which, far from man and his works, multiply on these arid rocks. The division of land-birds is only represented by fly-catchers and shrikes; we found, however, a beautiful species of tit[1] with a blue breast, which deserves more particular mention.

The Reptiles comprise only a species of skink[2] (*Scincus Tropisurus*, n. sp.), one of the largest of this genus, whose very short broad tail gives it the appearance, at first sight, of having two heads; a beautiful species of Tupinambis (*T. Endrachtensis*, n sp.) from 12 to 16 decimetres long (4-5ft.), a Gecko (*Gecko Dorreensis*, n. sp.) from 10-13 cms. (4-5 inches). An account of these species, all three new to science, will be given in the zoological account of New Holland, with all the details which ought to be presented.

No place in the world perhaps produces so many fish as the great Sharks Bay; but this abundance of fish is not found on the coasts of Bernier Island. It is in the depths of the neighbouring harbours that these animals seek the calm and food which they require; we shall return to them at another time; it is sufficient to observe that our fishing yielded very few, and that our collections of this group were increased by scarcely ten new species.

In the midst of the tumbled rocks of Bernier Island live different species of Octopus, some of which reach a very large size; I saw several which were not less than 9 or even 13 decimetres (3 or 4 feet) long when their arms were extended.

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[1] Malurus lamberti, Vig. and Horsf.
[2] Trachysaurus rugosus, Gray. (Stump-tailed Lizard).

Amongst the true shellfish these localities were richer; but if we except mussels and oysters which assemble, so to speak, amongst these rocks and waves in swarms, all the shells were univalves. In the bottom of the bay numerous magnificent bivalves live amongst the mud and sand. We will go on a future date to capture them in their peaceful habitations; but, not to anticipate the natural order of events, we will here indicate rapidly some of the more remarkable shells which we collected on Bernier Isle.

Of all the species of mussel known up to the present, one which I discovered there is undoubtedly the most beautiful and splendid; deprived of its sea-coating, it reflected all the most vivid colours of the prism and of precious stones; it is radiant, if I may thus express it. I have described it under the name of *Mytilus effulgens.*

On other grounds, the oyster of this coast (*Ostrea scyphophilla,* n. sp.) deserves particular attention: its lower valve is a kind of elongated cone 16 to 19 cms. long (6-7 inches), more or less regular. Fixed on the rock by its point and by one of its sides, it is covered by the second valve, which closely resembles the same piece in our common oysters, and which forms an operculum for the kind of cornet which I have just described. The animal does not occupy the whole depth of this curious shell; it lives in the summit of the cone, all whose lower portion is occupied by a large number of small transverse partitions like watch glasses, which reach to the extremity of the point by which the shell is attached. Their concave face is turned upwards, leaving between them free spaces, which are filled with an aeriform fluid, whose nature it would have been interesting to determine. However curious this oyster may be, its animal nevertheless was extremely delicate, and all opinions agreed in its favour.

Amongst the univalve shells peculiar to this part of the land of Endracht, I must mention a beautiful species of Trochus or Top-shell (*Trochus smaragdinus,* n. sp.) of the most vivid and intense green colour; a species of Limpet which, from its proportions, I named Patella gigantea ; a magnificent Volute[1] (*Voluta nivosa,* n. sp.) sprinkled with little white spots like so many snow-flakes, and above all a cone (*Conus dorreensis,* n. sp.) about 40 mm. (1½ inches) long, very light orange in colour, and distinguished by a band 6 or 7 mms. (3 lines) broad, which is developed on each whirl of the spire, and which in the quite fresh shell is the most brilliant (blue) lapis colour. Two species of land shells extremely numerous, but all dead, occupied great stretches of the interior of the island, one was a small species of Helix, the other belonged to the genus *Bulimus* of M. de Lamarck.

The Crustacean family does not embrace a large number of species on these coasts; but there are two of the genus *Portunus* of M. Latreille (*P. pleuracanthus* and *P. euchromus,* n. sp.), which

[1] Scaphella nivosa, Lamk.

cover the rocks with their greedy multitudes. Some of these crabs are not much less than 10 or 13 cms. (4-5 inches) in breadth, and their flesh was excellent. They might afford, in case of need, a diet inexhaustible as well as healthful.

Insects are in general not numerous on this island, if we except the ants, which alone number five or six different species, and whose innumerable legions occur in every situation. After the ants come the Blattas or Cockroaches, of which one apterous species attained very large dimensions. Grasshopper, crickets, etc., furnished us with several curious species. I must mention, in this connection, that the family of *Orthoptera*, which generally prefer arid and dry places, presents a large number of species in the Continent of New Holland, and each of them appears to be excessively numerous there. More than once we shall have occasion to note interesting connections between the nature of the soil and its various products.

Among the tumbled rocks which I have described live several species of sea-urchins, which it is sometimes very difficult to remove from the calcareous rocks in which they appear to be incrusted. In the same places live several species of Starfish, of the genus *Ophiura*; one of them (*Ophiura telactes*, n. sp.) is distinguished by its long arms, 21-27cms. (8-10ins.), jointed, fragile, and quite bristling with little spines. Withdrawn into the fissures of the rocks, this animal extends its long arms outside, and uses them with much skill to seize its prey and withdraw it into the interior of its little cavern. A second species of *Ophiura* (*O. phosphorea*, n. sp.) shines during the night like a beautiful star, by the aid of five glands or tubercles placed on its disc.

In the class of solid Zoophytes, besides some species of Millepore, a branched Madrepora is found, from 16-19cms. high (6-7ins.), whose extremity is marked, in the fresh state, by an extremely bright and pure rose colour.

From all the observations which I have just narrated on Bernier Isle and the waters which surround it, we conclude that the terrestrial animals are very few in species and all save the kangaroo are useless or harmful; whilst the sea on the other hand is remarkably rich, and from the whale to the microscopic polyp all the classes of the animal kingdom are represented there by numerous and interesting families; and when, in another part of this account, we shall have described the various productions of the great gulf at whose entrance we have now arrived, it will be seen, beyond doubt, that few seas have been more generously dowered than that which bathes these coasts."

As the "Naturaliste" did not appear, they decided to proceed further into the Bay, which they did on June 30th. "During the whole day we made little progress, navigating ceaselessly amidst great shoals of fish, of which we caught a great abundance, although under sail; all the species were new, and belonged to the genera Labrus, Balistes, Cottus, Ostracion, Chaetodon, etc. During the whole evening of the same day, we perceived an enormous quantity of whales, of which several came very near the ship. We also saw several sea-snakes from 1½ to 2 metres (five or six feet) long." They anchored in Dampier's Bay, at the northern end of Freycinet peninsula, but the same evening a sudden storm forced them to run back to their old anchorage off Bernier Island. After vainly waiting here for the "Naturaliste" till 12th July, they continued their journey northwards. After rounding the North-West Cape and passing Hermite Island, "from the 23rd to the 25th we had feeble winds, interspersed with flat calms. . . . Besides a prodigious number of Medusae, Salpae and Porpitae, etc., we were surrounded by fishes of various genera, particularly Balistes, Chaetodon, Clupea, etc., which must be placed at the head of the equatorial fishes. Every moment we perceived round the vessel very large sharks, and on all sides whales and turtles presented themselves in great numbers. We recognised also two new species of sea-snakes, of which one 25-32 dms. long (8-10ft.), was green spotted with red and brown; the other only 9-13dms. (3-4 feet), of a dull green colour, was distinguished by large yellow and black splashes spread over the back."

On the 17th a party landed on Depuch Island. "They saw only one quadruped, which from a distance, appeared to be a dog; a conjecture which has the more probability since this species occurs on every point of the neighbouring continent. One of our sailors also thought he had seen a small kangaroo. Birds are reduced to some species of flycatchers and shore-birds. They also brought back a grey snake, 16 dems. (5ft.) long, of the genus Boa. Insects there comprise numerous species of ants, grasshoppers and crickets, and especially a fly which, by its prodigious numbers, much fatigued our men. Amongst the shells we must mention a charming species of Pyrula (*P. ecspila*, n. sp.) elegantly ornamented with little rosy spots." After passing Bedout Island, "on the first of August, we experienced a violent storm, during which I had occasion to observe some medusae of a prodigious size; most of them were no less than 6.5 dms. (2ft.) in diameter, and weighed more than 25 or 30 kilogrammes (50 to 60lbs.). Several species of the same genus yielded us valuable observations for an account of the phosphorescence of the sea."

On the 5th they discovered the Lacepede Islands, and in front of them a reef "which we named Whale Shoals, on account of the great number of animals of this genus which we encountered there. All through the day we also saw large troops of molluscs, and many fishes and sea-snakes. Our collections were increased by many species of each of these classes of animals."

The 9th and 10th they were among islands which they named Champagny Archipelago. "All this part of the sea is very full of fish, and our collections were increased by several species of Balistes, Chætodon, Lophius, pelagic Crustaceans and soft Zoophytes."

On the 15th, "the day was marked by an important discovery, that of a new genus of fish (*Balistapodus wittensis*, n. sp.), near to Balistes, but differing from it by the complete absence of a ventral fin: this last character makes of it the first type of a new order in the Ichthyological Method of my illustrious master M. de Lacépède . . . . He dared to fix in his tables the place that each of the unknown groups would occupy there some day . . . . . His great work on fishes was not yet finished, and already on far off shores his daring conceptions were realised."

On the 18th of August, as their stock of water was almost exhausted and many of the crew were suffering from scurvy, they left the Australian coast for Timor, where on September 21st they were joined by the "Naturaliste."

The proceedings of the "Naturaliste" in the period during which she was separated from her consort are related by M. Freycinet. After the cessation of the storm in Geographe Bay she made her way to Rottnest Island, which she reached on June 14th. Whilst waiting here for the "Géographe," different parties of her crew explored the islands and the Swan River.

Round the salt lakes in the interior of Rottnest "a prodigious quantity of bivalve shells of a single species formed a shore of about 5 metres (15 feet) in breadth." On the island "we killed . . . . several seals, whose flesh tasted excellent."

At the entrance to the Swan River "a prodigious multitude of pelicans had fixed their abode: we could only secure one. The shore was covered by a very great quantity of white, gelatinous, and transparent molluscs, washed up by the sea, which are doubtless the food-supply of the birds which frequent the place." On the banks "the *Eucalyptus resinifera* occurs abundantly; and great flocks of land birds, especially elegant parrots, flying among the trees, enlivened, by their presence, these unknown, wild, and desolate regions." The calcareous rocks at the mouth of the river "exhibit evident traces of the former presence of the sea; the rock is almost exclusively composed of incrustations of shells, of roots, and even of trunks of trees petrified; a phenomenon which recurs in different parts of New Holland."

In what is now called Perth Water "we met with new flocks of pelicans, which flew round us; we killed two of them." After passing the Heirisson Isles (the present Causeway) "for the first time, we perceived some black swans; they were swimming majestically on the water: we killed several; they had entirely black plumage, except the quills, which were white, the beak was red, and the feet black. We observed that, shortly after death, their beak lost its beautiful red colour, and became black."

In descending the river their boat was stranded in the shallows among the Heirisson Isles; they were about to land for the night, "when suddenly a terrible roaring froze us with terror: it was like the bellowing of an ox, but much louder, and appeared to come from the neighbouring bushes. At this fearful cry we lost all desire to reach the land, and, although shivering with cold, we preferred to pass the night on the water, without supper and without being able to sleep, on account of the rain and the cold."

South of Rottnest they discovered two other islands, Ile Berthollet, now called Carnac, and Ile Buache, now called Garden Island. "The latter was covered with a great number of seals, which kept a little way from the shore, and seemed inclined to dispute the passage with our sailors. This audacity cost them dear: a great slaughter occurred." Giraud Reef, near Carnac Island, "serves more particularly as refuge for a great number of sea-birds."

On Rottnest Island, the naturalist Bailly, found "two species of small shells; one a bivalve, the other a univalve, fairly similar to a Melania and red in colour" on the shores of the salt lakes. "The shores of most of these lakes were, quite literally, covered with these shells: they are the only living beings which we discovered there." The rock composing the hills is entirely calcareous, "full of shells very well preserved, which are arranged as if in families, in one place Venus, in another "Vis," etc.

"We observed," on Rottnest, "a small species of kangaroo, about 65 cms. (2 feet) high, which is very numerous there. We also met with a second species of quadruped of the size of a very large rat, which the old Dutch navigators actually mistook for a rat, but according to the observations of our naturalist, M. Péron, they belong to a new and very remarkable genus, whose description will be found in the zoological portion of the works of this estimable and indefatigable naturalist. Seals are present in large numbers on various sandy beaches on the coast: they sometimes penetrate for considerable distances into the interior of the forests. We saw some very large ones: they were mostly grey; some were reddish, and others were black. These last were the smallest and, perhaps, also the youngest: for we saw a female of an ashy grey colour suckling one of its young, which was itself black. The flesh of these animals, when it is fresh, is very good to eat; we often fried it and did not observe the least disagreeable taste or smell. The fur of most of these animals is fine and thick, and on this account, might be of considerable value: it would be easy to obtain a rich cargo of it.

Snakes are fairly common on Rottnest Island; we found several not less than 10-13dms. (4-5ft.) in length, and with a thickness of 40-50cms. (1½-2ins.); their colour was that of dull steel. Also on Rottnest Island a singular species of lizard was obtained, in which my friend Péron found a combination of digits hitherto unknown in the lizard family. This kind has only two on the fore-feet and three on the hind-feet."

"Fishing yielded us an abundance of excellent fish; there were, however, some days on which we could not catch a single one; these days seemed to me to correspond with the days of the greatest calm of wind and waves. Perhaps at these times the fish moved further into the open, and only returned to our neighbourhood when the sea, being too rough, they found it necessary to seek in shallower water a region where the waves were smaller.

What struck us most concerning the fish was the multitude of sharks; they never left the ship for a moment, and the majority of them were truly enormous. We captured one whose muzzle was much more pointed than that of the rest; its length was 42dms. (13ft.), its circumference 32dms. (10ft.), and its total weight about 636 kilos (1,300lbs.). We saw some whose dimensions were twice as big as this. It may well be doubted whether any other seas contain more powerful and formidable monsters of this genus. We also frequently observed sea-snakes round the ship, principally when the sea was calm."

On Garden Island "I observed partridges and crows smaller than those of Europe, but of a delicious taste; seals are much more numerous there than on Rottnest."

Leaving this locality the "Naturaliste" continued northwards up the coast, passing the Abrolhos, and anchored in Sharks Bay on July 16th. On Cape Inscription at the north end of Dirk Hartog Island they found a plate with two Dutch inscriptions, that of Dirk Hartog in 1616 and that of de Vlaming in 1697. On the east coast of Dirk Hartog Island, a small bay and islet were named Bay and Islet of Tetrodons, "because of the great number of fish of this genus which we found there, and of which our sailors took an abundant haul. Here whales occur in such great numbers that I was often obliged to alter my course so as not to be capsized by these enormous cetaceans. I saw also some turtles, and many small sharks or dog-fish." Close to the southern point of the island "I observed several holes as large as a man, and which seemed to constitute so many burrows; it would be difficult to guess by what animal they were excavated, the largest species of quadruped which we observed on the island being scarcely as large as a rabbit."

"Round several extinct fires," presumably on the mainland, "we saw many remains of shells and of fish, but no quadruped bones." "We discovered a great many pearl oysters; our sailors collected a number, and found some pearls in them, of which the largest was only half a line in diameter."

"On a little, sterile, solitary islet, on which we passed the night, we found a prodigious number of different seabirds, which as soon as we landed, flew round us screaming loudly; they remained a long time sailing overhead, all the time making a great noise. The sight which this cloud of birds afforded was very curious; their whiteness allowed us to distinguish them against the sky, in spite of the darkness of the night. We killed several of them, and collected a large number of their eggs, but neither appeared to us good; the eggs especially, although they were fresh, were hardly edible." On the Island of Three Bays, discovered later, "one can obtain oysters and fish."

[All these last observations were made in exploring Freyeinet Harbour, between Dirk Hartog Island and Péron Peninsula.]

Hamelin Bay, on the east side of Péron Peninsula, was also explored. Near Faure Island "vast sandbanks were discovered, which, at this period of the year were covered with turtles . . . ., our companions obtained 15 turtles in less than three hours, of which some weighed 122 to 147 kilos. (250-300lbs.)

"The animal productions of the sea," in the southern part of Shark's Bay, "are the same" as those described by M. Péron in the neighbourhood of Bernier Isle; "those of the land only appear to differ in the species of kangaroo which, larger on the continent than on the islands, is also rarer there; finally, the continent alone possesses dogs; and the human species is also peculiar to it."

"From the commercial point of view, the prodigious number of whales which we saw there seems to prove that speculations having for object the fishery of this animal would be successful; and the employment of water distillers would furnish sufficient for the needs of the fishermen. Fish and turtles would offer them an abundant and healthy nourishment: and possibly pearls, if more systematically captured, would pay for the labour of obtaining them."

On the 4th of September, the "Naturaliste" left Sharks Bay for Timor, where she arrived, as previously mentioned on the 21st.

On the 13th of November, having lost a number of their crew by scurvy during their stay at Timor, the two boats sailed again for Australia, and rounding the Leeuwin early in January reached Van Diemen's Land on the 13th. On the voyage Péron devoted his attention principally to pelagic animals. Deaths continued to occur on both ships from scurvy. "On the 20th of November, we encountered on the surface of the sea a great quantity of those Physalias, whose interesting habits I have already described (in the account of the journey from the Canaries to Mauritius). The species here referred to appears to me different from that of the Atlantic Ocean: I described it under the name of Physalia australis, and I made, on the organisation of these peculiar animals, a great number of researches, of which the details will be presented in the zoological part of our travels."

"On the 24th we saw for the first time the Storm-birds (*Procellaria pelagica*, Lin.): we were in the 14th degree of South Latitude. On the 7th of December, in 17°, and the 1st of January in 34°, we perceived others; which is very unusual in this latitude. "On the 25th November, we captured a shark 32dms. (10ft.) long, which furnished us a new example of the prodigious irritability of these fish. Actually, more than ten minutes after its head had been cut off and its heart and all the viscera had been removed, we wished to draw it to the bow of the ship to wash it at the pump. The animal, which was held by the tail, made such violent efforts and heaved its body with so much strength and quickness, that several persons were knocked over by it."

"On the 27th, we met with numerous shoals of flying-fish; we saw them again on the 30th, December 1st and 2nd, in latitudes from 14° to 19°.

On December 2, in 15°, we observed the first Tropic Bird (*Phaëton aethereus*, Lin.), the most beautiful of the equatorial oceanic birds: on the 22nd we saw them again, and on this date we had just passed the tropic of Capricorn."

On December 11 we were in 21° S. Lat. and 101° E. Long. from Paris : we saw a Cape Pigeon[1] (*Procellaria capensis*), the most elegant of the Antarctic oceanic birds, whose description occurs so often in the accounts of ancient and modern voyagers. On the 13th we saw them again, and the same day we observed Phaëtons. so that we saw together at the same place two animals, of which one, exclusively inhabiting the Antarctic seas, is at home amidst cold, fog, and storms, whilst the other, attached, as Buffon says, to the highway of the sun, loves the calm of the Tropics and their high temperature." "We observed Cape Pigeons in great numbers the whole length of Leeuwin land, and even in Geographe Bay, in 33°."

"On the 25th we saw Grey Petrels (*Procellaria grisea*, Lin.) : we met with them again on the 29th, 30th, and 31st of the same month, in latitude 32°-33° S."

"On December 29th, the sea appeared to be covered with Ianthina, the most agreeable of the pelagic shelled Mollusca; this mollusc, by means of a cluster of little vesicles filled with air, floats freely on the surface of the water, as we have already observed. On this brilliant shell, I discovered a new species of Crustacean, of an ultramarine blue colour like it. I recognised it as a Pinnotheres and described it under the name of *Pinnotheres Ianthinae*. This discovery is specially interesting, since these animals never seem to have been discovered parasitic on univalve shells before."

"On January 4th, 1802, in the midst of the waves, we saw two monstrous whales, which passed very near the ship; it was, however, impossible for me to determine their genus, because they only just ascended to the surface of the waves and then disappeared, leaving a vast foam behind them."

"On the 5th we were already in 37° of Latitude and in 117° of Longitude East (of Paris). Here the great Equinoctial Petrel (*Procellaria equinoxialis*, Lin.) disappeared; it had appeared to us for the first time in latitude 21° on the 11th of December; and from that date onwards, it had never ceased to be on view round our vessel.

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[1] Daption capense, Linn.

Thus we saw this beautiful Petrel for an extent of more than 19° on the limits of the southern equinoctial regions."

"The 7th of January we were in Lat. 39° and E. Long. 120°. We had the first sight of the species of Albatross described by Forster under the name of Chocolate-coloured Albatross (*Diomedea spadicea*). We had, on the 4th, in 35°, met with the Common Albatross (*Diomedea exulans,* Lin.), the largest of the Antarctic oceanic birds; and we had observed the two varieties of it white and brown, which it would be better to consider as two distinct species, as I shall endeavour to prove elsewhere. Some individuals had a spread of 32dms. (10ft.) or even more. The Chocolate-coloured Albatross appeared to me, as to Forster, smaller than exulans.

"During the 9th, several interesting animals appeared. The first were the great Brown Gulls (*Larus cataractes,* Lin.). These Gulls are, next to the Albatrosses, the most powerful oceanic birds of the Antarctic extremity of the world. Other flocks of birds, which appeared during the 9th, all belong to the genus of Sea-swallows (*Sterna*). I distinguished three species of them: the first appeared to me to be *Sterna obscura,* Lin.; the second was new: I described it under the name of *Sterna melanosoma,* on account of the black colour of its body; the third was equally unknown to naturalists, and owing to its affinity with *Sterna caspia,* Lin., it received the name of *Sterna caspioides.* This same day we perceived in the waves a short distance from the ship, an enormous species of Sepia, resembling the genus Calmar (*Loligo,* Lamarck) of the size of a cask; it rolled noisily in the midst of the waves, and its long arms extended on their surface, writhed like so many enormous reptiles. Each of its arms was not less than 19 to 22dms. long (6 or 7ft.) with a diameter of 18 to 21cms. (7 or 8ins.)."

Whilst the French ships were passing down the coast the celebrated explorer, Mathew Flinders, was devoting his attention to the southern coast of the State, which he explored from King George's Sound to the head of the Bight.

As regards the fauna, however, he added little to what had already been recorded by Vancouver and Labillardière.

At King George's Sound he observed seals, oysters, parroquets, and black swans. On January 3, 1802, he "took the opportunity of standing backward and forward in the Sound with the dredge and trawl overboard; and a variety of small fish were brought up. These were of little use as food, but with the shells, sea weeds, and corals they furnished amusement and occupation to the naturalist and draughtsman, and a pretty kind of hippocampus, which was not scarce, was generally admired."

He states that "amongst the animal productions of the district, the kangaroo and cassowary hold the first ranks. The kangaroo appeared to be numerous and of more than one species, but none were caught. Three of them seen by me bore a resemblance to the large kind which inhabits the forests of Port Jackson; and the cassowary showed nothing distinguishable at a distance from the same animal at that place; both were shy, as were the ducks, swans, and all the birds."

"Near Point Possession were found two nests of extraordinary magnitude. They were built upon the ground, from which they rose about two feet, and were of vast circumference and great interior capacity, the branches of trees and other matter, of which each nest was composed, being enough to fill a small cart. If the magnitude of the constructor be proportionate to the size of the nest, Terra Australis must be inhabited by a species of bird little inferior to the condor of the Andes.

"Amongst the reptiles was a variety of lizards; one of which of the larger size[1] was met with by Dampier on the west coast, and is described by him. The animal is certainly of a singular form; but it is scarcely necessary to say, that the merit of Dampier's description does not consist in being strictly accurate.

"The fish caught with hook and line were principally small mullet, and an excellent kind of schnapper, nearly the same as that called wollamai by the natives of Port Jackson; but these were larger, weighing sometimes as much as twenty pounds."

At Lucky Bay (near Esperance) "upon a rock on the side of the hill I found a large nest, very similar to those seen in King George's Sound. There were in it several masses resembling those which contain the hair and bones of mice, and are disgorged by the owls in England after the flesh is digested. These masses were larger, and consisted of the hair of seals and of land animals, of the scaly feathers of penguins, and the bones of birds and small quadrupeds. Possibly the constructor of the nest might be an enormous owl; and, if so, the cause of the bird being never seen, whilst the nests were not scarce, would be from its not going out until dark; but from the very open and exposed situations in which the nests were found, I should rather judge it to be of the eagle kind, and that its powers are such as to render it heedless of any attempts from the natives upon its young."

"Geese and ducks were found here, and, not being very shy, some of them were killed by the shore parties. The goose[2] was also found upon the islands; and is the same bird as I found frequenting Furneaux Islands in Bass Strait, and resembling the bernacle goose.

"Some fish were caught alongside the ship, but our success was much impeded by three monstrous sharks, in whose presence no other fish dared to appear. After some attempts we succeeded in taking one of them; but to get it on board required as much preparation as

[1] Trachysaurus rugosus, Gray. (Stump-tailed Lizard).
[2] Cereopsis novaehollandiae, Latham. (Cape Barren Goose.)

for hoisting the launch. The length of it, however, was no more than twelve feet three inches, but the circumference of the body was eight feet. Amongst the vast quantity of substances contained in the stomach was a tolerably large seal, bitten in two, and swallowed with half of the spear sticking in it with which it had probably been killed by the natives. The stench of this ravenous monster was great, even before it was dead; and when the stomach was opened it became intolerable."

"All the islands of the Archipelago of the Recherche seem to be more or less frequented by seals,[1] but I think not in sufficient numbers to make a speculation from Europe advisable, the seals being mostly of the hair kind, and the fur of such others as were seen was red and coarse."

On Moudrain Island "a few small kangaroo[2] were captured of a species different from any I had before seen." "Some of the little blue penguins,[3] like those of Bass Strait, harboured under the bushes on Goose Island; and amongst the grass and upon the shore were a number of the bernacle geese, of which we killed nine, mostly with sticks."

"A small species of kangaroo seemed to be numerous on Middle Island, in parts thickly covered with brushwood and small trees, though none were caught."

At Point Malcolm, "the people of the watch occupied themselves successfully in catching dog fish"; on the following afternoon "we passed a number of pale red medusas, such as I had usually seen on the East Coast at the entrances of rivers, and which on being touched produce a sensation like the stinging of a nettle."

After exploring Tasmania and the islands of Bass Strait, visiting Sydney, and spending a lengthy period on the coasts of Napoleon Land, now South Australia, the Geographe, and a small ship the "Casuarina," which had been commissioned in Sydney, returned to Western Australia, and reached King George's Sound on February 11, 1803.

"On the peninsula which separates Princess Royal Harbour from King George's Sound," says Peron, "there are several freshwater lakes which are very deep, and contain a species of crayfish[4] peculiar to this coast."

"The Dog and the Kangaroo are the only terrestrial mammals whose existence we could discover. The remains of a whale, accumulated towards the end of Princess Royal Harbour, evidently showed that an enormous cetacean had recently perished in that place. Some seals were seen in the sea at intervals, but we could not catch any to determine their species; these animals chiefly inhabit a small

[1] Zalophus lobatus, Gray.
[2] Macropus eugenii, Desm. (Dama Wallaby).
[3] Eudyptula minor, Forster.
[4] Cheraps sp.

island near Bald Head; and on this account Vancouver called this island Seal Island. Land and sea birds were equally rare at King George's Sound, and were all so wary and wild that it was almost impossible to approach them; such wariness appeared to us to be the result of the continual hunting of the inhabitants. These birds belonged to the same species as those which have been previously mentioned in the course of this work. An exception to this statement is a teal[1] remarkable for a membranous appendage which it has under the beak, of which M. Lesueur managed, with much difficulty, to procure some individuals.

"Of all the places where we stayed in New Holland, King George's Sound is, after Sharks Bay, that which furnished us the greatest abundance of fish; the species were not very varied, but they were excessively numerous in individuals. Amongst others we caught a sort of Scomber, very similar to the Mackerels of Europe, but much smaller than the latter, which alone would have sufficed for the needs of a considerable fleet; other species belonged to the genera Sparus, Mugil, Scorpaena, Labrus, Ostracion, Squalus, Balistes, etc. A cartilaginous egg specially struck me owing to its extraordinary form; I shall give a figure and description of it elsewhere. The beautiful striped sea-horse is found on these coasts; we saw also Rays, Muræenas, Esox, etc.; in a word, on account of the fish and the resources which it offers, King George's Sound appeared, at the time when we were there, to be one of the most precious localities which navigators can frequent in these regions; one could, if necessary, lay in abundant provisions there.

"Other less useful animals deserve however to be mentioned here. Of the order of Batrachians, I discovered a charming new species of the genus Hyla; it is the only Frog, except those of Port Jackson, which I saw in New Holland, and the absence of animals of this family evidently depends on the scarcity of fresh water which is a necessity to them. Lizards provided me with three species, two of which were Skinks; and in the 'anse de l'Aiguade,' I myself killed a snake 182 cms. (6ft.) long, which, in M. Lacepede's system, would form the type of a new genus, near to that of Boa; this terrible reptile is armed with venomous fangs.

"Insects were few in number, and did not present any feature of interest. Of Crustaceans, I collected fifteen species previously unknown, amongst which was a Crayfish which lives in the lakes and brooks; it is the only species of freshwater crustacean which I saw in the whole extent of New Holland, the reason for which is evident.

"True Molluscs, worms and soft zoophytes are here abundant and numerous in species; but in the double aspect of magnificence and of variety, the shells bear the palm before all the rest. In the short period of a few days I collected more than 160 species, of which the greater part were new to me. Especially one must men-

[1] Biziura lobata, Shaw. (Musk Duck).

tion elegant species of Trochus, enormous Turbos, brilliant Haliotids a Conus of a beautiful red colour, gigantic Barnacles, eight or ten species of Limpets, several Stomatias, agreeably tinted with most fresh and graceful colours, a new species of Janthina of the rarest beauty, and a Terebra 1520 cms. (5-7 ins.) long, which is very similar to a species of the same genus found fossil in the neighbourhood of Paris; we saw also pretty Pearl Oysters, excellent eating Oysters, beautiful and edible Mussels, various kinds of Murex, Serpulas, Bullas, Dentaliums, etc. . . . But in the midst of such riches it is impossible even to mention the most precious objects; I will content myself then by presenting here some remarks of a more general interest, which if not suggested to me were at least confirmed by the examination of the various animal productions of King George's Sound." . . . .

"No one, I daresay, has collected more animals from the southern hemisphere than I have; I have observed and described them all on the spot; I have brought several thousand of them to Europe; they are deposited in the great museum of the Empire; . . . . . . If one examines, I will not say the species of Doris, Aplysia, Salpa, Nereis, Amphinome, and the crowd of molluscs and worms highly differentiated which are successively offered to our observation; if one descends to the Holothurians, Actinians and Medusae, even if necessary let us descend to the formless sponges which everyone agrees to regard as the last term of degradation or rather of simplicity in animal organisation; in this so to speak frightful multitude of antarctic animals, it will be found that not one occurs in northern seas; and from this well considered examination, from this long series of rigorous comparisons, one will be forced to conclude, as I have done myself, that there is not a single species of well-known animal which is truly cosmopolitan or actually native to all parts of the world.

"Besides this, and it is on this account that the wonderful variety of nature occurs; however imperfect an animal may be, each one has received a distinct country; it is to certain localities that they are attached; it is there that they are to be found in most abundance, of the greatest size and beauty. In proportion as they progress further from this point, the individuals degenerate, and the species ends by extinction. Let us take as an example that enormous Ear-shell of which I have already frequently spoken under the name of *Haliotis gigantea;* it dwells at the extremity of the globe, amidst the shock of the polar waves; there it reaches a length of 15-20cms. (6-7ins.); there it forms precious banks on which man comes to seek an abundant and healthy food. . . . . Hardly are we at Maria Island—we have made, so to speak, only the crossing of d'Entrecasteaux channel—and already this great shell has lost its dimensions; at King Island it is smaller still, and rarer; its degradation becomes more and more evident as we proceed further towards Kangaroo Island and the 'Josephine' Islands; in the miserable abortions of this species which live on the rocks of Nuyts Land, one can scarcely recognise the largest shell of Van Diemen's Land; and finally at King George's Sound one seeks for traces of it in vain.

"The same is the case with Phasianella, formerly so rare and so precious, and which we collected in such large numbers. Maria Island is their true country; there it would be possible to load vessels with them. . . . . . Like the *Haliotis gigantea* of the South Cape, they expire at King George's Sound, after having experienced, like it, a series of degradations almost insensible, it is true, but which nevertheless end by destroying the species.

"It would be easy for me to multiply examples; but what I have just said of the largest and most beautiful shell of this part of the Great Southern Ocean will suffice to prove that animals belonging to cold countries cannot advance with impunity into the midst of the torrid zones.

"On the other hand, animals of these latter climates do not appear any more suited to live in cold countries, and our own experience furnishes an excellent proof of this also. Of all the countries which I have seen none can compare with Timor for abundance and variety of shells; the richness of its coasts is really, in this genus, beyond all expression; more than twenty thousand shells, belonging to several hundred species, were obtained there by my labours. Yet! of this prodigious multitude of animals, there is not one which I could find, either in Van Diemen's Land, or in the southern part of New Holland; it is in Endracht Land, and consequently at the beginning of the equatorial region, that some of the Timor shells begin to appear.

"It is not only for species that this singular exclusion holds; one observes it also amongst the genera. Without speaking of those Crassatellas, 'Houlettes,' and especially Trigonias, which appear to be so rare in nature in the living state, it holds for genera of which numerous species seem to have been almost exclusively confined to such or such a part of the globe; thus for example, the equatorial countries contain a multitude of Cones, of Olivas, of Cowries, etc., which are hardly known on the colder coasts of either hemisphere. Thus, whilst Timor and all the neighbouring isles swarm with these brilliant shells, two or three small obscure species hardly dare to appear in the southern parts of New Holland. It is at the level of King George's Sound that the shells of these pompous genera are seen to reappear with some èclat; they succeed, so to speak, to Phasianellas and to Haliotis, and continue, whilst further embellishing it, the admirable geographical scale of the productions of nature. Seen from this point of view, science appears to me to offer a new career both useful and brilliant to follow, and of which the beautiful geographico-zoological divisions of M. de Lacepede, and the precious hydrographico-zoological work of M. de Fleurieu, have gloriously marked the commencement.

"I have finished my account of the natural history of King George's Sound. From its position at the extremity of the S.W. coast of New Holland, it marks the line of demarcation which exists between the animals of the North and those of the South of this vast continent; on this last account it obviously deserved the greater length which I have devoted to its description."

In Oyster Harbour "excellent oysters, hardly covered by a few feet of water, grow on the banks of sand and clay; our sailors fished as many of them as they desired. Not far from the entrance of the sound is a little islet on which Vancouver sowed several useful seeds, and which, for this reason, he called Garden Island. Landing there, our companions found no trace of European plants; innumerable legions of large ants appeared to them to be the principal cause of the destruction of these useful seeds."

The ships left King George's Sound on 1st March. In Geographe Bay the Casuarina "encountered an innumerable quantity of dead whales, which, floating on the surface of the water, presented an appearance as strange as it was surprising." In the marshes near Port Leschenault "we saw everywhere many very wild teal, some pelicans, and other sea-birds." "Some bones of a large kangaroo, on which some of the flesh remained," were collected near a recent fire. They arrived at Sharks Bay on March 16. On Peron Peninsula "innumerable legions of little Tabanus pursued us mercilessly everywhere."

On the east coast the sand banks were covered with shells, "various troops of fish swam fearlessly round us: we distinguished among others brilliant Labrus, curious Chætodons, several species of Balistes, Scomber, Raia, Tetrodon, and several large sharks."

The chief object of this second visit to Sharks Bay was to obtain turtles, but "with much trouble, in eight days, they procured only 12 of these animals in the same place at which our companions of the 'Naturaliste' had encountered them in thousands. This rarity of turtles is as simple to explain as it was easy to foresee. It is in spring that these amphibia approach deserted sandy islands to deposit their eggs, which are hatched by the heat of the sun: they live on land as long as the education of their young family requires; after which they regain the high seas, where they habitually live. A small number of feeble or diseased individuals remain on shore, and it was from amongst these latter that we managed to procure a few.

"Thus the habitation of marine turtles, like that of seals, is essentially governed by the progress of the seasons; and the prudent navigator ought to take account of this circumstance: not to be misled in the researches or commercial speculations which he may wish to make on these animals. The same is true of whales, which had terrified us by their number on the occasion of our first sojourn in Sharks Bay and of which we did not see a single individual on our return to the same locality."

Faure Island, in the middle of Hamelin harbour, is surrounded by sand banks between which there are intervals where the water is 9 to 12 feet deep. "It is in these deeper places that the marine plants grow on which the turtles feed: these amphibians themselves live chiefly on the west side of the island. The eastern side is infested by sharks remarkable for their size and voracity. One of these monsters almost devoured Lefèvre, who had saved my life at the Josephine Islands. He was already knocked over: the terrible shark was about to swallow him, when three other sailors, running up at his shouts, managed to rescue him from the jaws of the animal. Furious at thus being deprived of its prey, the shark hurled itself several times at the sailor, succeeding in tearing off part of his clothing, and only retired when it had received five wounds.

Several times we have noticed interesting correspondences between the nature of the soil and that of the living beings which are natural to it; we have seen everywhere that the different tribes of terrestrial or marine animals correspond to such or such latitudes, to such or such climates, live exclusively in such or such temperatures, on such or such foods, and can only exist where all the physical circumstances indispensable to their needs exist. It is not alone to the naturalist that considerations of this kind may be useful: often they throw considerable light on geography, and consequences of the greatest interest from this point of view may often be deduced from them. Unfortunately we must add that this fascinating and philosophical portion of natural history has scarcely been touched; and the accounts of travellers, which ought to serve as its basis, usually contain inexactitudes or errors, instead of the precise facts and rigorous notions which are required by science. What remains to be said concerning Sharks Bay will furnish the proof of this latter assertion and of the importance of researches of this nature.

Amongst the numerous observations which Dampier made in Sharks Bay, one was most important to verify, since it contrasts strongly with everything that we saw in this locality. I refer to the hippopotamus head which the celebrated English navigator claimed to have found in the stomach of a shark; now it has been proved by naturalists,

1st. that the true hippopotamus (*Hippopotamus amphibius*, Lin.) belongs exclusively to Africa;

2nd. that this animal is confined to fresh water;

3rd. that it is only found in the largest lakes and principal rivers of Africa, such as the Nile, the Niger, the Senegal, the Gambia, the Congo, the Orange River, etc.;

4th. that it is even unusual to find them near the mouths of these rivers.

But, since it is completely proved that the existence of the hippopotamus is essentially connected with that of large sheets of fresh water, Dampier's observation would naturally lead to the belief that such occur in the neighbourhood of Sharks Bay. Such a consequence being supported by some other particulars given by the English captain, and especially by the complete ignorance in which he leaves us concerning all the details of this vast gulf, it is not surprising that several geographers have fixed on this point as the mouth of one of those great rivers which they consider must exist in New Holland. This last hypothesis having been completely destroyed by the excellent surveys of Messrs. Freycinet and Faure, it remains to discover what was the animal which could have deceived such a clever observer as Dampier, and all our researches had been in vain up to this time. A happy chance finally furnished us with the solution of the problem, and this last discovery was also the result of M. Ransonnet's explorations in Hamelin Harbour.

Quite near to the place where Lefèvre was almost devoured by a shark lay stretched on the shore an animal 20-22 dms. (6ft.-7ft.) long, half decomposed by putrefaction, which appeared to our sailors so different from the seals that these worthy men thought they would bring me at least some pieces of it; not being able to bring the entire head, on account of the horrible stench which it gave off, they pulled out seven teeth, which they presented to me. I readily recognised that these teeth had belonged to a herbivorous animal like the hippopotamus, but they differed essentially from those which characterise the latter genus. They belonged, in fact, to a dugong,[1] a little-known marine mammal, which appears to be confined to the Indian Ocean. "This animal," says Leguat, the ancient navigator who gives the most details about them, "attains a length of 20 feet . . . It feeds in flocks like sheep, in only 3 or 4 feet of water . . . We sometimes found three or four hundred together feeding on the grass at the bottom of the water . . . We never saw this animal on land. I doubt whether it could draw itself up onto it, and I do not believe it is amphibious" (Leguat, Voy., Vol. I., pp. 94-96).

"Each of these prodigious fish," says Barchewitz, "was more than 6 aunes (23 feet) long; the male was a little larger than the female; their head resembled that of an ox . . . When we killed them, they were travelling (at some toises (fathoms) of depth), and were eating a green grass which grew on the coast" (Barchewitz, Ost-Indian Reise-Beschreib., p. 381).

It is to this herbivorous character, which only the dugong in this region shares with the hippopotamus, that the mistake of Dampier must doubtless be attributed; the mistake was the more excusable since the celebrated traveller saw only a head half decomposed by digestion. With respect to the two longer teeth of which

[1] Halicore dugong, Illig.

Dampier speaks, and which doubtless also contributed to his deception, they occur both in the hippopotamus and the dugong, with this essential difference, that the former animal has them in the lower jaw and the latter in the upper; but the silence of the English navigator on this point excludes all means of distinction and even all possibility of comparison.

Beyond this we ourselves saw no trace of the dugong in this locality; unless perhaps we might assign to this genus the monstrous animal which caused so much terror to our companions in the Swan River. The terrible roar, similar to the bellowing of a bull, but much louder, and which appeared to come from the reeds, must have belonged to one of the largest species of animals which the Indian Ocean nourishes in its waves. Now, of all those which we know, the dugong alone presents dimensions comparable with the "terrible noise" which we are discussing. Such a presumption is confirmed by all the details which we have already given concerning the Swan River, or rather the long arm of the sea which is known by that name.

Thus, thanks to the interest which simple sailors, who might well serve as an example to their officers, took in my labours, we find ourselves led to a solution as simple as it is precise on two problems important both in the zoölogic and the physical history of New Holland."

[Owing to the untimely death of Peron, the work was completed by L. Freycinet.]

The two ships left Sharks Bay on 23rd March and rounded the North-West Cape on the 27th. The sea in this neighbourhood was studded with reefs, "several of which appeared to us to be partially uncovered at low tide. It is to this last circumstance, doubtless, that we must attribute the extraordinary multiplicity of marine animals on this part of the coast of New Holland: innumerable legions of petrels, gulls, terns, noddies, cormorants, etc., sailed above us; thousands of fish of different kinds swarmed round our vessels, and long marine reptiles glided rapidly through the surface waters."

On the night of the 30th "several of our sailors occupied themselves in line-fishing, which procured us a magnificent species of Amphinome. This beautiful marine worm, which glows with the richest reflections of gold, purple, and red, is sometimes no less than 7 inches long: it perpetually took the bait of our fishermen, whose sport was spoiled by its voracity."

Two islands discovered on 2nd April were called Turtle Islets "on account of the great number of animals of this genus which we saw in their neighbourhood." (Lat. 19 deg. 50 min. 13 sec. S., Long. 116 deg. 23 min. 48 sec. E. (P.).

"All these banks and reefs, which made us despair of ascertaining the geography of the coast, were on the other hand very favourable to our researches in natural history; and during these days of alarms we were enriched by a crowd of species of marine animals which were previously unknown to us. Sea-snakes especially astonished us by their prodigious number: we noticed some of every colour and of many sizes; some were as thick as an arm and not less than 5 or 6 feet long. But what more particularly attracted our attention was a kind of grey powder which covered the sea for a space of more than 20 leagues from east to west. This extraordinary phenomenon had been previously observed by Banks and Solander near New Guinea. These two illustrious travellers state that the English sailors called it sea-sawdust. There is certainly a rough resemblance between the two substances; but on examining this supposed sea-sawdust under the microscope we recognised in each of the atoms which compose it such a regular and constant form that we could not fail to regard it as so many little organic bodies. They were fairly similar to the glumes or balls of oats; their very small size, with the absence of any kind of sensible movement, led us to consider them as true eggs of some species of marine animal.

The prodigious multiplication which such a quantity of eggs supposes is not without parallel in nature: it will suffice to recall in this respect those "seas of blood" of which several celebrated navigators speak, which owe their colour to a single species of microscopic crustacean.

On 25th April they fell in with a fleet of Malay prows. From these they learnt "that all this coast was fringed with great sand banks which were partly dry at low water; that they were then covered by an enormous quantity of different animals, particularly by the Holothurians or Trepang of which the cargoes of the Malays are composed; that green turtles,[1] and even the tortoiseshell-turtle,[2] occur in very considerable numbers round these banks, and furnish to the fishermen an abundant and healthy food; that all these coasts were excessively plentiful in fish."

The name of Holothuria Banks was given to this region. "Those of our people who had been on Cassini Island brought back a fairly large number of shells which all belonged, with some differences in colour and size, to species which we had previously collected at Timor; on the other hand, there was not one of the species of the south of New Holland or of Van Diemen's Land. This curious result is equally applicable to all branches of the animal kingdom."

On the 30th they once more left the coast for Timor, from which they returned to take up the work where they had left it on 12th June.

An extensive sand bank "was named Medusa Bank on account of the great number of animals of this genus which our naturalists found in this neighbourhood."

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[1] Chelonia mydas, Linn.
[2] Chelonia imbricata, Linn.

Owing to perpetual contrary winds very little further progress was made, and the expedition finally left Australian shores on 7th July.

The very large collections made by Peron and Lesueur on this expedition were taken to Paris, and a great part of the material was described by Lamarck in his "Animaux sans Vertebrés," by the authors of the Nouveau Dictionnaire d'Histoire Naturelle," and by other French naturalists of the period. Unfortunately none of these works are accessible in Western Australia.

In the year 1817 Captain Philip P. King, R.N., under directions from the Admiralty and the Colonial Office, was put in charge of the "Mermaid," a cutter of 84 tons, with directions to complete the survey of the coasts of Australia which had been begun by Flinders. In this small ship he had with him the famous botanist Allan Cunningham; two officers, Messrs. Bedwell and J. S. Roe, the latter afterwards Surveyor General of the Swan River Colony, 12 seamen, 2 boys, and a new South Wales aboriginal, Boongaree.

They left Port Jackson on 22nd December, and passing through Bass Strait and across the Bight, anchored off Middle Island in the Recherche Archipelago on 16th January, 1818. "No animals were observed, excepting some small quadrupeds, which were momentarily seen by Mr. Roe, and, from his description, were kangaroo-rats.[1] On Goose Island, the bird[2] from which it takes its name appeared to be abundant, but there was too much surf to permit our landing upon it."

On 20th January the "Mermaid" reached King George the Third's Sound, where she remained till 1st February. The first evening they "landed on Seal Island. Several seals were upon it, one of which we killed; and some penguins were also taken." "Iguanas, geese, penguins, gulls, and seals of the hairy species were the sole inhabitants of this rock."

On an adjacent hill on the mainland "an abundance of shells of the helix tribe[3] (*Helix bulimus*) was found."

"During our stay in Oyster Harbour," says King, "many parts of the neighbourhood were visited by us. The shoals of Frenchman's River (now called the Kalgan) were covered with large flights of water-fowl, among which curlews and teals were abundant. Oyster Harbour is plentifully stocked with fish, but we were not successful with the hook on account of the immense number of sharks that were constantly playing about the vessel.

"A few fish were taken with the seine, which we hauled on the eastern side of the small central island. Boongaree speared a great many fish with his fiz-gig; one that he struck with the boat-hook on

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[1] Macropus eugenii, Desm. (Dama Wallaby.)
[2] Cereopsis novaehollandiae, Latham. (Cape Barren Goose.)
[3] Bothryembrion kingii, Gray.

the shoals at the entrance of the Eastern (Kalgan) River weighed twenty-two pounds and a-half, and was three feet and a-half long."

"Excepting the sea-fowl, which consisted of geese, wild ducks, teals, curlews, divers, sea-pies, gulls, and terns, very few birds were seen, and those chiefly of the parrot and cockatoo tribe; a species of the latter was noticed of a rich black plumage, and very like the black cockatoo of New South Wales. Kangaroos from their traces must be numerous, but only a very few were noticed; the only reptile that was found was a black snake, which Mr. Cunningham saw for a moment as it glided past him."

"A little without the east entrance of the harbour we saw one of those prodigious large nests which Captain Flinders observed near Point Possession; it was built on the summit of an almost inaccessible rock, exposed to the S.W. winds; it measured four feet in diameter at the top, and nearly seven feet at the base; it appeared to have been deserted for some time, as the branches and sea-weed, with which it was made, were strewed about the rock. Captain Flinders thought it probable that the inhabitant was an eagle; but on our subsequent visit to King George's Sound in 1821, we saw the same nest occupied by a hawk of moderate size."

On leaving King George's Sound the expedition proceeded round the Leeuwin and up the west coast but did not see land again till February 10, 1818, in the neighbourhood of the North-West Cape. "We were no sooner under the lea of the land," says King, "than the air, before of a pleasant and a moderate temperature, became so heated as to produce a scorching sensation; and to raise the mercury in the thermometer from 79deg. to 89deg. We were also assailed by an incredible number of flies and other insects, among which was a beautiful species of libellula. The sea swarmed with turtles, sea-snakes, and fish of various sorts; and the dolphin was eminently conspicuous for its speed, and the varied beauty of its colours."

From this date until March 6 the "Mermaid" was engaged in surveying the coast between the North-West Cape and Depuch Island, including Exmouth Gulf, the Dampier Archipelago, and Nickol Bay.

The only evidences of mammals were the bones of kangaroos seen round the fire-places of the natives. "The impression of what appeared to have been an emu's foot was noticed upon the sand, there is reason, however, to think we may have been deceived; we never afterwards saw one of those birds on the north coast." Pelicans and curlews were very numerous, some shoals between Legendre and Gidley Islands were covered with immense flights of pelicans and other water-fowl. On Lewis Island was observed one of those immense nests that were seen at King George's Sound, the base of which measured seven feet in diameter.

The country was covered with immense ant-hills; one that Mr. Cunningham measured was eight feet high and nearly twenty-six in circumference; but on breaking it up he found it to be deserted by its constructors; an iguana which was hunted by that gentleman took refuge in one of these hills, which proved a safe asylum, for, although he broke a great part down, it escaped.

The most numerous and annoying of the inhabitants were the flies, from their constantly creeping into the eyes, nostrils, and mouth, particularly during meals.

In Exmouth Gulf the sea was abundantly stocked with fish and turtle, though it did not appear to be the season for the latter to lay their eggs. An immense shark was hooked, but it broke the hook and escaped; its length was about twelve feet, of an ashy-grey colour, spotted all over with darker marks; the belly was white, and the nose short; it was altogether different from any we had before seen. Curlew River appeared to abound in fish, but the only sort that was caught was what the sailors called cat-fish; they were of a nauseous taste.

In Exmouth Gulf the eastern shore was covered with dead shells, among which a buccinum of immense size was noticed. Near Curlew River the shore is lined by a barrier of sharp rocks covered with ostrea and nerita; but although these were the only living testaceous animals that were found, the beach was covered with a multitude of dead and imperfect shells of various species. The shores of a bay on Enderby Island were plentiful in shell-fish, particularly oysters; and bêche-de-mer were also abundant in the crevices of the rocks.

After leaving Depuch Island the "Mermaid" proceeded to survey Rowley's Shoals and then sailed eastward to Arnheim Land. After spending more than two months examining this part of the coast of the Northern Territory, she proceeded to Timor and thence returned to the North-West coast at Barrow Island. A few days were then spent sailing round the Montebello Islands. "Off these islands," says King, "we had much calm weather, during which we were surrounded by myriads of fish, of which sharks, and small whales, called by the whalers fin-backs, were the most conspicuous. The smaller kinds consisted of bonetas, barracoutas, porpoises, and flying fish. A voracious dolphin was harpooned, in the maw of which was a barracouta in a half-digested state, and in the throat a flying-fish, bitten in half, waiting its turn to be swallowed; for its tail had not disappeared out of the dolphin's mouth."

At this point they left the coast and proceeded by way of Bass Straits to Sydney which was reached on July 29, 1818.

Before Captain King returned to the west coast to continue his survey, the French ships "Uranie" and "Physicienne," under the command of Captain Freycinet, had visited Sharks Bay on their voyage round the world. Unfortunately I have been unable to obtain Freycinet's account of this voyage, which contains a section on the zoology by Messrs. Quoy and Gaimard.

A second account of the same voyage is contained in the "Promenade autour du Monde," by Arago, of which an English translation was published. The expedition entered Sharks Bay on Spetember 12, 1818, and remained till about September 24.

Arago mentions "a prodigious number of whales sporting on the waves, approaching the vessel, which they sometimes struck with their enormous tails, and spouting into the air brilliant jets of water that reflected the colours of the rainbow. Several monstrous sharks likewise followed, in a constant and regular course, the light track of the ship; while a few turtle of prodigious size seemed, with their hard shell, to brave the murderous teeth of the most voracious of fish."

"A few birds of prey skimmed, with rapid wings, the flats washed by the waves. In the Bay of Seals we saw a prodigious number of those animals, which contended, no doubt, with clouds of pelicans assembled at the south point of the cove, for the sovereignty of the place, which I yield to them with all my heart. When we discharged our pieces we were answered by a prodigious number of birds, in plumage resembling our ducks, and in voice our ravens." The reefs were studded with oysters.

On Peron Peninsula "we saw only a single kangaroo. I saw two birds, that I took for cassowaries, to which I gave chase; but to my regret I could not come up with them." "I was attacked by such a prodigious number of flies, assailing my eyes and my mouth, that I had all the difficulty in the world to protect myself against them." "The sun sets; everything is dead. The myriads of flies that devoured us have disappeared; no insect wings through the air.—— The sun reappears, the air is again peopled."

Captain King left Sydney on his second surveying voyage on the 8th May, 1819, and after passing up the east coast and through Torres Straits spent some time examining the coast of what is now the Northern Territory. The "Mermaid" entered Western Australian waters on September 16th at Lacrosse Island at the mouth of Cambridge Gulf, and from this point made a survey of the coast westward as far as Cape Voltaire, which point she left for Timor on October 16th. The following animals were met with on this portion of the Kimberley coastline.

A few kangaroos were seen and their tracks noticed on several occasions and kangaroo-rats were observed in Cambridge Gulf and Admiralty Gulf. Tracks of dingoes were also seen. At Adolphus Island in Cambridge Gulf "the noise made by the chain cable, in running through the hawse-hole, put to flight a prodigious number of bats that were roosting in the mangrove bushes; and which, flying over, and about the cutter's mast, quite darkened the air with their numbers." "On the summit of Adolphus Island we observed a large hawk's nest, but it was deserted by its constructor." "Several birds new to us were seen" at Admiralty Gulf, "and we also found about the bushes the tail feathers of the cuculus phasianus."[1]

"Off Cape Londonderry our people caught a porpoise." In Cambridge Gulf "many medusae were seen; and also a snake three feet long; its back was black, the belly yellow and the tail striped black and white."[2] One evening "after dusk Mr. Roe went with a party on shore in order to take turtle, and at eight o'clock returned with one of the hawk's bill species[3] (*Testudo imbricata?*) the meat of which weighed seventy-one pounds; about fifty eggs were also procured."

In Admiralty Gulf "an alligator[4] was lying asleep on the beach, but it rushed into the water as we passed the spot. The whole of this gulf is admirably formed for the trepang fishery, and the animal is extremely abundant among the reefs. Both fish and turtle are plentiful. The latter are of very large size; none, however, were taken to determine its species."

From Timor Captain King returned to Sydney by way of Bass Straits without sighting the coast of Western Australia.

On 13th July, 1820, the "Mermaid" left Sydney on her third surveying voyage to the north coast, and on this occasion a medical officer, Mr. Hunter, was added to her list. She proceeded by way of Torres Straits almost directly to the point at which she had left the coast the previous year, which she reached on 5th September. From this date until 14th October they were engaged in surveying the stretch of coast between Cape Voltaire and Brunswick Bay, including Montagu Sound and York Sound.

Traces of kangaroos were frequently met with in this district, and at Brunswick Bay Mr. Cunningham saw four individuals of a small species amongst the spinifex on the cliffs, whilst near the waterholes one of the crew saw a fifth, of a grey colour, and of a larger size than usual. Small opossums were twice noted, the second "appeared to be the same animal that the colonists at Port Jackson call 'the native cat'[5]; its colour was light red with white spots." "On first entering the cavern on Bat Island we were nearly overpowered by a strong sulphurous smell, which was soon accounted for by a flight of an incredible number of small bats, which were roosting in the bottom of the cave."

At York Sound "small birds were numerous, together with white cockatoos, cuckoos, some birds with very hoarse, discordant notes, and one whose note resembled the beating of a blacksmith's

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[1] Centropus phasianinus, Latham (Coucal).
[2] Pelamydrus platurus, Linn.
[3] Chelonia imbricata, Linn.
[4] Crocodilus porosus, Schn.
[5] Dasyurus hallucatus, Gould.

hammer upon an anvil. At daybreak they all exerted themselves in full chorus." On the banks of Roe's River "some of our party thought they saw both an emu and a black swan amongst the bushes."

At Careening Bay "a few birds were observed on the wing, chiefly, however, of the pigeon kind." At Brunswick Bay "Mr. Hunter shot seven or eight brace of birds; they were of two kinds —one a species of oyster-catcher, and the other a sandpiper."

"A snake about seven feet long was seen at York Sound. "Alligators" were frequent in all the rivers, "as many as twelve were seen by Mr. Roe in his passage down Roe's River. Two were fired at, but the balls glanced off their tough coats of mail without hurting or scarcely frightening them." In Brunswick Bay, "as we passed a small round islet, an alligator, which had been basking in the sun, alarmed at our approach, rushed into the water and, as we came near the spot, rose to reconnoitre us, but instantly sunk again."

"If we may judge from the number of snakes at so advanced a period of the dry season, when they are generally in a dormant state, reptiles are very numerous" at Careening Bay. "Mr. Cunningham found a very curious species of lizard,[1] remarkable for having a thin membranaceous appendage attached to the back of its head and round the neck and falling over its shoulders in folds as low as the forearm. It was sent by Mr. Cunningham to the College of Surgeons, where it is now preserved. Small lizards, centipedes, and scorpions were numerous about our encampment; and the trees and bushes about the tents were infested by myriads of hornets and other insects, particularly mosquitoes and small sand-flies, which annoyed us very much in the evenings."

In York Sound a "hill was strewed about with ant-hills constructed of dry dusty sand." In Roe's River "fish were plentiful, but principally of that sort which the sailors call 'cat-fish.' Of these several were caught."

For Captain King's fourth voyage a new and larger brig was purchased and named the "Bathurst," and a third officer, named Baskerville, joined the expedition. Mr. Montgomery replaced Mr. Hunter as surgeon. The "Bathurst" left Port Jackson on 26th May, 1821. On 13th July she was off Cassini Island on the Kimberley coast and proceeded to Careening Bay, passing the Maret Islands on the way. A further survey of Brunswick Bay was made and the coast followed southward as far as Cape Latouche Treville, from which they proceeded on 27th August to Mauritius for supplies.

"Many kangaroo-rats and small kangaroos were seen skipping about the rocks" at Brunswick Bay, "but they were very shy, and fled the moment they saw us."

In Collier's Bay "several whales, of that species called by whalers fin-backs, were playing about us all day, and during the

[1] Chlamydosaurus kingi, Gray (Frilled Lizard), v. infra.

morning two or three were seen near the vessel lashing the water with their enormous fins and tails, and leaping at intervals out of the sea which foamed around them for a considerable distance." Off Cape Levêque "during the afternoon we were surrounded by an immense number of whales leaping out of the water and thrashing the sea with their fins, the noise of which, from the calmness and perfect stillness of the air, was as loud as the report of a volley of musquetry." Off Point Gantheaume, also, King remarks: "As usual, we had been surrounded by whales." In Prince Regent's River "porpoises were observed as high as the first falls, a distance of fifty miles from the sea."

The Lacepede Islands "appear to be solely inhabitated by boobies[1] and other sea-fowl." "Large flocks of boobies flew over the vessel at sunset, directing their course towards the reefs of these islands." "Large flights of boobies" were also seen off Point Gantheaume; "one of them lighted upon the deck, and was easily taken; it seemed to be the same bird (*Pelecanus fiber*) that frequents the reefs upon the north and north-eastern coasts."

Alligators were again observed in Prince Regent's River. Captain King writes. "The appearance of these animals in the water is very deceptious; they lie quite motionless. and resemble a branch of a tree floating with the tide; the snout, the eye, and some of the ridges of the back and tail being the only parts that are seen. The animal that we fired at was noticed for some time, but considered to be only a dead branch, although we were looking out for alligators, and approached within six yards of it before we found out our mistake. The length of this animal was from twelve to fifteen feet. I do not think that we have ever seen one more than twenty feet long."

"In the vicinity of the Maret Is. we saw many sea-snakes; one was shot and preserved; its length was four feet four inches; the head very small; it had neither fins nor gills; and respired like land snakes; on each scale was a rough ridge; it did not appear to be venomous." Off Cape Levêque "a snake about four feet long, of a yellowish-brown colour, rose up alongside, but instantly dived upon seeing the vessel."

In Brunswick Bay, "a successful haul of the seine supplied our people with abundance of fish, among which were mullets weighing from three to five pounds, cavallos, whitings, silver fish, breams, and two species of guard-fish." Another haul "procured about four dozen fish, principally mullet." Prince Regent's River "appears to abound with fish, particularly with mullet." "A curious species of mud-fish (chironectes sp. Cuvier) was noticed of amphibious nature, and something similar to what we have frequently before seen; these were, however, much larger, being about nine inches long. At low water the mud-banks near the cascade, that were ex-

[1] Sula leucogaster, Bodd.

posed by the falling tide, were covered with these fish, sporting about and running at each other with open mouths; but as we approached they so instantaneously buried themselves in the soft mud that their disappearance seemed the effect of magic: upon our retiring and attentively watching the spot, these curious animals would reappear as suddenly as they had before vanished. We fired at several, but so sudden were their motions that they generally escaped; two or three only were procured, which appeared, from their lying on the mud in an inactive state, to have been asleep; they are furnished with very strong pectoral and ventral fins, with which, and with the anal fin, when required, they make a hole into which they drop. When sporting on the mud, the pectoral fins are used like legs, upon which they move very quickly; but nothing can exceed the instantaneous movement by which they disappear. Those that were shot were taken on board, but on account of the extreme heat of the weather they had become so putrified as to be totally unfit for preservation."

Off Cape Levêque "some remoræ were swimming about the vessel the whole day." In the vicinity of the Maret Islands "a shark was taken eleven feet long; and many curious specimens of crustacea and medusa were obtained by the towing-net. Some of the latter were so diaphanous as to be perfectly invisible when immersed in the water. Among the former were a species of phyllosoma and the alima hyalina of Leach (*Cancer vitreus*, Banks and Solander MSS.; *Astacus vitreus*, Fabr. Syst. ent.)."

"Upon the reef off the east end of the Midway Isles, in Brunswick Bay, we found several varieties of coral, particularly *Explanaria mesenterina*, Lam.; *Caryophyllia fastigiata*, Lam.; and *Porites subdigitata*, Lam. The only shell that we observed upon the reef was a *Delphinula laciniata*, Lam. (*Turbo delphinus*, Linn.)."

After taking in supplies at Mauritius the "Bathurst" proceeded to King George's Sound to take in wood and water previous to commencing the examination of the west coast. She remained in the Sound for this purpose from Dec. 23, 1821, to Jan. 6, 1822.

Five seals were killed on Seal Island for the sake of their skins; the boat's crew also found some penguins (*Aptenodytes minor*) and a nest of iguanas on the island. Mr. Montgomery shot a few parakeets and water-birds on Green Island.

"During our visit," King remarks, "we caught but very few fish, and only a few oysters were obtained, on account of the banks being seldom uncovered. Shell-fish of other sorts were obtained at Mistaken Island in abundance, of which the most common were a patella and an haliotis; the inhabitant of the former made a coarse, although a savoury dish. There were also varieties of the following genera, viz.: lepas, chiton, cardium, pinna, nerita, two or three species of ostrea, a small mytilus, and a small buccinum of great beauty; that covered the rocks, and at low water might be collected in abundance."

The next point touched at was Rottnest Island, on which they landed on Jan. 14. King gives the following account of the animals met with:—"We disturbed a great many seals, but only killed three, and were much disappointed in finding that these animals were not of the fur species, as in M. de Freycinet's account of the island they are said to be; they were evidently the same description as those noticed at King George's Sound. The traces of a small kangaroo were everywhere abundant, but the animals were not seen. We walked to the easternmost of the lakes which M. de Freycinet remarks as being surrounded by an extensive beach, composed entirely of bivalve shells, a species of cardium; the quantity was indeed extraordinary. The banks were frequented by gulls and sandpipers, of which many were shot. The beaches were covered with dead shells of the genera buccinum, bulla, murex, trochus, and haliotis; but we found none with the living animal in them. Of the feathered tribe, a hawk and a pigeon were the only land birds seen; but boobies, terns, and sandpipers were very numerous about the shores."

From Rottnest the "Bathurst" proceeded to Sharks Bay and remained anchored inside Dirk Hartog Island from Jan. 20 to Jan. 26, whilst some minor repairs were effected. The following observations were made on the fauna of the island. A small black kangaroo was seen by Mr. Cunningham. He states that "it was feeding upon the seeds of a small acacia, and, upon perceiving my approach, fled across the down without reaching a single bush or rock large enough to conceal itself as far as the eye could discern it, so bare and destitute of vegetation are these arid, sandy plains." A small opossum[1] was also seen. "A seal of the hair species, like those of Rottnest Island, was seen on the rocks." "The remains of two or three whales that had been lately wrecked" were found on the coast.

"We saw two snakes of very distinct kinds, each exceeding five feet in length; the one black with a yellow belly, the other green and black, but they quickly escaped into holes, leaving a serpentine impression of their bodies upon the sand. These marks were seen and remarked near the edge of all the holes, which were very numerous upon the surface of the island, before I discovered that they were the tracks of reptiles; from which it may be inferred that these animals are very abundant."

Turtles were very numerous, fifty being turned in one night; a large quantity of their eggs were also obtained.

"The only bird seen was a solitary species of loxia, but upon a steep ledge of rocks," says Cunningham, "I observed one of those nests of which frequent mention has been already made. I examined and found it built upon the pinnacle of some large rocks, very strongly constructed of long sticks; it was about five feet high, and exceeded four feet in diameter, with a very slight cavity above, and seemed to have been very recently inhabited."

[1] Perameles bougainvillei, Quoy and Gaim.

"We had not been anchored five minutes," says King, "before the vessel was surrounded by sharks, which at once impressed us with the propriety of Dampier's nomenclature. One that was caught measured eleven feet in length, but the greater number were not more than three or four feet long. They were very voracious, and scared away large quantities of fish, of which, however, our people caught a good supply." Five or six dozen snappers were obtained in one evening, besides some of the genus tetradon; these were the only two species obtained: "our people could not be persuaded to eat the tetradon, although the French lived chiefly upon it." It was described by M. Lacepede in a paper in the Annales du Museum d'Histoire Naturelle (tom. iv., p. 203) as le tetrodon argente (*T. argenteus*).

A rocky reef fronting the shore was "covered with shell-fish, of which the principal sorts were species of trochus, chama, conus, voluta, cypræa, buccinum, ostrea, mytilus, and patella; among the latter was the large one of King George's Sound. Upon the beaches we found varieties of sponge and coral; and bêche-de-mer were observed in the crevices of the rocks, but were neither large nor plentiful."

From Sharks Bay the expedition passed north and surveyed various islands and shoals, but the only further notes on animals relate to the neighbourhood of what is now called King Sound.

From Point Cunningham, on Feb. 12, "the gentlemen brought off a few shells and some insects, among which was a beautiful sphynx; besides which, one of the boat's crew caught a species of vampyrus, apparently similar to the flying fox of Port Jackson. Of shells there was not a great variety; a chama (*Tridacna gigas*, Lam.), a pinna, and the trochus (cœrulesceus) of Dirk Hartog's Island; but at one of the fire-places they found a very large voluta[1] that seemed to have served the purpose of a water-vessel; it was fifteen inches long and ten inches in diameter."

When off the Adele Islands, on Feb. 18, "towards sunset large flights of boobies, terns, and other sea-birds passed by, flying towards the islands."

Soon after this date the "Bathurst" returned to Sydney round the south coast without again sighting Western Australia. Here she remained from April 25 to Sept. 25, on which date she left for England, calling in once more at King George's Sound on her way home.

Thus ended Captain King's long service on our coast-line. In one of the appendices to his Journal are contained the descriptions of the animals brought home by him. Unfortunately the exact localities are not nearly always recorded, and in the ensuing list I have only included those definitely recorded from within the limits of the State.

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[1] Cymbium flammeum, Bolten.

The following specimens appear to be those referred to in the journal, though in the appendix the locality from which they came is not given:—

Pisces: *Tetraodon argenteus*, Lacépède (? from Dirk Hartog Island, Sharks Bay).

Lepidoptera: *Macroglossum kingii*, n. sp. (? from Point Cunningham, King Sound).

List of Collections made on the Coast of Western Australia.

Mammalia—J. E. Gray:

Pteropus edwardsii, Desm.[1]—Point Cunningham. Large flights of these animals were observed in Cambridge Gulf.

Canis australiae, n. sp.[2]—Found on all parts of the coast.

Otaria cinerea, Peron and Lesueur.[3]—Found at Rottnest Island and at King George the Third's Sound. It appeared also to be the same species that frequents Sharks Bay.

Aves—P. P. King:

Halcyon sacra, Swainson.[4]—Taken at sea in the neighbourhood of Cambridge Gulf, having probably been blown off by a strong land wind.

Centropus phasianus, Illiger.[5] is found upon the eastern part of the North-West Coast.

Haematopus picatus, n. s.[6]—Common upon the shores of the continent generally.

Aptenodytes minor, Gmel.[7]—King George the Third's Sound.

Larus georgii, n. s.[8]—King George the Third's Sound, in the vicinity of Seal Island.

Reptilia—J. E. Gray:

Chlamydosaurus kingii, n.s. figured.—Port Nelson, on the branch of a tree in Careening Bay. "I secured a lizard of extraordinary appearance, which had perched itself upon the stem of a small decayed tree. It had a curious crenated membrane like a ruff or tippet round its neck.

[1] This name was generally applied to an Indian species, though originally given to one from Madagascar. Pteropus gouldi, Peters, and Pt. scapulatus, Peters, are both found in the Kimberley Division.

[2] Canis dingo, Blumenb. 1789.

[3] Zalophus lobatus, Gray. The type of Otaria cinerea was obtained at Kangaroo Island, and this name given in 1816, should have precedence over Arctocephalus forsteri, Lesson, 1828.

[4] Halcyon sanctus, Vig. and Horsf.

[5] Centropus phasianinus, Latham.

[6] Haematopus ostralegus picatus, King.

[7] Eudyptula minor, Forster.

[8] Gabianus pacificus georgii, King.

covering its shoulders, and when expanded, which it was enabled to do by means of transverse slender cartilages, spreads five inches in the form of an open umbrella."

Tiliqua tuberculata, Gray.[1]—Seal Island, in King George the Third's Sound.

Trachysaurus rugosus, n.s.—King George the Third's Sound.

Leptophis punctulatus, n.s.[2]—Careening Bay.

MOLLUSCA—J. E. Gray.

Delphinula laciniata, Lam.[3]—Found at low water upon the Coral Reefs, in the entrance of Prince Regent's River.

Bulimus kingii, Gray.[4]—Abundant on the hills of King George the Third's Sound, in the vicinity of Bald Head.

Patella neglecta, n.s.—Abundant on the rocky shores of K. G. Sound.

Padollus rubicundus, De Montfort.[5]—Found upon Rottnest Island.

In June, 1825, the French vessels "Thétis" and "Esperance," commanded respectively by de Bougainville and du Camper, were cruising about the Southern Coast. I have not at present been able to consult the published account of this voyage, and do not know whether members of the expedition made any observations on the fauna of Western Australia.

In October, 1826, the French ship "Astrolabe," commanded by Dumont d'Urville, spent about a fortnight at King George's Sound. The celebrated naturalists Quoy and Gaimard, who had already accompanied Freycinet's expedition in the "Uranie" and "Physicienne" previously referred to, were members of this expedition also, and published an account of the Zoology of the voyage, with illustrations of a large number of new species. I have here extracted the accounts of Western Australian animals from this work, and it will be noticed that in addition to the animals obtained on the voyage of the "Astrolabe" at King George's Sound a few from Sharks Bay obtained on the previous voyage are described.

The following general remarks on the two Western Australian localities examined by Quoy and Gaimard were written by them "to facilitate zoological researches":—

Sharks Bay.—This great extent of sea, sheltered by islands, is quite shallow. We were anchored near Peron Peninsula, on a bottom covered with fucus, which we were unfortunately unable to explore properly, and which appeared to promise an ample harvest of

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[1] Tiliqua scincoides, White.
[2] Dendrophis punctulatus, Gray.
[3] Angaria delphinus, L. var. laciniata, Lamk.
[4] Bothriembryon kingii, Gray.
[5] Haliotis scalaris, Leach.

zoophytes of every kind, which will probably long remain unknown; for this country, lacking fresh water, cannot attract navigators.

We brought thence, more than ten years ago, specimens of Vermetus, whose tubes are attached to shells. *Voluta undulata* occurs there as well as the large species for which the genus Cymbium[1] was created, also *Pinna maritima* buried in the sand, which occurs in such numbers that it is necessary to wear shoes to avoid being cut by them. We collected there a completely black Pleurobranchus which we lost, and several species of bivalves. The borders of the salt lagoons are covered with *Cerithium album*.

On Dirk Hartog Island, ten leagues distant, tuns occur in numbers, also sponges and fragments of corals, which shows that there are localities where these latter grow, doubtless in small numbers, for on these sandy coasts the temperature is low at nights and must be unfavourable to their reproduction.

Riche and Peron have mentioned trees entirely fossilised, of which only the trunks remained. These productions ought to be studied anew in order to determine their origin, in the light of more recent knowledge.

King George's Sound.—This locality is rich in Molluscs. In the calm waters of Princess Royal Harbour, especially on the left, occur many varieties of Phasianella, a shell which was for a long time rare in collections. Bullas are there in hundreds, and at every step one crushes three or four species. Following the right bank, one meets with specimens of Trochus, many Aviculas fixed on the long leaves of fucus like the beads of a rosary, Fusus, Buccinums, Naticas, Neritas, Barnacles, etc. On the rocks on the two sides of the entrance of this harbour are enormous Limpets and long Acorn-barnacles which it is not always easy to obtain, because the sea breaks over them. In the crevices on the left, in the little rock-basins, we discovered accumulations of the large Cerithium leve, very rare in collections. On these sluggish molluscs we found *Hipponyx australis*, formerly regarded as a Patella. Valves of Solen and of Solemia, perfectly whole, lie on the sandy shores. We could not obtain the animals of these latter, which are very similar to those found in the Mediterranean. By drawing a tangle along the bottom we captured small Phasianellas, which we also obtained with the dredge, as well as Stomatellas and Cryptostomas. But it was chiefly on Garden Island in the nests of terns and gulls that we obtained these latter shells, of which the molluscs serve as food to the young bird.

From the islands in the middle of the harbour *Turbo cooki* and Haliotis of a very large size were brought to us. The left bank of the Englishmen's River abounds in Venus, on which we fed. They are buried in the mud, but easy to obtain because they almost always

[1] Cymbium flammeum, Bolten.

bear an elegant moniliform fucus. In the same place there is also a small yellow Trochus of which the individuals occur in numbers on the stones. The swampy shores of this river are covered with *Ampullaria minima*, which belongs to our genus Ampullacera.

Sheltered places yielded us branches of *Astrea galaxea* whose polyp is a beautiful green colour. By dredging at the entrance of the Sound we obtained, in 50 fathoms, Comatulas[1] and flexible and stony corals.

In King George's Sound occur also Parmophoras, Boltenias, a large red species of Tubularia, etc.

On land we collected *Helix trilineata;* on Bald Head, *Succinea elongata* and *Bulimus melo.* The base of this hill, formed of limestone, has incrustations apparently very recent, where the same shells which live in the harbour are seen, such as the large Cerithium leve mentioned above. But in traversing its summit for three-quarters of its extent, we did not meet with the fossil corals mentioned by Vancouver.

The English seal-fishers exchanged skins of seals and kangaroos for spirits and tobacco. These men procured us abundance of fish, turtle-doves, a seal, and some black petrels in full plumage in large numbers. They obtained these birds in holes on the islands which are at the entrance of the sound. These fishermen had with them aboriginal women of New Holland and of Van Diemen's Land. These women fished, hunted with guns or, for kangaroos, with dogs; they dived to obtain for us oysters and other shells, and they procured for us a large number of large lizards which we could not have obtained without their help.

Mammals.

King George's Sound yielded us some young Perameles and a new species of kangaroo with a short tail, with long stiff fur, which we figure under the specific name of brachiurus. Some of the kangaroos were very large, but we could not obtain any although we hunted them with several dogs trained for this purpose, the kangaroos in their bounds left them far behind. The Australians have with them fine dogs with red hair which they call kangaroos. Decriptions and figures are given of:—

Otaria australis,[2] new sp., female.—Although this Otaria was young, it was nevertheless about to pass down the only foetus which its uterus contained. This Otaria comes from King George's Sound.

Kangurus brachyurus,[3] new sp.—It was recently dead when we found it, probably from disease, since there was no appearance of a wound.

[1] Ptilometra macronema, J. Müll.
[2] Zalophus lobatus, Gray.
[3] Macropus brachyurus, Q. and G. (Short-tailed Wallaby).

Birds.

If the travellers who visited King George's Sound before us have only found very few birds, it is because they have confined their excursions to the neighbourhood of the bay, which certainly has few of them; but in the forests adjoining the rivers named French and English (King and Kalgan), we found a considerable number and variety amongst the parrots and honey-eaters. New Holland is the home of these latter; but all the coastal species, even at Port Jackson, are little known.

A small black petrel exists in great numbers on the islets of King George's Sound. The aboriginal women, who lived with the English seal-fishers, brought us a large number every day; they said that they obtained them in holes, and it is a remarkable fact that they were all males. Were they nesting at this period, which was the month of October; and in that case why were they alone? We could not have been mistaken as to the sex, because they brought them plucked and cleaned. The genital organs alone remained and they were very well developed. The flesh of these birds was useful for feeding the dogs rather than the men.

These Australian countries are also the refuge of gulls, terns, and pelicans. The little Garden Island seems to be their place of special choice, and myriads of these birds were gathered together there. We also found there oyster-catchers and black swans. A flight of 30 or 40 pelicans rose into the air as we approached the island, where these birds appeared to be living. We found a dozen young pelicans. The English brought us some blue penguins and pretty little turtle-doves with metallic reflections.

Ascending Frenchman's River we met with flocks of pelicans, cereopsis, black swans, white herons, musk ducks, and two other species of ducks. We killed a black swan, a brown duck, and two herons. M. Dumont D'Urville killed some pretty little cuckoos with green reflections on the back.

We only saw a single cassowary of large size, which we pursued without capturing it. Descriptions and figures are given of:—

Muscicapa vittata, new sp.,[1] King George's Sound.

Muscicapa georgiana, new sp.,[2] King George's Sound.

Muscicapa gularis, new sp.,[3] King George's Sound.

Saxicola splendens, new sp.[4]—Its habits are those of the blue wren. Like it, it carries its tail upright and it is ceaselessly in movement on the small bushes among which it lives. We obtained this beautiful wren at King George's Sound.

Fringilla oculata, new sp.[5]—This bird inhabits King George's Sound. It is rare there.

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[1] Amaurodryas vittata, Q. and G. (Dusky Robin).
[2] Eopsaltria georgiana, Q. and G. (White-breasted Shrike Robin).
[3] Eopsaltria griseicapilla, Vieillot. (Grey-breasted Shrike Robin).
[4] Malurus splendens, Q. and G. (Banded Wren).
[5] Zonaeginthus oculatus, Q. and G. (Red-eared Finch).

Psittacus (Platycercus) purpureocephalus, new sp.,[1] King George's Sound.

Psittacus semitorquatus, new sp.,[2] King George's Sound.

Reptiles.

A snake five or six feet long, which from the structure of its teeth was a very dangerous species, was killed by M. Guilbert. Amongst the lizards we obtained some very large skinks, animals whose movements are slow.

Fish.

The bad weather and the exigencies of work did not allow of our casting the seine-net, the best means of ascertaining varieties of fish; but we took a number with hook and line, and the English fishermen stationed in this port exchanged them every day for salted butter. The commonest was a large species of bream. Descriptions and figures are given of:—

Plectropoma nigrorubrum, Cuv. & Val.,[3] King George's Sound.
Plectropoma dentex, Cuv. & Val.,[4] King George's Sound.
Plectropoma serratum, Cuv. & Val.,[5] King George's Sound.
Sillago punctata, Cuv. & Val.,[6] King George's Sound.
Malacanthus radiatus, new sp.,[7] King George's Sound.

Molluscs.

At King George's Sound in the shallow and rather calm Princess Charlotte Harbour, the shore is covered with the shells of three or four species of Bulla. Here the animals prefer sandy bottoms. Helix melo, of the division Bulimus, covers the summit of Bald Head, in company with Succinea elongatus. King George's Sound and Sharks Bay provided us with a number of species of Voluta. Cerithium leve we only saw at King George's Sound, living in societies in the very sheltered spots among the cracks of the rocks, motionless at the bottom of the water; this habit accounts for its being covered with Hipponyx. King George's Sound yielded us specimens of Parmophorus of very large size. They are entirely black, sluggish in habits and hide under stones in places where there is only a little water. We could only obtain one living individual of Cryptostoma at King George's Sound; but we made a plentiful collection of its shells in the nests of the terns, which carry this mollusc to their young, for which it is a sort of ready-made tit-bit.

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[1] Purpureicephalus spurius, Kuhl. (Red-capped King Parrot).
[2] Barnardius semitorquatus, Q. and G.. (Twenty-eight Parrot).
[3] Hypoplectrodes nigrorubrum, Cuv. and Val.
[4] Colpognathus dentex, Cuv. and Val.
[5] Acanthistius serratus, Cuv. and Val. (Wirrah).
[6] Isosillago punctata, Cuv. and Val. (Spotted Whiting).
[7] Odax radiatus, Q. and G.

The little *Patella australis* of Lamarck belongs to Blainville's genus Hipponyx. The genus is remarkable in that it is always fixed by a semicircular muscle, which only allows the animal a slight motion of elevation and depression; it carries and hatches its eggs in a pocket with several cells, placed between the neck and the foot. The young issue from it and fix themselves on the surroundings and even on their parents. This species is abundant at King George's Sound.

Everywhere where sand occurs it is covered with oysters, which are long and wrinkled. Thus at Sharks Bay they were an agreeable food for us. Granite being predominant at King George's Sound, it was necessary to go to a distance to obtain a species which lives at a moderate depth unattached.

Figures and descriptions are given of:—

Helix (*Bulimus*) *Trilineata*, new sp.[1]—This species inhabits King George's Sound, but is not as common there as the following. We found it on the summit of Bald Head and in a very circumscribed area of Princess Royal Harbour. The animal only emerges from its shell rarely and slowly.

Helix (*Bulimus*) *melo*, Fer.[2]—This Helix is very common at King George's Sound, especially on the summit of Bald Head. We collected them in hundreds amongst the Succineas, which are equally widely distributed there in spite of the dryness which appears to exist on this mountain. Discoloured individuals are sometimes alive. This mollusc is so timid that we could not get it to emerge in order to draw it. We could ascertain, however, that it does not differ at all from the true Helix. At the period when we were on the coast of New Holland, the month of October, the individuals which we met with were nearly all dead. Can their occurrence in such a large number on a mountain be due to the custom of the aborigines of setting fire perpetually to the bushes and grasses of the plains?

Helix georgiana, new sp.[3]—This species inhabits King George's Sound. We do not know the animal.

Vitrina nigra, new sp.—King George's Sound provided us with individuals (smaller than those at Port Western) living under the trees, at a distance from fresh water.

Ampullacera fragilis, Lamk.[4]—We collected this variety by handfuls on the grassy and swampy shores of the Englishman's river at King George's Sound. It was doubtless from this locality that Peron brought them.

Physa georgiana, new sp.[5]—King George's Sound.

Cryptostoma zonalis, new sp.[5]—This is the staple food of the young sea-birds. The parents have only, with one blow of the

[1] Bothriembryon kingii, Gray.
[2] Rhytida georgiana, Q. and G.
[3] Salinator fragilis, Lamk.
[4] Isidora georgiana, Q. and G.
[5] Sinum zonale, Q. and G.

beak, to remove from this mass of flesh the shell which surmounts it in order to have a natural ready prepared food. We do not know in what localities they find them; probably it is in the islets and on the rocks washed by the waves, since in the whole circumference of King George's Sound we never found one. Our solitary individual, although living, lacked the specific zonal band. It was especially on Garden Island that we collected so many of their shells.

Natica plumbea, Lamk.[1] King George's Sound.

Bulla bicincta, new sp.[2]—It inhabits Princess Royal Harbour in King George's Sound. In this place we saw the greatest collection of Bullas of every species all together.

Bulla australis, new sp.[3]—These shells can be collected by basketfulls in King George's Sound. They delight in the fairly calm waters of Princess Royal Harbour. When the animal is dead its shell becomes detached and is preserved intact among the masses of fucus piled up by storms.

Bulla brevis, new sp.[4]—Excessively common at King George's Sound.

Bulla arachis, new sp.,[5] King George's Sound.

Buccinum costatum, new sp., King George's Sound.

Buccinum litiopa, Rang.—This species comes from the South-west coast of New Holland.

Fusus australis, new sp., King George's Sound.

Triton leucostomum, Lamk, King George's Sound.

Dolium perdrix, Lamk.[6]—The real home of the Doliums is the little island of Dirk Hartog and Sharks Bay, on the west coast of New Holland. We explored this region in the voyage of the "Uranie," with M. de Freycinet, and nowhere else have we seen so many fragments of them, though we were unable to secure a single living individual.

Voluta undulata, Lamk.[7]—We found *Voluta undulata* on the coasts of New Holland, at Sharks Bay, and at King George's Sound.

Conus luteus, new sp.—This species was captured, with many others, in about 50 fathoms, at the entrance of King George's Sound.

Cerithium leve, new sp.[8]—This *Cerithium* inhabits King George's Sound. We met with them on one occasion to the number of a hundred collected together in a calm place, shut in by the mass of rocks which are at the left of the entrance to Princess Royal

[1] Polinices plumbea, Lamk.
[2] Akera bicincta, Q. and G.
[3] Bullaria australis, Gray.
[4] Haminea brevis, Q. and G.
[5] Cylichna arachis, Q. and G.
[6] Tonna perdrix, Linn.
[7] Scaphella undulata, Lamk.
[8] Ceratoptilus levis, Q. and G.

Harbour. As they were in shallow water we obtained them easily. We observed them on various occasions and at different hours of the day, but never saw them show the least sign of movement. Besides, they were covered with rather large specimens of Hipponyx which appeared to have multiplied there peacefully. This was in the month of November. Had these animals assembled in such numbers for breeding purposes? We cannot say. We regret that we did not make researches on their sex at the time. All those which we brought back in spirit are females.

In examining the base of Bald Head, we recognised several of these same Cerithiums enclosed in limestone between tide-marks. We suppose that these shells are not fossil but merely encrusted in the rock.

Turritella granosa, new sp.,[1] King George's Sound.

Turbo torquatus, Lamk.[2]—This Turbo, which attains a large size, inhabits King George's Sound. We found few living individuals.

Turbo fimbriatus, Lamk.[3]—King George's Sound.

Phasianella bulimoides, Lamk.[4]—King George's Sound.

Phasianella ventricosa, new sp.—King George's Sound.

Trochus irisodontes, new sp.[5]—King George's Sound.

Trochus luteus, new sp.—This Trochus occurs throughout King George's Sound, but principally in the little salt creeks.

Vermetus arenarius, Lamk.[6]—Inhabits King George's Sound, living, at a considerable depth, on other shells.

Vermetus dentiferus, Lamk.—Obtained in Sharks Bay on an Avicula.

Stomatella auricula, Lamk.[7]—Our individuals came from the same place as the one which is in the Museum (Paris), which Peron brought from King George's Sound.

Haliotis albicante, new sp.—King George's Sound, on the rocks at the entrance. It is so common that it is surprising that Peron did not describe it.

Parmophorus australis, Lamk.[8]—This Mollusc inhabits King George's Sound, where, however, we only found it on one occasion. It lives for a long time in the air, and we watched one climb out of the water in which we had placed it.

Emarginula australis, new sp.[9]—King George's Sound.

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[1] Epitonium granosum, Q. and G.
[2] Turbo stamineus, Martyn var. lamellosus, Brod.
[3] Astralium fimbriatum, Lamk.
[4] Phasianella australis, Gmel.
[5] Cantharidus irisodontes, Q. and G.
[6] Serpulus sipho, Lamk.
[7] Gena auricula, Lamk.
[8] Scutus anatinus, Don.
[9] Subemarginula australis, Q. and G.

Emarginula rugosa, new sp.[1]—King George's Sound.

Patella compressa, Lamk.—King George's Sound.

Patelloida conoidea, new sp.[2]—Inhabits King George's Sound, where it is very rare, for we only met with it once.

Patelloida elongata, new sp.[3]—King George's Sound.

Patelloida septiformis, new sp.[4]—King George's Sound.

Patelloida punctata, new sp.[5]—King George's Sound.

Chiton georgianus, new sp.[6]—This Chiton is very common at King George's Sound.

Chiton sulcatus, new sp.[7]—This Chiton inhabits King George's Sound, where it is rare.

Hipponyx australis, Lamk.[8]—This shell inhabits the southern extremity of New Holland, especially King George's Sound, where we found many individuals on our large Cerithium leve, as may be seen at the Museum.

Hipponyx foliacea, new sp.—We met with a variety, or perhaps another species, at King George's Sound, but we did not see the animal.

Pecten foliacea, new sp.[9]—King George's Sound.

Avicula georgiana, new sp.[10]—Aviculas are very common in King George's Sound. Long rows of various species are found fixed in groups on the leaves of Zostera or other seaweeds. Their byssus is so short that they appear to be attached to the object on which they occur by their valves. It is in the sheltered Princess Royal Harbour that they are most plentiful, the piles of seaweeds serving to protect their fragile shells from breakage.

Venus Zelandica, new sp.—This Venus occurs in New Zealand, but it is much commoner at King George's Sound. In the shallow muddy parts of the Frenchmen's River we could not obtain the pretty moniliform fucus which is abundant there, without bringing up with each one of these shells which served for its attachment. They are very good to eat, but they were not in very good condition at the season when we were there, which was the month of October.

Brachiopod.

The only species figured and described is:—

Terebratula recurva, new sp.,[11] of which one individual was obtained at King George's Sound.

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1 Subemarginula rugosa, Q. and G.
2 Acmaea conoidea , Q. and G.
3 Acmaea elongata, Q. and G.
4 Acmaea septiformis, Q. and G.
5 Acmaea punctata, Q. and G.
6 Acanthopleura georgiana, Q. and G.
7 Ischnochiton sulcatus, Q. and G.
8 Hipponyx conicus, Schum.
9 Pecten lividus, Lamk.
10 Pteria papilionacea, Lamk.
11 Waldheimia flavescens, Lamk.

Tunicates.

Salpa confoederata, Forskal.—Our examples come from the west coasts of New Holland.

Ascidia reticulata, new sp.—King George's Sound.

Ascidia spinosa, new sp.—King George's Sound.

Ascidia australis, new sp.[1]—King George's Sound.

Ascidia spinifera, new sp.[2]—King George's Sound.

Aplidium pedunculatum, new sp.[3]—King George's Sound.

Cirripede.

The only species figured and described is:—

Anatifa hirsuta, Q. and G.[4]—This species lives in groups on the rocks of Princess Royal Harbour at King George's Sound, and in some other places in New Holland. It was doubtless from the same locality that it was brought to M. Cuvier by Peron.

Holothurian.

The only species figured and described is:—

Holothuria fulva, new sp.—King George's Sound.

Coelenterates.

The following are figured and described.—

Actinia tuberculosa, new sp.—King George's Sound.

Lobophyllia aurea, new sp.—King George's Sound.

Astrea galaxea, Lamk.—This Astrea occurs at King George's Sound in sheltered places in shallow water.

Alcyonum terminale, new sp.—Inhabits King George's Sound, probably at a great depth.

Insects.

Either the season was not sufficiently advanced for insects, or this place contains very few, for our collections of this group were almost none.

The bloodthirsty mosquitoes which pursued us everywhere did not help to make our walks agreeable.

The following insects, all from King George's Sound, are described by Boisduval, who wrote the entomological portion of the results of the voyage. None of them are figured:—

Coleoptera.

Melolontha (*Aplonycha*) *astrolabei*, new sp.[5]

Prostomus (*Cherrus*) *australis*, new sp.

Cneorhinus impressipennis, new sp.[6]

Periteles lateralis, new sp.

Amycterus (*Phalidurus*) *scorpio*, new sp.[7]

Cryptocephalus monochroa, new sp.

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[1] Boltenia australis, Q. and G.
[2] Boltenia gibbosa, Heller.
[3] Colella pedunculata, Q. and G.
[4] Ibla quadrivalvis, Cuvier.
[5] Haplonycha astrolabei, Borsd.
[6] Catasarcus impressipennis, Borsd.
[7] Enomus scorpio, Borsd.

Diptera.

Musca australis, new sp.

In addition to the official account of the voyage of the "Astrolabe," Dumont d'Urville wrote a popular account of King George's Sound in his "Voyage Pittoresque autour du Monde." This account does not add anything to our knowledge of the fauna of the locality.

The fear of French annexation of the Western and Southern coasts of Australia had already caused General Darling, then Governor of New South Wales, to draw the attention of the Secretary of State for the Colonies to the possibility, and to ask that steps be taken to avert it.

In consequence, Darling was directed to take steps to form a settlement at King George's Sound, and on November 8th, 1826, the colonial brig "Amity" sailed from Sydney having on board Major Lockyer in command of a party for this purpose, consisting of a detachment of the 39th regiment under Captain Wakefield, a surgeon and 24 convicts.

The "Amity" reached the Sound on Christmas Day, and a settlement was formed on the site of the town of Albany. This little penal settlement remained in existence till March, 1831, when the convicts were withdrawn and the district placed under the control of the Swan River Colony, which had been established in the interval.

Major Lockyer returned to Sydney in April, 1827, and what little we know of the early history of Albany is derived from his diary. From this the following references to animals are extracted:

"Kangaroos are numerous and of large size, one that was shot weighed 75lbs. after the inside had been taken out. The only animal except the kangaroo that was met with was the wild native dog.

The islands along the Southern Coast are more or less frequented by the black or fur seal. The coast also abounds with the sperm whale and they have not as yet been molested.

Black swans, wild geese, ducks, musk ducks and teal, pelicans, curlew, red bills, sandpipers, and a number of other water-birds are plentiful.

The islands on the coast and vicinity of King George's Sound are frequented by penguins and mutton birds. The latter can be taken in any quantities that may be required and are an excellent substitute for fresh provisions. In the months of September and November their eggs, which are very good and as large as those of ducks, are to be had in great quantities. Even in January some that we brought from the Eclipse Island, and of which I partook, were not at all inferior to duck eggs.

Black and white cockatoos were seen with a great variety of parrakeets, with also a great variety of small birds that sing very prettily, but I did not observe any with particularly handsome plumage.

Great quantities of fish were obtained with the seine; on one occasion a single haul capturing what was estimated as a ton weight. The most important species were bream, whiting, sand mullet, large mullet and the fish called salmon.

Exceedingly fine oysters are to be had as well as abundance of sand-cockles.

Great quantities of sponge are found on the shore around the harbours, as well as on the sea coast, washed up, and by dredging for it pieces would be brought up that would prove a valuable article of trade."

Further information as to the animals of the Albany district is to be found in a "Description of the Natives of King George's Sound (Swan River Colony), and adjoining Country," written by Mr. Scott Nind, medical officer of the settlement from its commencement till October, 1829. This is to be found in Vol. I. of the Proceedings of the Royal Geographical Society, published in 1832.

Mr. Nind's account of the natives includes details of the methods they pursue for capturing the principal animals on which they feed.

The following particulars about their haunts and habits are given incidentally.

Kangaroos (native names: male—Yungur; female—Warre) are not very plentiful near the coast, preferring the open forest country further inland.

The Brush Kangaroo[1] is, however, common in the scrub country near the coast. Four species of wallaby are distinguished by native names—Nailoit, Wabl, Tāāmur[2] and Quakur.[3]

There are two species of opossums which are not often found in the same districts. The larger[4] (native name—Comal) lives chiefly in lofty and thick woods. It is of a lighter colour, with longer fur, and fatter than the second, and has a brownish bushy tail; the second is the common ring-tail[5] (Nworra) which is frequently found in the swamps and the low brush which surrounds them.

The bandicoot[6] (Quernde) is another common animal.

The wild dog (Toort) is sometimes killed by the natives, who eat their flesh. Upon finding a litter of young they generally carry away one or two to rear. In this case it often occurs that the mother will trace and attack them; and being of a large size, and very strong; they are rather formidable. But, in general, they will stand and look for a few moments, and leisurely retire.

Many seals (Barlard) of the black furred species occur on the rocks off the coast, and a sickly whale (Mammang) is not infrequently cast on the shore.

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[1] Macropus irma, Jourd.
[2] Macropus eugenii, Desm.
[3] Macropus brachyurus, Q. and G.
[4] Trichosurus vulpecula, Kerr.
[5] Pseudochirus occidentalis, Thos.
[6] Isoodon obesulus, Shaw.

Emus (Wait) are more plentiful further north than in the immediate vicinity of the Sound; they lay their eggs in winter.

Other birds that are mentioned are Parrots (Noorlark, Tiajip, Bernanore, Towern, Teer), the Black Cockatoo (Curräāk), White Cockatoo (Munnit), Black Eagle[1] (Nailoit or Warlit), Hawk (Corriore), Black Swan (Marlie), Musk Duck (Coatchuck), other Ducks (Wackerren and Wainern), Bronze Pigeon (Moorhait), Quail (Pourriock or Pourrha) and Night Cuckoo[2] (Combiac).

The largest lizard (Munnāar) resembles an iguana found at Sydney. It is long, and generally very lean and lank. At one season, however, it is fat, and very good eating. It makes a hole in the nest of a species of ant, which is a mound of earth four or five feet high, the inner part consisting of cells constructed of a gummy substance mixed with earth, which is very hard; yet the munnāar burrows from the top nearly to the bottom, and there deposits its eggs, which are the size of a large pigeon's egg, covered with a thick pellicle as tough as parchment. The eggs are about ten or twelve in number, and adhere together. The ants soon repair the hole made by the munnāar, and the warmth of the nest is sufficient to hatch the eggs. These eggs have an oily taste, and will not easily mix with either warm or cold water, but nevertheless they are very good eating.

The second species of lizard (Wandie) is of a very dark colour, and has a long round tail. It is generally found among rocks and conceals itself under them; it also inhabits hollow trees or holes in the ground; and is a very lively animal, and quick in its motions.

The third species, or short-tailed[3] (Youern), has a large head and an enormous mouth, which, when attacked, it immediately opens, and exhibits a purplish-coloured tongue; its body is covered with large scales of a grey colour, but having transverse patches of brown. It is very sluggish, and does not burrow in holes, but conceals itself in long grass. They are frequently found in pairs. The female, when pregnant, has two large eggs in her, but I have never seen them when deposited. According to the natives she buries them in the ground very near the surface, and they are hatched by the warmth of the sun. These youerns are frequently found in the ants' nests, constructed of straw or leaves, with minute portions of sand. I do not, however, know if they lay their eggs there, or whether they feed upon the ants.

The common diamond snake[4] of New South Wales (Wackul) is not poisonous. It is eaten by the natives together with the Norne and Docat which are much alike, of very dark colour, six and seven feet in length, and their bite generally fatal. There is another species of a smaller size, and sienna colour, of which al-

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[1] Uroaetus audax, Lath. (Wedge-tailed Eagle).
[2] Ninox boobook, Lath. (Boobook Owl).
[3] Trachysaurus rugosus, Gray.
[4] Python spilotes, White. (Carpet Snake).

though the bite is venomous, it seldom occasions death. Other small species occur.

The fresh-water tortoise[1] (Kilon) lays its eggs on shore, generally on a bank about twenty or one hundred yards from the water, buried in a small hole, and carefully covered up.

Frogs (Cooyah) of several species occur.

Fish (Wallah) are very plentiful, in the autumn the smaller species approach the shores in large shoals.

Sharks (Martiat) are very numerous, but the natives are not at all alarmed at them and say that they are never attacked by them. Sting rays and maiden rays are also common.

The fresh-water swamps abound with a species of crayfish (Challows) very like those found in rivulets in England. In the summer months when the water is partly dried up they are found in holes in the ground a foot or more deep, the entrance being small, but sufficiently wide within for the arm to be thrust to the bottom.

A species of Cockchafer (Pāāluck) deposits its ova upon the fallen grass-trees; they develop into large milk-white grubs. Other kinds of white grubs (Changut), some of much larger size, are procured from rotten trees, bull-rushes, etc.

A bee is found at King George's Sound.

Oysters and other edible kinds of shell-fish are to be obtained in large quantities.

On January 17, 1827, Captain James Stirling, R.N., sailed from Sydney to examine the country in the vicinity of the Swan River. He had on board as a passenger Mr. Charles Fraser, Colonial Botanist of New South Wales. Both these gentlemen gave a glowing report of the district, and as a result it was decided to establish a settlement on the banks of the Swan River.

The following extracts from Capt. Stirling's Report to the Admiralty record the animals met with:—

Kangaroo, Opossum, and Tortoise are the only Land Animals whose existence we can answer for here. The Native Dog we heard occasionally at night, but did not see him.

Of Reptiles the amount is short. Lizards and Guannas were seen and one Snake only the whole time we were there; it was, however, the dry season, during which it is probable they remain torpid in their retreats.

Of Birds the list is longer. There are found here the Emu, and in the greatest abundance Swans and several varieties of the Duck tribe. Cockatoos—white and black, a new species of the first colour was seen in great beauty. Pigeons, Quails, and Parroquets were also numerous, and to the above-mentioned may be added some Birds of very melodious note, which were heard but not seen.

We saw many Seals on the Islands, but all of the hair, or least valuable, species. It was not the season for Whales, but their

[1] Chelodina oblonga, Gray.

wrecks strewed the shore of Geographe Bay. Sharks were enormous and numerous, and Fish generally exist here in great abundance.

The bottom of the sea is composed of a calcareous sand, sometimes passing into marl or clay. On this there are endless varieties of marine plants, and these seem to form the sustenance of quantities of small fish.

When it is considered that the bank extends a hundred miles from the shore, and whenever the bottom is seen presents a moving picture of various animals gliding over the green surface of the bottom, it is not too much to look forward to the time when a valuable fishery may be established on these shores.

Of shells there is the greatest abundance; they are thrown up on the beach in a bed of several feet in thickness.

In the narrative mention is also made of Red-bills seen on the Swan River, and of a point on its banks which contained the greatest number of mosquitoes of all places he had ever visited.

On May 2, 1829, Captain Charles Fremantle, of H.M.S. "Challenger," hoisted the British flag on the South head and took formal possession in the name of His Majesty King George IV. of "all that part of New Holland which is not included within the territory of New South Wales."

A month later, on 2nd June, the transport "Parmelia" arrived, having on board Captain Stirling, who had been appointed Lieutenant-Governor of the new colony, and the first party of settlers.

At this point I must close this second part of my "History."

The following is a list of all the animals mentioned in the narratives quoted as far as I have been able to identify them. The identifications in many cases depend on the fact that only one species of a particular family is known to inhabit the district from which it was described, *e.g. Macropus eugenii*, on the Abrolhos Islands. In other cases the actual description gives sufficient particulars for an accurate identification.

In all cases where there was any reasonable doubt as to the species met with, I have only included the family or larger group to which the species belongs.

The distribution is indicated by the Roman numerals which refer to the areas shown on the accompanying map, for which I am indebted to my colleague Mr. G. Pitt Morison. The date after each indicates the year in which the species or family was discovered in the district, not that in which the discovery was published.

MAMMALIA.

MARSUPIALIA.

Peramelidae (Bandicoots) II. 1826.

Perameles bougainvillei, Q. and G., IV. 1822.

Dasyuridae (Native Cats).
Dasyurus hallucatus, Gould VI. 1820.
Phalangeridae (Opossums) III. 1827.
Pseudochirus occidentalis, Thos. II. 1829.
Trichosurus vulpecula, Thos. II. 1829.
Macropodidae (Kangaroos) V. 1801, VI. 1699.
Lagostrophus fasciatus, Peron IV. 1699.
Macropus brachyurus, Q. and G. II. 1826, III. 1658.
Macropus eugenii, Desm. I. 1802, II. 1829, III. 1629.
Macropus irma, Jourd. II. 1829.
Macropus giganteus, Zimm. I. 1792, II. 1791, III. 1827.
SIRENIA (Dugong).
Halicore dugong, Illig. IV. 1803, VI. 1688.
CETACEA (Whales) II. 1791, III. 1801, IV. 1699, V. 1801, VI. 1699.
Physeteridae (Sperm Whales).
Physeter macrocephalus, L. II. 1827.
Delphinidae (Dolphins) VI. 1699.
CARNIVORA.
Canidae (Dogs).
Canis dingo, Blumenb. I. 1792, II. 1803, III. 1697, IV. 1801, V. 1801, VI. 1688.
Otariidae (Sea-lions).
Zalophus lobatus, Gray I. 1792, II. 1791, III. 1656, IV. 1699.
CHIROPTERA (Bats) VI. 1820.
Pteropodidae (Flying-foxes) VI. 1819.

AVES (Birds).
CASUARIIFORMES.
Dromiceiidae (Emus).
Dromiceius novæ-hollandiæ, Latham I. 1792, II. 1802, III. 1697, IV. 1818.
SPHENISCIFORMES.
Spheniscidae (Penguins).
Eudyptula minor, Forster I 1792, II. 1791.
COLUMBIFORMES.
Columbidae (Pigeons) VI. 1699.
Phaps chalcoptera, Latham I. 1792.
Phaps elegans, Temm. III. 1629.
PROCELLARIIFORMES.
Puffinidae (Shearwaters) I. 1791, II. 1826, III. 1658, IV. 1699, V. 1803.
Daption capense, Linn. III. 1801.
Diomedeidae (Albatrosses) I. 1791.

LARIFORMES.

Laridae (Gulls and Terns) I. 1791, II. 1791, III. 1618, IV. 1635, V. 1699.

Anous stolidus, Linn. V. 1803, VI. 1699.

Larus novæhollandiæ, Stephens II. 1791.

Catharactidae (Skuas).

Catharacta lonnbergi, Mathews I. 1792.

CHARADRIIFORMES I. 1792, IV. 1627.

Haematopodidae (Oyster-catchers).

Hæmatopus ostralegus, Linn. I. 1792, II. 1791, III. 1827, IV. 1699, V. 1699, VI. 1699.

Recurvirostridae (Avocets).

Recurvirostra novæhollandiæ, Viellot IV. 1699.

Scolopacidae (Curlews and Snipe).

Numenius cyanopus, Vieillot II. 1791, IV. 1699, V. 1818, VI. 1699.

ARDEIFORMES.

Plegadidae (Ibises).

Carphibis spinicollis, Jameson IV. 1699.

Ardeidae (Herons) II. 1826.

ANSERIFORMES.

Anatidae (Swans, Geese, and Ducks) II. 1791, IV. 1697.

Chenopis atrata, Latham II. 1791, III. 1697.

Cereopsis novæhollandiæ, Latham I. 1792, II. 1826.

Biziura lobata, Shaw II. 1791.

PELECANIFORMES.

Phalacrocoracidae (Cormorants) II. 1791, III. 1697, IV. 1699, V. 1699.

Sulidae (Gannets) I. 1791, IV. 1699.

Sula leucogaster, Boddaert VI. 1699.

Fregatidae (Frigate-birds).

Fregata ariel, Gould VI. 1699.

Pelecanidae (Pelicans).

Pelecanus conspicillatus, Temm. II. 1791, III. 1697, IV. 1699, V. 1818, VI. 1791.

ACCIPITRIFORMES.

Falconidae (Eagles and Hawks) II. 1791, IV. 1699, VI. 1699.

Uroaetus audax, Lath. II. 1829.

PSITTACIFORMES.

Cacatuidae (Cockatoos) II. 1829, III. 1697, V. 1699, VI. 1820.

Calyptorhynchus sp. II. 1818, III. 1827.

Cacatua leadbeateri, Vigors I. 1792.

Psittacidae (Parrots), I. 1792, II. 1791, III. 1697.

Purpureicephalus spurius, Kuhl II. 1826.

Barnardius semitorquatus, Q. and G. II. 1826.

CORACIIFORMES.

Alcedinidae (Kingfishers).

Halcyon Sanctus, Vigors VI. 1818-22.

Coccyges.
Cuculidae (Cuckoos) VI. 1820.
Chalcococcyx sp. II. 1826.
Centropus phasianinus, Latham VI. 1819.
Passeriformes II. 1791, IV. 1699, VI. 1699.
Muscicapidae (Flycatchers) I. 1792, IV. 1801, V. 1801,
Amaurodryas vittata, Q. and G. II. 1826.
Eopsaltria georgiana, Q. and G. II. 1826.
Eopsaltria griseicapilla, Vieillot II. 1826.
Sylviidae (Warblers).
Malurus lamberti, Vigors IV. 1801.
Malurus splendens, Q. and G. II. 1826.
Laniidae (Shrikes) IV. 1801.
Meliphagidae (Honey-eaters) II. 1826.
Ploceidae (Weaver-finches).
Zonaeginthus oculatus, Q. and G. II. 1826.

REPTILIA.

Crocodilia.
Crocodilidae (Crocodiles).
Crocodilus porosus, Schn. VI. 1819.
Chelonia.
Chelonidae (Turtles) IV. 1697, V. 1801, VI. 1688.
Chelonia imbricata, Linn. VI. 1803.
Chelonia mydas, Linn. IV. 1699, V. 1699, VI. 1699.
Chelydidae (Freshwater Tortoises)
Chelodina oblonga, Gray II. 1829, III. 1827.
Lacertilia (Lizards) II. 1791, III. 1801, VI. 1699.
Geckonidae (Geckoes) IV. 1801.
Varanidae (Monitors) II. 1818, III. 1827, IV. 1801, V. 1818.
Scincidae (Skinks) II. 1803.
Trachysaurus rugosus, Gray II. 1802, IV. 1699
Ophidia (Snakes) I. 1792, II. 1791, III. 1697, VI. 1699.
Pythonidae (Boas) V. 1801.
Python spilotes, White II. 1829.
Hydrophiinae (Sea-snakes) III. 1801, IV. 1699, V. 1699, VI. 1699.
Pelamydrus platurus, Linn. VI. 1819.

AMPHIBIA.

Anura.
Hylidae (Frogs) II. 1803.

PISCES (Fish).

Elasmobranchii.
Pleurotremata (Sharks) II. 1818, III. 1801, IV. 1697, V. 1699, VI. 1699.

Carchariidae (Sharks).
Prionace glauca, Linn. I. 1792.
Pristiophoridae (Saw-sharks) IV. 1801.
Squatinidae (Angel-sharks) V. 1699.
HYPOTREMATA (Rays) II. 1803, IV. 1699.
TELEOSTEI III. 1696, IV. 1699, VI. 1699.
Clupeidae (Herrings) IV. 1801, V. 1801.
Plotosidae (Cat-fish) V. 1818, VI. 1820.
Muraenidae (Eels) II. 1803.
Hemirhamphidae (Gar-fish) IV. 1699, VI. 1821.
Exocoetidae (Flying-fish) V. 1818.
Syngnathidae (Sea-horses) II. 1802.
Sphyraenidae (Sea-pike) II. 1791.
Mugilidae (Grey Mullet) II. 1791, VI. 1821.
Serranidae (Sea Perch) I. 1792.
Hypoplectrodes nigrorubrum, Cuv. and Val. II. 1826.
Colpognathus dentex, Cuv. and Val. II. 1826.
Acanthistius serratus, Cuv. and Val. II. 1826.
Sillaginidae (Whiting) II. 1827.
Isosillago punctata, Cuv. and Val. II. 1826.
Arripididae (Salmon).
Arripis trutta, Forst. II. 1827.
Mullidae (Red Mullet).
Upeneichthys porosus, Cuv. and Val. II. 1791.
Sparidae (Bream) V. 1699.
Pagrosomus auratus, Forst. II. 1802, IV. 1822, V. 1699.
Chaetodontidae (Coral-fish) IV. 1801, V. 1801, VI. 1801.
Enoplosidae (Old Wife).
Enoplosus armatus, Shaw V. 1699, VI. 1699.
Labridae (Parrot-fish) I. 1792, II. 1803, IV. 1801.
Odacidae (Rock Whiting).
Odax radiatus, Q. and G.
Gempylidae (Barracouta) V. 1818.
Scombridae (Mackerel) II. 1803, IV. 1803.
Gobiidae (Mud-skippers) VI. 1820.
Scorpaenidae (Rock-cod) II. 1803.
Echeneididae (Sucking-fish) (?) 1699, VI. 1821.
Balistidae (Leather-jackets) II. 1791, IV. 1801, V. 1801, VI. 1801.
Ostraciontidae (Box-fish) II. 1803, IV. 1801.
Tetrodontidae (Blow-fish) IV. 1801.
Tetrodon argenteus, Lacep. IV. 1822.
Antennariidae (Angler-fish) VI. 1801.

TUNICATA.
ASCIDIACEA (Sea-squirts).

Cynthiidae.
Boltenia australis, Q. & G. II. 1826.
Boltenia gibbosa, Heller II. 1826.
Ascidia reticulata, Q. & G. II. 1826.
Ascidia spinosa, Q. & G. II. 1826.
Distomidae.
Colella pedunculata, Q. & G. II. 1826.
THALIACEA.
Salpidae IV. 1801, V. 1801.
Salpa scutigera-confœderata, Cuv.-Forsk. II. 1826.

CRUSTACEA.
CIRRIPEDIA (Barnacles) II. 1803.
Lepadidae II. 1821.
Pollicipedidae.
Ibla quadrivalvis, Cuvier II. 1826.
Balanidae. II. 1826.
Stomatopoda (Mantis-shrimps) VI. 1821.
DECAPODA.
MACRURA.
Scyllaridae (Marine Crayfish) VI. 1821.
Parastacidae (Freshwater Crayfish) II. 1803.
BRACHYURA (Crabs) IV. 1629.
Portunidae (Swimming-Crabs) IV. 1801.

INSECTA.
ORTHOPTERA.
Blattidae (Cockroaches) IV. 1801.
Acridiidae (Grasshoppers) IV. 1801, V. 1801.
Gryllidae (Crickets) IV. 1801, V. 1801.
NEUROPTERA.
Termitidae (White-ants) IV. 1629, V. 1818, VI. 1699.
Libellulidae (Dragon-flies) V. 1818.
HYMENOPTERA VI. 1820.
Formicidae (Ants) II. 1803, III. 1801, IV. 1801, V. 1801.
COLEOPTERA (Beetles) II. 1791.
Scarabaeidae (Cockchafers) II. 1829.
Haplonycha astrolabei, Boisd. II. 1826.
Curculionidae (Weevils).
Cherrus australis, Boisd. II. 1826.
Catasarcus impressipennis, Boisd. II. 1826.
Euomus scorpio, Boisd. II. 1826.
Periteles lateralis, Boisd. II. 1826.
Cryptocephalus monochroa, Boisd. II. 1826.
LEPIDOPTERA.
Sphingidae (Hawk-moths) VI. 1822.
DIPTERA (Flies) III. 1697, IV. 1629, V. 1801, VI. 1688.
Culicidae (Mosquitoes) I. 1792, II. 1791, VI. 1820.

Tabanidae (Horse-flies) IV. 1803.
Muscidae I. 1792, II. 1791.
Musca australis, Boisd. II. 1826.

ARACHNIDA.
Scorpionida (Scorpions) VI. 1820.

MYRIAPODA.
Chilopoda (Centipedes) VI. 1820.

ANNELIDA.
Polychaeta (Bristle-worms).
Amphinomidae V. 1803.

MOLLUSCA.
Amphineura.
Polyplacophora (Chitons) II. 1821.
Ischnochitonidae.
Ischnochiton sulcatus, Q. & G. II. 1826.
Chitonidae.
Acanthopleura georgiana, Q. & G. II. 1826.
Gastropoda.
Fissurellidae.
Scutus anatinus, Don. II. 1826.
Subemarginula australis, Q. & G. II. 1826.
S. rugosa, Q. & G. II. 1826.
Haliotidae (Ear-shells) I. 1792, II. 1803, III. 1822.
Haliotis albicante, Q. & G. II. 1826.
Stomatiidae II. 1803.
Gena auricula, Lamk. II. 1826.
Trochidae (Top-shells) II. 1803, III. 1822, IV. 1801.
Trochus caerulescens, Lamk. IV. 1822, VI. 1826.
T. luteus, Q. & G. II. 1826.
Cantharidus irisodontes, Q. & G. II. 1826.
Angaria delphinus, Linn. var. laciniata, Lamk. VI. 1821.
Turbinidae I. 1792, II. 1803.
Phasianella australis, Gmel. II. 1826.
P. ventricosa, Q. & G. II. 1826.
Turbo stamineus, Martyn var. lamellosus, Brod. II. 1826.
Astralium fimbriatum, Lamk. II. 1826.
Neritidae II. 1821, V. 1818.
Patellidae (Limpets) I. 1792, II. 1803, IV. 1699, V. 1699, VI. 1699.
Patella compressa, Lamk. II. 1826.
Patella neglecta, Gray II. 1822.
Acmaeidae.
Acmaea conoidea, Q. & G. II. 1826.

Acmaea elongata, Q. & G. II. 1826.
A. septiformis, Q. & G. II. 1826.
A. punctata, Q. & G. II. 1826.
Littorinidae (Periwinkles) IV. 1699, V. 1699, VI. 1688.
Hipponicidae (Cap-shells).
Hipponyx conicus, Schum. II. 1826.
Hipponyx foliacea, Q. & G. II. 1826.
Cerithüdae IV. 1818.
Ceratoptilus levis, Q. & G. II. 1826.
Vermetidae (Worm-shells) II. 1803.
Serpulus sipho, Lamk. II. 1826.
Vermetus dentiferus, Lamk. IV. 1818.
Ianthinidae II. 1803.
Scalarüdae.
Epitonium granosum, Q. & G. II. 1826.
Tritonidae.
Triton leucostomum, Lamk. II. 1826.
Dolüdae IV. 1818, V. 1801.
Tonna perdrix, Linn. IV. 1818.
Naticidae IV. 1801.
Polinices plumbea, Lamk. II. 1826.
Sinum zonale, Q. & G. II. 1826.
Cypraeidae (Cowries) IV. 1822.
Volutidae.
Scaphella nivosa, Lamk. IV. 1801.
S. undulata, Lamk. II. 1826, IV. 1818.
Cymbium flammeum, Bolten IV. 1818, VI. 1822.
Terebridae, II. 1803.
Conidae (Cone-shells) II. 1803, IV. 1801.
Conus luteus, Q. & G. II. 1826.
Fusidae.
Fusus australis, Q. & G. II. 1826.
Buccinidae (Whelks) II. 1821, III. 1822, IV. 1822, V. 1818, VI. 1699.
Buccinum costatum, Q. & G. II. 1826.
B. litiopa, Rang. II. 1826.
Muricidae (Dog-whelks) II. 1803, III. 1822.
Amphibolidae.
Salinator fragilis, Lamk. II. 1826.
Limnaeidae (Pond-snails)
Isidora georgiana, Q. & G. II. 1826.
Succineidae II. 1826.
Bulimulidae IV. 1801.
Bothriembryon kingii, Gray II. 1818.
Helicidae (Snails) IV. 1801.
Rhytididae.
Rhytida georgiana, Q. and G. II. 1826.

Zonitidae.
Vitrina nigra, Q. and G. II. 1826.
Scaphandridae.
Cylichna arachis, Q. and G. II. 1826.
Bullidae II. 1803, III. 1822.
Bullaria australis, Q. and G. II. 1826.
Haminea brevis, Q. and G. II. 1826.
Akera bicincta, Q. and G. II. 1826.
Pleurobranchidae IV. 1818.
SCAPHOPODA.
Dentaliidae (Tusk-shells) II. 1803.
LAMELLIBRANCHIA.
Solenomyidae. II. 1826.
Pinnidae (Razor-shells) II. 1821, IV. 1818, VI. 1822.
Pteriidae (Pearl-Oysters) II. 1803, IV. 1699, VI. 1699.
Pteria papilionacea, Lamk. II. 1826.
Ostreidae (Oysters) II. 1791, IV. 1697, V. 1699, VI. 1699.
Pectinidae (Scallops).
Pecten lividus, Lamk. II. 1826.
Mytilidae (Mussels) II. 1803, IV. 1699, VI. 1688.
Chamidae IV. 1822, VI. 1822.
Cardiidae (Cockles) II. 1821, IV. 1699, VI. 1688.
Veneridae.
Venus zelandica, Q. and G. II. 1826.
Solenidae II. 1826.
CEPHALODA.
Sepiidae (Cuttle-fish) IV. 1627.
Octopodidae (Octopus) IV. 1801.

BRACHIOPODA (Lamp-Shells).
TESTICARDINES.
Terebratulidae.
Waldheimia flavescens, Lamk. II. 1826.

ECHINODERMATA.
CRINOIDEA (Sea-Lilies)
Comatulidae (Feather-Stars).
Ptilometra macronema, J. Müll. II. 1826.
OPHIUROIDEA (Brittle-Stars) IV. 1801.
ECHINOIDEA (Sea-Urchins) IV. 1801.
HOLOTHUROIDEA (Sea-Cucumbers) IV. 1822, V. 1818, VI. 1803.
Aspidochirotae.
Holothuria fulva, Q. and G. II. 1826.

COELENTERATA.
MILLEPORINA.
Milleporidae IV. 1801.
GYMNOBLASTEA.

Tubulariidae II. 1826.
Siphonophora.
Porpitidae IV. 1801, V. 1801.
Scyphozoa (Medusae) I. 1802, IV. 1801, V. 1801, VI. 1801.
Alcyonaria.
Alcyonium terminale, Q. and G. II. 1826.
Actiniaria (Sea-Anemones)
Actinia tuberculosa, Q. and G. II. 1826.
Madreporaria (Corals).
Madreporidae IV. 1801.
Poritidae.
Porites subdigitata, Lamk. VI. 1821.
Turbinoliidae.
Caryophyllia fastigiata, Lamk. VI. 1821.
Astraeidae.
Astraea galaxea, Lamk. II. 1826.
Fam. incert.
Lobophyllia aurea, Q. and G.
Explanaria mesenterina, Lamk.

CTENOPHORA.
Nuda.
Beroidae IV. 1801.

PORIFERA (Sponges) II. 1827, III. 1801, IV. 1818.

PROTOZOA.
Foraminifera.
Miliolidaeeae.
Orbitolites complanata, Lamk. III. 1801.

NOTE ON THE BIRDS MET WITH ON THE SWAN RIVER BY VLAMINGH IN 1697.

By

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(Read 8th June, 1915.)

When I wrote Part I. of my paper on "The History of Zoology in Western Australia" (Journal of W.A. Nat. Hist. and Sci. Soc. V., p. 49), I had to rely for the narrative of Vlamingh's voyage on the translation given by Major (Early Voyages to Terra Australis, p. 120).

This is as follows: "On the 11th (January), at break of day, we again ascended the river, and saw many swans (our boat knocked over nine or ten), some rotganzen, geese, some divers, etc." (p. 124); and on the next page: "The men, the birds, the swans, the rotganzen, koopganzen, the geese, the cockatoos, the parroquets, etc., all fled at the sight of us."

Mr. F. E. Blaauw was good enough to inform me that "rotganzen" was an old Dutch word for cormorants, and that "koopganzen" was probably a misprint for "kropganzen," meaning pelicans.

In my paper I therefore substituted cormorants for rotganzen and pelicans for koopganzen.

Since then I have been fortunate enough to obtain a copy of the original Dutch account printed at Amsterdam in 1701, which Major states is "exceedingly scarce."

In this the two passages already cited stand as follows: "Den 11den met den dag, voeren wy de Rivier weder op, en zagen veele Swaanen (daar onze Schuit'er wel negen of tien af schoot) Rotganzen, Duikers, enz;" and "'t Was ook alles schigtig voor ons, zo Menschen als Gevogelte, Swaanen, Rotganzen, Kropganzen, Kaketoeën, Parkieten, enz."

It will be seen in the first place that Mr. Blaauw was right in his surmise that koopganzen was a misprint for kropganzen.

Secondly we find that there is no mention of geese in the original. Evidently Major's document should have read "rotganzen (geese?)," and again "rotganzen, koopganzen (geese?)."

Now there can be no question that the most striking birds likely to be seen on the river at the present day are Cormorants, Pelicans and Black Swans, but in writing the passage before, I wondered what sort of geese could have been seen there, and speculated in my own mind as to whether the Cape Barren Goose might formerly have extended as far as the Swan River. This problem is now settled satisfactorily.

The only question that still remains is as to the identity of the "Duikers," translated "Divers," which are mentioned. I think there can be very little doubt that these were Musk Ducks, which are sometimes seen on the river. The only other diving birds possible are Grebes, but I am not aware that these are ever seen there, though common enough on adjacent lakes and swamps.

A PRELIMINARY INDEX OF THE MOLLUSCA OF WESTERN AUSTRALIA.

By
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(*Communicated by W. B. Alexander. Read July* 13, 1915.)

Zoological investigation has progressed more rapidly in the Eastern States of Australia than in the West. The former have longer enjoyed the advantages offered by large and wealthy cities, of endowment of research, of Universities, of Museums, and of scientific societies. So the fauna of the south and east of the continent thus came to be studied and catalogued at an earlier date. But with the increase of population, the advance of education, and especially the founding of a University and expansion of the Museum, Zoology in Western Australia will take her part in the general advance.

Among the various branches of Zoology, few are more attractive to the general student than Conchology. In every State, except this and the Northern Territory, a catalogue has been provided of the molluscan fauna. To supply this deficiency, and at the request of naturalists in Western Australia, a catalogue of the mollusca of the province has now been prepared as a foundation for future work. Since what is now known is but a fraction of what will be found eventually, it is offered as a "preliminary" index. Probably most of the common and conspicuous shells, those which first attract attention, are here represented. But this number will be increased perhaps fourfold when small species and those from deep water are collected.

Hitherto students in Western Australia and those abroad engaged in the study of the fauna of that State, have not had any consecutive account of the mollusca. Even advanced students had difficulty in finding what information was published and when or where. The present endeavour is to abstract literature so that those who have access to libraries may readily identify West Australian shells, and that those not so fortunately situated may make the best use of fewer books, and learn in what direction to seek information. The plan followed, is to give first the original description on which the species is based, then a reference to an approved or accessible figure, finally the reference to occurrence in Western Australia. Besides this analysis of literature, there are noted additional species identified from Western Australia in the Natural History Museum, in London, and the Australian Museum in Sydney, but not hitherto recorded in literature. Mistaken references are also noted for expulsion.

Two elements, which have little in common, an inter-tropical and an extra-tropical, are included in the marine fauna. The latter, for which I have proposed the name of Adelaidean, extends from Melbourne past South Australia, the Bight and the Leeuwin, and fades away at the commencement of the coral belt. To it succeeds a fauna which I have called the Dampierian, and which extends to Torres Strait. Owing to climatic conditions, the fresh water fauna is extremely restricted. But the land-snail fauna developes a variety surprising in so arid a region, with peculiarities indicating a high antiquity and relation to lost land south and west.

If the early voyagers of the seventeenth and eighteenth centuries gathered any shells in West Australia, no account has come down to us. Thomas Martyn, in 1784, published figures of several shells from King George's Sound, quoted by subsequent writers as Australian; but the King George's Sound of Martyn was Canadian, and is now called Nootka Sound of Vancouver Island.

The earliest conchological work was due to French enterprise. At the opening of the last century (1801 and 1803) Baudin's expedition surveyed a good deal of the coast in the ships "Geographe" and "Naturaliste." The collections obtained by this party provided Lamarck, Montfort, Blainville, Kiener, Chenu, and others with material for research. But owing probably to political disturbances no official report of the scientific work as a whole was produced. Indeed unpublished material from this expedition is said to be still preserved in the Havre Museum.* In 1817-1820, another French expedition in the "Uranie" and "Physicienne," visited this coast and continued the work of their predecessor. About the same time (1818-1822) Capt. P. P. King, an ardent naturalist, was exploring the coast on behalf of the British navy. A selection of the shells he obtained were described by Dr. J. E. Gray, of the British Museum. A well organised expedition, under Admiral Dumont D'Urville (1826-1829) visited this territory. Their results were elaborately presented in the Zoology of the "Astrolabe." A collection formed by a German scientific traveller, Dr. J. A. L. Preiss, in 1838 to 1842, were studied by Dr. T. Menke and published under the title of Specimen Molluscorum Novae Hollandiae. Unfortunately several foreign shells had been introduced into this collection and misled the author, who gave numerous corrections in the following year (1844). Several of Menke's shells were illustrated by Philippi and others by Reeve. A German government vessel, the "Gazelle," called at a few places in 1875, dredging and collecting. A collection of shells made in Cambridge Gulf was recorded by W. S. Kent in Proc. Roy. Soc. Qland. VI. During the surveying

* Hedley, Proc. Roy. Soc., Tasm., 1914, p. 81.

cruise of H.M.S. "Penguin," Mr. J. J. Walker, then (1890-1891) Chief Engineer, collected vigorously. Some of his gatherings were dealt with by Mr. E. A. Smith. On behalf of the Hamburg Museum, Drs. Michaelsen and Hartmeyer travelled through the State in 1905. Part of their mollusca has been published, but most of it is still unfinished. In 1910-11 Dr. J. C. Verco made important explorations in conchology in the south of the State. No previous excursion added so much to our knowledge. Mr. T. H. Haynes and Mr. P. D. Montague, who were interested in the Monte Bello Islands, recently provided Messrs. H. B. Preston, G. C. Robson, and T. Iredale with material for various papers.

SUB-KINGDOM—MOLLUSCA.

CLASS—PELECYPODA.

ORDER—PRIONODESMACEA.

Family—Nuculida.

NUCULA M'ANDREWII, Hanley, Proc. Zool. Soc., 1860, p. 441 ; Sowerby, Conch. Icon., XVIII., 1870, Pl. 4, f. 28 ; Von Marten s, Forsch. Gazelle, 1889, p. 185. 45–60 fath. Dirk Hartog.

NUCULA MICANS, Angas, Proc. Zool. Soc., 1878, p. 864, Pl. 54, f. 16 ; Verco. Trans. Roy. Soc., S.A., XXXVI., 1912, p. 205. Geraldton.

Family—Arcidæ.

ARCA FUSCA, Bruguiere, Enc. Meth., Vers. I., 1789, p. 192 , Reeve, Conch. Icon., II., 1844, pl. 12, f. 82 ; Brazier, P.L.S., N.S.W.. IX., 1884, p. 802. Cossack ; Iredale, Proc. Zool. Soc. 1914, p. 666; Monte Bello Is.

ARCA DOMINGENSIS, Lamarck, An. s. vert., VI., 1819, p. 40 ; *A. divaricata*, Reeve, Conch. Icon., II., 1844, pl. 16, f. 108 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 205 ; Geraldton.

ARCA IMBRICATA, Bruguiere, Ency. Meth., Vers. I., 1792, p. 98 ; Reeve, Conch. Icon., II., 1844, pl. 11, f. 73 ; *A. tetragona* and *A. umbonata*, Menke, Moll. Nov. Holl., 1843, p. 37. N.W. Australia.

ARCA INDICA, Gmelin. Syst. Nat., XIII., 1790, p. 3312 ; Reeve, Conch. Icon., II., 1844, pl. 9, f. 56 ; Menke, Moll. Nov. Holl., 1843, p. 37. N.W. Australia.

ARCA NAVICULARIS, Bruguiere, Ency. Meth., Vers., I., 1792. p. 99 ; Reeve, Conch. Icon., II., 1844, pl. 11, f. 70 ; Verco. Trans, Roy. Soc. S.A., XXXVI., 1912, p. 205. Geraldton.

ARCA TORTUOSA, Linne, Syst. Nat., X., 1758, p. 693 ; Reeve, Conch. Icon., II., 1844, pl. 13, f. 86 ; Von. Martens, Forsch. Gazelle, III., 1889, p. 191. Mermaid Strait.

GLYCYMERIS RADIANS, Lamarck,—*Pectunculus radiano* , Lamarck, An. s. vert., VI., 1819, p. 54 ; Reeve, Conch. Icon., I., 1843, pl. 9, f. 50 ; Menke, Moll. Nov. Holl., 1843, p. 37. Woodman's Point ; Von Martens, Forsch. Gazelle, III., 1888, p. 186. Dirk Hartog ; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 205. Geraldton.

Glycymeris reevei, Mayer, *Pectunculus reevei*, Mayer, Cat. foss. tert., Mus. Zurich, III., 1868, p. 5 ; *Pectunculus angulatus*, Reeve, Conch. Icon., I., 1843, pl. 6, f. 30. Swan River—Jukes (Brit. Museum).

Glycymeris sordidus, Tate.—*Pectunculus sordidus*, Tate, Trans. Roy. Soc. S.A., XIV., 1891, p. 264, pl. 11, f. 8. Geographe Bay ; *G. insignis*, Pilsbry, Proc. Acad. Nat. Sci. Philad., LVIII., 1906, p. 213, text fig.

Glycymeris striatularis, Lamarck.—*Pectunculus striatularis* Lamarck, An. s. vert., VI., 1819, p. 52. King George Sound ; *P. obliquus*, Reeve, Conch. Icon., I., 1843, pl. 6, f. 33. Swan River.

Family—Pinnidæ.

Pinna virgata, Menke, Moll., Nov. Holl., 1843, p. 36. W. Australia ; Reeve, Conch. Icon., XI., 1858., pl. 24, f. 45.

Family—Pernidæ.

Isognomon australica, Reeve.—*Perna australica*, Reeve, Conch. Icon., XI., 1858, pl. 3, f. 12 ; Brazier, P.L.S.N.S.W., IX., 1884, p. 802. Cossack.

Isognomon ephippium, Linne.—*Ostrea ephippium*, Linne, Syst. Nat., X., 1758, p. 700 ; Chemnitz, Conch. Cab., VII., 1784, p. 245, pl. 58, f. 576 ; Von Martens, Forsch. Gazelle, III., 1889, p. 196. Mermaid Strait.

Crenatula bicostalis, Lamarck, An. s. vert., VI., 1819, p. 137. King George's Sound.

Crenatula viridis, Lamarck, An. s. vert., VI., 1819, p. 137 ; Reeve, Conch. Icon., XI., 1858, pl. 1, f. 2 ; Brazier, P.L.S.N.S.W . IX., 1884, p. 802. Cossack.

Family—Pteridæ.

Pteria macroptera, Lamarck.—*Avicula macroptera*, Lamarck, An. s. vert., VI., 1819, p. 147 ; Reeve, Conch. Icon., X., 1857, pl. 2, f. 2. Bedoubt Is. (Austr. Museum).

Pinctada carchariarum, Jameson.—*Margaritifera carchariarum*, Jameson, Proc. Zool. Soc., 1901, p. 381, f. 92. Sharks Bay, Derby, and Kimberley.

Pinctada margaritifera, Linne.—*Mytilus margaritifera*, Linne, Syst. Nat., X., 1758, p. 704 ; Chemnitz, Conch. Cab., VIII., 1785, p. 132, pl. 80, f. 718 ; Jameson, Proc. Zool. Soc., 1901, p. 373 ; Von Martens, Forsch. Gazelle, III., 1889, p. 191. Mermaid Strait.

Pinctada maxima, Jameson.—*Margaritifera maxima*, Jameson, Proc. Zool. Soc., 1901, p. 377. W.A., as far South as 25° S. Lat. ; *Melcagrina maxima*, Kent, Great Barrier Reef, 1893, pl. 38.

Pinctada papilionacea, Lamarck.—*Avicula papilionacea*, Lamarck, An. s. vert., VI., 1819, p. 149 ; Menke, Moll. Nov. Holl., 1843, p. 36. Carnac Island ; *A. georgiana*, Quoy and Gaim., Zool. Astrolabe, III., 1835, p. 457, pl. 77, f. 10–11. King George's Sound.

PINCTADA PHYSOIDES, Lamarck.—*Avicula physoides*, Lamarck, An. s. vert., VI., 1819, p. 149; Menke, Moll. Nov. Holl., 1843, p. 36. Carnac Is.; Dunker, Conch. Cab., VII., 1872, p. 25, pl. 8, f. 2–3.

PINCTADA SUGILLATA, Reeve.—*Avicula sugillata*, Reeve, Conch. Icon., X., 1857, pl. 9, f. 27, and *A. fimbriata*, f. 25. North-West Australia.

PINCTADA VIRENS, Lamarck.—*Avicula virens*, Lamarck, An. s. vert., VI., 1819, p. 150. "Terre d Endracht"; Chemnitz, Conch. Cab., VIII., 1785, p. 136, pl. 80, f. 721.

PINCTADA VULGARIS, Schumacher.—*Perlamater vulgaris*, Schumacher, Nouv. Syst. ver. test., 1817, p. 108, pl. 20, f. 8; Jameson, Proc. Zool. Soc., 1901, p. 385. Sharks Bay.

PINCTADA ZEBRA, Reeve.—*Avicula zebra*, Reeve, Conch., Icon., X., 1857, pl. 11, f. 36; Von Martens, Forsch. Gazelle, III., 1889, p. 185, 45–60 fath. Dirk Hartog.

MALLEUS MALLEUS, Linne.—*Ostrea malleus*, Linne, Syst. Nat. X., 1758, p. 699; Chemnitz, Conch. Cab., VIII., 1785, p. 8, pl. 70, f. 655; *M. vulgaris*, Menke, Moll. Nov. Holl., 1843, p. 36, W.A.; Iredale, Proc. Zool. Soc., 1914, p. 666. Monte Bello Is.

MALLEUS REGULUS, Forskal.—*Ostrea regulus*, Forskal, Descr. Anim., 1775, p. 124; *M. vulsellatus*, Brazier, P.L.S.N.S.W., IX., 1884, p. 803. Cossack.

Family—Vulsellidæ.

VULSELLA VULSELLA, Linne.—*Mya vulsella*, Linne, Syst. Nat., X., 1758, p. 671; *V. rudis*, Reeve, Conch. Icon., XI., 1858, pl. 2 f. 12. Swan River; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 205. Geraldton.

Family—Ostreidæ.

OSTREA CUCULLATA, Born, Test Mus., Caes. Vindob., 1780, pl. 6, f. 11–12; *O. australis*, Lamarck, An. s. vert., VI., 1819, p. 280. King George's Sound; Iredale, Proc. Zool. Soc., 1914, p. 666. Monte Bello Is.

OSTREA ANGASI, Sowerby, Conch. Icon. XVIII., 1871, pl. 13, f. 27: *O. hippopus*, Menke, Moll, Nov. Holl., 1843, p. 35. King George's Sound.

OSTREA TRAPEZINA, Lamarck, An. s. vert., VI., 1819, p. 208. Sharks Bay.

Family—Unionidæ.

DIPLODON AMBIGUUS, Philippi.—*Unio ambiguus*, Philippi, Abbild. Besch., III., 1847, p. 47, pl. 3, f. 2. Canning River (W.A. Museum).

Family—Trigoniidæ.

NEOTRIGONIA MARGARITACEA, Lamarck.—*Trigonia margaritacea* Lamarck, Anal, Mus., IV., 1804, p. 355, pl. 67, f. 2. Onslow (A. U. Henn).

Family—Pectinidæ.

PECTEN ASPERRIMUS, Lamarck, An. s. vert., VI., 1819, p. 174 ; Delessert, Rec., 1841, pl. 15, f. 1 ; *P. rubidus*, Menke, Moll. Nov. Holl., 1843, p. 36, *vide* Menke, Zeit. malak., 1844, p. 90 ; *P. australis*, Sowerby, Thes. Conch., I., 1842, p. 76, pl. 19, f. 210–220. Swan River ; Von. Martens, Forsch. Gazelle, III., 1889, p. 186. Dirk Hartog ; Bavay, Bull. Mus. hist. nat., 1904, p. 365. Exmouth Gulf.

PECTEN HEXACTES, Lamarck, An. s. vert., VI., 1819, p. 178. King George's Sound.

PECTEN INFLEXUS, Poli.—This Mediterranean species has been erroneously ascribed to W. Australia by Menke, Moll. Nov. Holl., 1843, p. 36.

PECTEN LIVIDUS, Lamarck, An. s. vert., VI., 1819, p. 178. King George's Sound ; *P. foliaceus*, Quoy & Gaim., Zool. Astrolabe, III., 1835, p. 445, pl. 76, f. 4–6.

PECTEN MEDIUS, Lamarck, An. s. vert., VI., 1819, p. 163 . *P. bifidus*, Menke, Moll. Nov. Holl., 1843, p. 35, and Philippi, Abbild; Besch., I., 1844, p. 202, pl. 2, f. 6. W.A.

PECTEN RADULA, Linne.—*Ostrea radula*, Linne, Syst. Nat., X., 1758, p. 697 ; *Pecten radula*, Reeve, Conch. Icon., VIII., 1853. pl. 21, f. 83. Iredale, Proc. Zool. Soc., 1914, p. 666. Monte Bello Is.

PECTEN UNDULATUS, Sowerby, Thes. Conch., I., 1842, p. 60, pl. 19, f. 206, 207. Cottesloe (A. U. Henn).

PECTEN SQUAMOSUS, Gmelin.—*Ostrea sq.*, Syst. Nat. XIII., 1791, p. 3319 ; Thes. Conch. I., 1842, p. 69., pl. XIII., f. 48–50 ; Iredale, Proc. Zool. Soc. 1914., p. 666. Monte Bello Is.

PECTEN CRUENTATUS, Reeve, var., LENTIGINOSUS, Reeve, Conch. Icon., VIII., 1853, pl. XX., fig. 76 ; Iredale, Proc. Zool. Soc., 1914, p. 666, Monte Bello Is.

Family—Spondylidæ.

SPONDYLUS AMERICANUS, Hermann.—This American species has been erroneously ascribed to W. Australia by Menke, Moll. Nov. Holl., 1843, p. 35.

SPONDYLUS CASTUS, Reeve, Conch. Icon., IX., 1856, pl. 13, f. 47 ; Brazier, P.L.S., N.S.W., IX., 1884, p. 803. Cossack.

SPONDYLUS COSTATUS, Lamarck, An. s. vert., VI., 1819, p. 189 ; Chemnitz, Conch. Cab., VII., 1784, p. 74, pl. 44, f. 460–462 ; Menke, Moll. Nov. Holl., 1843, p. 35. W. Australia.

SPONDYLUS CROCEUS, Lamarck, An. s. vert., VI., 1819, p. 192 ; Encyclop. Meth. p. 980, pl. 191, f. 4, 20-50 fath., Holothuria Bank. J. J. Walker (Brit. Museum).

SPONDYLUS EECVEI, Fulton, Conch. Icon., XI., 1856, pl. 12, f. 43 ; Von Martens, Forsch. Gazelle, III., 1889, p. 191. Mermaid Strait. Fulton. Journ. of Conch. XIV., 1915, p. 332.

SPONDYLUS DUCALIS Bolten, var., LAMARCKII, Chenu, Illust., Conch., 1843. *Spondylus*, p. 6, pl. 9, f. 4 ; Brazier, P.L.S., N.S.W., IX., 1884, p. 803, Cossack.

Spondylus hystrix, Bolten, var. ocellatus, Reeve, Conch Icon., XI., 1856, pl. 12, f. 43 ; Brazier, P.L.S., N.S.W., IX., 1884, p. 803. Cossack. Fulton. Journ. of Conch. XIV., 1915, p. 334.

Spondylus wrightianus Crosse, Journ. de Conch., XXI., 1872, p. 253, pl. 9, f. 1. Nicol Bay.

Spondylus violascens, Lamarck, An. s. vert., VI., 1819, p. 193. King George's Sound.

Plicatula imbricata, Menke, Moll. Nov. Holl., 1843, p. 35. W. Australia ; Sowerby, Conch. Icon., XIX., 1873, pl. 1, f. 4.

Family—Limidæ.

Lima linguatula, Lamarck, An. s. vert., 1819, VI., p. 157 ; Quoy & Gaim., Zool. Astrolabe, III., 1835, p. 453, pl. 76, f. 11-12. King George's Sound.

Lima multicostata, Sowerby, Thes. Conch., I., 1843, p. 85, pl. 22, f. 38 ; Von Martens, Forsch. Gazelle, III., 1889, p. 186. Dirk Hartog.

Lima paucicostata, Sowerby, Thes. Conch., I., 1843, p. 85, pl. 21, f. 14. Nicol Bay. (Austr. Mus.)

Lima sowerbyi, Deshayes, Cat. Moll. Reunion, 1863, p. 30 for *L. squamosa*, var., Sowerby, Thes. Conch., I., 1843, p. 84, pl. 21, f. 18 ; Menke, Moll. Nov. Holl., 1843, p. 36. Swan River ; Von Martens, Forsch. Gazelle, III., 1889, p. 186. Dirk Hartog.

Lima lima, Linne.—*Ostrea lima*, Linne, Syst. Nat. X., 1758, p. 699 ; Sowerby, Thes. Conch. I., 1843. Lima pl. I., fig. 1 : Iredale, Proc. Zool. Soc. 1914, p. 666. Monte Bello Is.

Lima fragilis, Chemnitz.—*Pecten fragilis*, Conch. Cab. VII., pl. 68, fig. 650 ; Iredale, Proc. Zool. Soc., 1914, p. 666. Monte Bello Is.

Family—Anomiidæ.

Patro elyros, Gray.—*Anomia elyros*, Gray, Proc. Zool. Soc., 1849 (1850), p. 118, pl. 4, f. 1–2. Depuch Is.

Placuna ephippium, Retzius.—*Placenta ephippium*, Retzius, Diss. Sist. nova test genera, 1788, p. 16 ; *Placuna sella*, Gray, Cat. Placentadæ British Mus., 1850, p. 2. N.W. Australia ; Sowerby, Conch. Icon., XVIII., 1871, pl. 1, f. 1.

Placuna placenta, Linne.—*Anomia placenta*, Linne, Syst. Nat., X., 1758, p. 703 ; Sowerby, Conch. Icon., XVIII., 1871, pl. 3, f. 3. N.W. Australia.

Family—Mytilidæ.

Brachyodontes rosus, Lamarck.—*Mytilus erosus*, Lamarck, An. s. vert., VI., 1819, p. 120 ; *M. magellanicus*, Menke, Moll. Nov. Holl., 1843, p. 37. Rottnest, Carnac, and Garden Islands ; *M. menkeanus*, Philippi, Zeit. f. Malak., IV., 1847, p. 118 ; Reeve, Conch. Icon., X., 1857, pl. 7, f. 26 ; Tate, Trans. Phil. Soc. Adelaide, II., 1879, p. 138. King George's Sound; Verco. Trans. Roy. Soc., S.A., XXXVI., 1912, p. 205. Geraldton.

BRACHYODONTES ROSTRATUS, Dunker.—*Mytilus rostratus*, Dunker, Proc. Zool. Soc., 1856, p. 358; Reeve, Conch. Icon. X., 1857, pl. 5, f. 15. Abrolhos (Aust. Museum).

MYTILUS NITENS, Menke, Zeit. f. Malak., V., 1848, p. 4. W. Australia.

MYTILUS PLANULATUS, Lamarck, An. s. vert., VI., 1819, p. 125. King Georgo's Sound.

MODIOLA ALBICOSTA, Lamarck, An. s. vert., VI., 1819, p. 111; Delessort, Rocueil, 1841, pl. 13, f. 8; Menke, Moll. Nov. Holl., 1843, p. 38. Carnac Is.

MODIOLA ELEGANS, Gray, Spicil. Zool., 1828, p. 7, pl. 6, f. 14; Reeve, Conch. Icon., X., 1857, pl. 5, f. 19; Garden Island. (G. Clifton in Brit. Muscum.)

MODIOLA FLAVIDA, Dunker.—*Volsclla flavida*, Dunker, Proc. Zool. Soc., 1856, p. 364; Reeve, Conch. Icon., X., 1858, pl. 10, f. 77; Tate, Trans. Phil. Soc. Adelaido, II., 1879, p. 138. King George's Sound.

MODIOLA INCONSTANS, Dunker, Proc. Zool. Soc., 1856 (1857), p. 363; *M. semivcstita*, Tate, Trans. Roy. Soc., S.A., IX., 1887, p. 106, pl. 5, f. 16; *M. inconstans*, op. cit., XXI., 1897, p. 49. King George's Sound.

MODIOLA PULEX, Lamarck, An. s. vert., VI., 1819, p. 112. King George's Sound; Hedley, P.L.S., N.S.W., XXXVIII., 1913, p. 265, op. cit., XXXIX., 1914, pl. 79, f. 24.

MODIOLA PHILIPPIANA, Menke, Zeit. f. malak., V., 1848, p. 4; *M. sulcata*, Monke, Moll. Nov. Holl., 1843, p. 38. Carnac Is.

MODIOLA PHILIPPINARUM, Hanley, Proc. Zool., Soc., 1844, p. 15; Iredale, Proc. Zool. Soc., 1914, p. 667. Monte Bello Is.

LITHOPHAGA CINNAMOMEA, Lamarck.—*Modiola cinnamomea*, Lamarck, An. s. vert., VI., 1819, p. 114; Reeve, Conch. Icon., X., 1858, pl. 1, f. 5; Brazier, P.L.S., N.S.W., IX., 1884, p. 802. Cossack.

LITHOPHAGA DACTYLUS, Sowerby.—Menke's record, Moll. Nov. Holl., 1843, p. 38, of this from W. Australia was apparently an error of identification.

LITHOPHAGA GRACILIS, Philippi.—*Modiola gracilis*, Philippi, Zeit. f. malak., 1847, p. 117, and Abbild. Besch., III., 1847, p. 19, pl. 2, f. 1; Brazier, P.L.S., N.S.W., IX., 1884, p. 802. Cossack.

MUSCULUS PAULUCCIÆ, Crosse.—*Crenella paulucciæ*, Crosse, Journ. de Conch., XI., 1863, p. 89, pl. 1, f. 8; Verco, Trans. Roy. Soe., S.A., XXXVI., 1912, p. 205. Geraldton.

MUSCULUS CUMINGIANA, Reevo.—*Modiola cumingiana*, Reeve, Conch. Icon., X., 1857, pl. 9, f. 63; Smith, Chall. Exped., Zool. XIII., 1885, p. 278. Swan River.

SEPTIFER BILOCULARIS, Linne.—*Mytilus bilocularis*, Linne, Syst. Nat., X., 1758, p. 705; Reeve, Conch. Icon., X., 1857, pl. 9, f. 42; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 205. Geraldton.

ORDER—ANOMALODESMACEA.

Family—Anatinidæ.

LATERNULA ANATINUS, Linne.—*Solen anatinus*, Linne, Syst. Nat., X., 1758, p. 673 ; *Anatina subrostrata*, Reeve, Conch. Icon., XIV., 1863, pl. 1, f. 6 ; Menke, Zeit. f. malak., 1., 1844, p. 64. W.A,

LATERNULA IMPERFECTA, Lamarck, An. s. vert., V., 1818. p. 464. Shark Bay.

Family—Thraciidæ.

THRACIA ALCIOPE, Angas, Proc. Zool. Soc., 1872, p. 611, pl. 42, f. 6. Sharks Bay.

Family—Clavagellidæ.

BRECHITES AUSTRALIS, Chenu.—*Aspergillium australis*, Chenu, Conch. Illustr., 1842, pl. 3, f. 4 ; *Warnea australis*, Gray, Proc. Zool. Soc., 1858, p. 316. Swan River.

BRECHITES AGGLUTINANS, Lamarck.—*Aspergillum agglutinans*, Lamarck, An. s. vert. V., 1818, p. 430 ; Chenu, Conch. Illustr., 1842, pl. 3, f. 2; *Foegia agglutinans*, Gray, Proc. Zool. Soc., 1858, p. 313. Swan River.

ORDER—TELEODESMACEA.

Family—Pleurophoridæ.

TRAPEZIUM ANGULATUM, Lamarck.—*Cypricardia angulata*, Lamarck, An. s. vert., VI., 1819, p. 28. Sharks Bay ; Deshayes, Trait. elem. Conchyl., II., p. 18, pl. 24, f. 10–11.

Family—Crassatellitidæ.

CRASSATELLITES KINGICOLA, Lamarck.—*Crassatella kingicola*, Lamarck, Ann. du Mus., V., 1804, p. 408 ; Delessert, Recueil, 1841, pl. 9, f. 1 ; Menke, Moll. Nov. Holl., 1843, p. 39. Woodman's Point ; *C. decipiens*, Brazier, P.L.S., N.S.W., IX., 1884, p. 802. Cossack.

Family—Sphæridæ.

PISIDIUM SEMEN, Menke, Moll. Nov. Holl., 1843, p. 40. Swan River ; Menke, Zeit. f. malak., I., 1844, p. 63.

Family—Carditidæ.

CARDITA AVICULINA, Lamarck, An. s. vert., VI., 1819, p. 26. Sharks Bay ; Delessert, Recueil, 1841, pl. 11, f. 10.

CARDITA CRASSICOSTA, Lamarck, An. s. vert., VI., 1819, p. 24 ; Reeve, Conch. Icon., I., 1843, pl. 2, f. 7 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 205. Geraldton.

CARDITA INCRASSATA, Sowerby, App. Tankerville Cat., 1825, p.v. ; *C. preissci*, Reeve, Conch. Icon., I., 1843, pl. 8, f. 39 ; Verco, Trans. Roy. Soc. S.A., 1912, p. 205. Geraldton ; Iredale, Proc. Zool. Soc., 1914, p. 666. Monte Bello Is.

CARDITA NODULOSA, Lamarck, An. s. vert., VI., 1819, p. 25, Sharks Bay ; Delessert, Recueil, 1841, pl. 11, f. 8.

CARDITA SEMIORBICULATA, Linne.—*Chama semiorbiculata*, Linne, syst. Nat., X., 1758, p. 691 ; Reeve, Conch. Icon., I., 1843, pl. III., f. 10 ; Lamarck, An. s. vert., VI., 1819, p. 24. Nouvelle Hollande.

CARDITA SOWERBYI, Deshayes, Proc. Zool. Soc., 1852 (1854), p. 103. Swan River.

Family—Chamidæ.

CHAMA AERUGINOSA, Lamarck, An. s. vert., VI., 1819, p. 95, Sharks Bay ; Von Martens, Forsch. Gazelle, III., 1889, p. 191. Mermaid Strait.

CHAMA ASPERELLA, Lamarck.—Lamarck (An. s. vert., VI., 1819, p. 95) described this as from Sharks Bay, but Deshayes (op. cit., 2nd ed., VI., 1835, p. 584) notes that it is really from the Mediterranean.

CHAMA FIMBRIATA, Reeve, Conch. Icon., IV., 1847, pl. 8, f. 41, Point Cunningham ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 205. Geraldton.

CHAMA LIMBULA, Lamarck, An. s. vert., VI., 1819, p. 95 ; Menke, Moll. Nov. Holl., 1843, p. 39. N.W. Australia.

CHAMA SPINOSA, Broderip, Trans. Zool. Soc., I., 1835, p. 306, pl. 38, f. 8–9 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 205. Geraldton.

CHAMA SPONDYLODES, Menke, Moll. Nov. Holl., 1843, p.39. N.W. Australia.

Family—Lucinidæ.

CODAKIA INTERRUPTA, Lamarck.—*Cytherea interrupta*, Lamarck, An. s. vert., V., 1818, p. 574 ; *Lucina interrupta*, Reeve, Conch. Icon. VI., 1850, pl. 2, f.5. ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 205. Geraldton.

DIVARICELLA ANGULIFERA, von Martens, Fauna Mauritius 1880, p. 321, pl. 22, f. 14. Cottesloe (A. U. Henn).

LORIPES TATEI, Angas.—*Lucina tatei*, Angas., Proc. Zool. Soc., 1878, p. 863, pl. 54, f. 15 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 205. Geraldton.

LORIPES ICTERICA, Reeve.—*Lucina icterica*, Reeve, Conch. Icon., VI., 1850, pl. 10, f. 60 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 205. Geraldton.

LORIPES LACTEOLA, Tate.—*Lucina lacteola*, Tate, Trans. Roy. Soc., S.A., XXI., 1897, p. 48 ; *L. lactea*, A. Adams (not Lamarck), Proc. Zool. Soc., 1855 (1856), p. 225, Swan River ; *L. concentrica*, Adams and Angas (not Lamarck), Proc. Zool. Soc., 1863, p. 426, pl. 37, f. 19.

LORIPES PEROBLIQUA, Tate.—*Lucina perobliqua*, Tate, Trans. Roy. Soc., S.A., XV., 1892, p. 128, pl. 1, f. 10. Irwin River (Austr. Mus.).

Thyasira globosa, Forskal.—*Venus globosa*, Forskal, Descrip. Anim., 1775, p. 122 ; Chemnitz, Conch. Cab., VII., 1784, p. 36, pl. 40, f. 431–6 ; Lynge, Lamell. Danish Exped., Siam., 1909, p. 175 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 205. Geraldton.

Family—Corbidæ.

Corbis sowerbii, Reeve, Proc. Zool. Soc., 1841 (1842), p. 85, and Conch. Icon., XVIII., 1872, pl. 1, f. 2 ; Brazier, P.L.S.N.S.W., IX., 1884, p. 801. Cossack.

Family—Cryptodontidæ.

Cryptodon globularis, Lamarck.—*Lucina globularis*, Lamarck, An. s. vert., V., 1818, p. 544, King George's Sound ; Hanley, Cat. Recent Shells, 1843, p. 77, pl. 14, f. 16.

Lasaea australis, Lamarck.—*Cyclas australis*, Lamarck, An. s. vert., V., 1818, p. 560 ; Lamy, Bull. Mus. Hist. Nat., 1913, p. 466 ; *L. scalaris*, Philippi, Zeit. f. Malak., IV., 1847, p. 72 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 205, Geraldton ; *L. rubra*, Tate, Trans. Phil. Soc., Adelaide, II., 1879, p. 138, King George's Sound.

Rochefortia donaciformis, Angas.—*Mysella donaciformis*, Angas, Proc. Zool. Soc., 1878, p. 863, pl. 54, f. 13 ; Tate, Trans. Phil. Soc., Adelaide, II., 1879, p. 138, King George's Sound ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 205, Geraldton.

Kellya suborbicularis, Montagu.—*Mya suborbicularis*, Montagu, Test. Brit., 1804, p. 39, pl. 26, f. 6 ; *Amphidesma physoides*, Lamarck, An. s. vert., V., 1818, p. 493. King George's Sound.

Mylitta deshayesii, D'Orbigny & Recluz, Journ. de Conch., I., 1850, p. 292, pl. 11, f. 12–14 ; Brazier, P.L.S.N.S.W., (2), VIII., 1894, p. 434. Cape Riche, King George's Sound.

Family—Cardiidæ.

Cardium cygnorum, Deshayes, Proc. Zool. Soc., 1854 (1855), p. 331. Swan River.

Cardium elongatum, Bruguiere, Ency. Meth., Vers., I., 1789, p. 228 ; Reeve, Conch. Icon., II., 1844, pl. 9, f. 46 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 205. Geraldton.

Cardium erugatum, Tate, Trans. Roy. Soc., S.A., XI., 1889, p. 62, pl. 11, f. 6 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 205. Geraldton.

Cardium exasperatum, Sowerby, Proc. Zool. Soc., 1840 (1841), p. 106 ; Conch. Illust., f. 37. Swan River.

Cardium flavum, Linne, Syst. Nat., X., 1758, p. 680 ; *C. angulatum*, Menke, Moll. Nov. Holl., 1843, p. 40, W.A. ; *C. vertebratum*, Jonas, Zeit. f. Malak., I., 1844, p. 33, W.A. ; *C. dupuchense*, Reeve, Conch. Icon., II., 1845, pl. 14, f. 67, Depuch Isl. ; Iredale, Proc. Zool. Soc., 1914, p. 666, Monte Bello Isl.

Cardium foveolatum, Sowerby, Proc. Zool. Soc., 1840 (1841), p. 111 ; Conch. Illust., f. 65. Swan River.

Cardium imbricatum, Sowerby, Proc. Zool. Soc., 1840 (1841), p. 110 ; Conch. Illust., f. 48. Swan River.

Cardium minutum, Lamarck, An. s. vert., VI., 1819, p. 14. King George's Sound.

Cardium rugatum, Reeve, Conch. Icon., II., 1844, pl. 12, f. 63. Monte Bello Islands ; T. H. Haynes (Brit. Mus.).

Cardium tenuicostatum, Lamarck, An. s. vert., VI., 1819, p. 5 ; Delessert, Recueil, 1841, pl. 11, f. 6 ; Menke, Moll. Nov. Holl., 1843, p. 39. W. Australia.

Cardium tumoriferum, Lamarck, An. s. vert., VI., 1819, p. 15, Sharks Bay ; Delessert, Recueil, 1841, pl. 11, f. 7.

Cardium unedo, Linne, Syst. Nat., X., 1758, p. 680 ; Menke, Moll. Nov. Holl., 1843, p. 40, W. Australia ; Reeve, Conch. Icon., II., 1844, pl. 2, f. 13 ; Iredale, Proc. Zool. Soc., 1914, p. 666. Monte Bello Is.

Family—Tridacnidæ.

Tridacna elongata, Lamarck, An. s. vert., VI., 1819, p. 106 ; Menke, Moll. Nov. Holl., 1843, p. 39 ; Reeve, Conch. Icon., XIV., 1862, pl. 2, f. 2 ; Iredale, Proc. Zool. Soc., 1914, p. 666, Monte Bello Is.

Hippopus hippopus, Linne.—*Chama hippopus*, Linne, Syst. Nat., X., 1758, p. 691 ; *H. maculatus*, Menke, Moll. Nov. Holl., 1843, p. 39, N.W. Australia ; Reeve, Conch. Icon., XIV., 1862, pl. 1.

Family—Veneridæ.

Dosinia bruguieri, Gray, Analyst, VIII., 1838, p. 309 ; *Artemis prostrata*, Reeve, Conch. Icon., VI., 1850, pl. 4., f. 23. Swan River.

Dosinia contusa, Reeve.—*Artemis contusa*, Reeve, Conch. Icon., VI., 1850, pl. 7, f. 38, Point Cunningham ; Brazier, P.L.S.N.S.W., IX., 1884, p. 801, Cossack.

Dosinia lucinalis, Lamarck.—*Cytherea lucinalis*, Lamarck, An. s. vert, V., 1818, p. 572 ; Delessert, Recueil, 1841, pl. 9, f. 2 ; Jukes Browne, Proc. Malac. Soc., X., 1912, p. 214, Monte Bello Islands.

Dosinia scalaris, Menke.—*Cytherea scalaris*, Menke, Moll. Nov. Holl., 1843, p. 42, N.W. Australia ; *Artemis scalaris*, Reeve, Conch. Icon., VI., 1850, pl. 2, f. 11, Swan River ; Brazier, P.L.S.N.S.W., IX., 1884, p. 801. Cossack.

Sunetta excavata, Hanley.—*Cytherea excavata*, Hanley, Proc. Zool. Soc., 1842, p. 123 ; *C. vaginalis*, Menke, Moll. Nov. Holl., 1843, p. 42. W. Australia ; Philippi, Abbild. Besch., II., 1846, p. 96, pl. 3, f. 2.

Gafrarium angasi, Smith.—*Circe angasi*, Smith, Chall. Zool., XIII., 1885, p. 184, pl. 2, f. 4; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 205. Geraldton.

Gafrarium australe, Sowerby.—*Circe australis,* Sowerby Thes. Conch., II., 1851, p. 651, pl. 137, f. 16–17 ; Verco, Trans Roy. Soc., S.A., XXXVI., 1912, p. 205. Geraldton.

Gafrarium cuneatum, Lamarck.—*Cytherea cuneata,* Lamarck An. s. vert., V., 1818, p. 578, King George's Sound ; Romer Mon. Venus, 1869, p. 180, pl. 48, f. 3.

Gafrarium elegans, Philippi.—*Cytherea elegans,* Philippi Abbild. Besch., I., 1844, p. 150, pl. 1, f. 4. Swan River.

Gafrarium gibbium, Lamarck.—*Cytherea gibbia,* Lamarck An. s. vert., V., 1818, p. 577 ; Encycl. Meth., Vers, pl. 271, f. 4 Menke, Moll. Nov. Holl., 1843, p. 42. W. Australia.

Gafrarium gibbium, var. ranella, Lamarck.—*Cytherea ranella,* Lamarck, An. s. vert., V., 1818, p. 578 ; Encycl. Meth. Vers, pl. 271, f. 5 ; Menke, Moll. Nov. Holl., 1843, p. 42. W. Australia.

Gafrarium impar, Lamarck.—*Cytherea impar,* Lamarck, An. s. vert., V., 1818, p. 565 ; Deshayes, Cat. Conchif. Brit. Mus., 1853 p. 55. Swan River ; *Dione impar,* Reeve, Conch. Icon., XIV., 1863, pl. 2, f. 6 and 8 ; Brazier, P.L.S., N.S.W., IX., 1884, p. 800 Cossack.

Gafrarium nummulina, Lamarck.—*Cytherea nummulina* Lamarck, An. s. vert., V., 1818, p. 576. King George's Sound ; *Circe nummulina,* Reeve, Conch. Icon., XIV., 1863, pl. 6, f. 25.

Gafrarium rivulare, Born.—*Venus rivularis,* Born, Index Mus. Caes., 1778, p. 59, and Test. Mus. Caes., 1780, p. 72, pl. 5, f. 7 ; *Cytherea rivularis,* Menke, Moll. Nov. Holl., 1843, p. 42. W. Australia.

Gafrarium undatinum, Lamarck.—*Cytherea undatina,* Lamarck, An. s. vert., V., 1818, p. 575 ; Menke, Moll. Nov. Holl., 1843 , p. 42. W. Australia ; *Circe undatina,* Sowerby, Thes. Conch., II., 1851, p. 651, pl. 138, f. 22–26.

Lioconcha castrensis, Linne.—*Venus castrensis,* Linne, Syst. Nat., X., 1758, p. 687 ; Sowerby, Thes. Conch., II., 1851, p. 642, pl. 134, f. 151–4 ; von Martens, Forsch. Gazelle, III., 1889, p. 185, 40–50 fth. Dirk Hartog Is.

Marcia peronii, Lamarck.—*Venus peronii,* Lamarck, A. s. vert., V., 1818, p. 606 ; Menke, Moll. Nov. Holl., 1843, p. 44. W. Australia ; Pfeiffer, Conch. Cab., XI., 1869, p. 213, pl. 34, f. 11–18.

Macrocallista planatella, Lamarck.—*Cytherea planatella,* Lamarck, An. s. vert., V., 1818, p. 565 ; *C. costata,* Roemer, Mon. Venus, 1869, pl. 18, f. 3. W. Australia ; Hedley, P.L.S., N.S.W., 1913, XXXVIII., p. 270.

Paphia alba, Deshayes.—*Tapes alba,* Deshayes, Proc. Zool. Soc., 1853 (1854), p. 9. Swan River ; Reeve, Conch. Icon., XIV., 1864, pl. 4, f. 14.

Paphia crassisulca, Lamarck.—*Venus crassisulca,* Lamarck, An. s. vert., V., 1818, p. 594. Sharks Bay.

PAPHIA GALACTITES, Lamarck.—*Venus galactites*, Lamarck, An. s. vert., V., 1818, p. 599. King George's Sound ; *Tapes galactites*, Sowerby, Thes. Conch., II., 1852, p. 695, pl. 151, f. 132.

PAPHIA LITERATA, Linne.—*Venus literata*, Syst. Nat., X., 1758, p. 689 ; *Tapes lineata*, Romer, Monog. Venus, 1870, p. 38, pl. 12, f. 1. Iredale, Proc. Zool. Soc. 1914, p. 666. Monte Bello Is.

PAPHIA ROTUNDATA, Linne.—*Venus rotundata*, Linne, Syst. Nat., X., 1758, p. 690 ; *Venus papilionacea*, Menke, Moll. Nov. Holl., 1843, p. 44. W. Australia ; *Tapes rotundata*, Reeve, Conch. Icon., XIV., 1864, pl. 2, f. 7.

PAPHIA TEXTILE, Gnelin.—*Venus textile*, Gmelin, Syst. Nat., XIII., 1791, p. 3280 ; Menke, Moll. Nov. Holl., 1843, p. 44. W. Australia ; Sowerby, Thes. Conch., II., 1852, p. 681, pl. 148, f. 26-28.

PAPHIA TURGIDA, Lamarck.—*Venus turgida*, Lamarck, An. s. vert., V., 1818, p. 595, and *V. ovulaea*, op. cit., p. 601. King George's Sound ; Sowerby, Thes. Conch., II., 1852, p. 684, pl. 147, f. 53–54.

ANTIGONA CHEMNITZII, Hanley.—*Venus chemnitzii*, Hanley, Proc. Zool. Soc., 1844, p. 160 ; Reeve, Conch. Icon., XIV., 1863, pl. 10, f. 32. N.W. Australia (Austr. Museum).

ANTIGONA GRAVESCENS, Menke.—*Venus gravescens*, Menke, Moll. Nov. Holl., 1843, p. 43. W. Australia ; Philippi, Abbild. Besch., II., 1846, p. 107, pl. 5, f. 2.

ANTIGONA LAMELLARIS, Schumacher.—*Alamellaris*, Schumacher, Essai, 1817, p. 155, pl. 14, f. 1 ; Brazier, P.L.S., N.S.W., IX., 1884, p. 799. Cossack.

ANTIGONA LAQUEATA, Sowerby.—*Venus laqueata*, Sowerby, Thes., Conch., II., 1853, p. 706, pl. 153, f. 15. Swan River ; Von Martens, Forsch. Gazelle, III., 1889, p. 186. Dirk Hartog.

ANTIGONA TIARA, Dillwyn. *Venus tiara*, Dillwyn, Descrip. Cat., I., 1817, p. 162 ; Reeve, Conch. Icon., XIV., 1863, pl. 23, f. 109 ; Brazier, P.L.S.N.W.W., IX., 1884, p. 799. Cossack ; Iredale, Proc. Zool. Soc., 1914, p. 666. Monte Bello Is.

ANTIGONA TOREUMA, Gould.—*Venus toreuma*, Gould, Proc. Bost, Soc. Nat. Hist. Soc., III., 1850, p. 277, and Wilkes Am. Expl. Exped., p. 419, pl. 37, f. 537 ; von Martens, Forsch. Gazelle, III., 1889, p. 186, 50 fath. Mermaid Strait.

CHIONE GALLINULA, Lamarck.—*Venus gallinula*, Lamarck, An. s. vert., V., 1818, p. 592 ; *Venus coelata*, Menke, Moll. Nov. Holl., 1843, p. 43. W. Australia ; Philippi, Abbild. Beschr., II., 1846, p. 108, pl. V., f. 3.

CHIONE LAGOPUS, Lamarck.—*Venus lagopus*, Lamarck, An. s. vert., V., 1818, p. 591. King George's Sound ; *V. australis*, Sowerby, Thes. Conch. II., 1853, p. 719, pl. 157, f. 111–112. Swan River.

CHIONE MARICA, Linne. *Venus marica*, Linne, Syst. Nat., X., 1758, p. 685 ; Reeve, Conch. Icon., XIV., 1863, pl. 22, f. 104 ; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 205. Geraldton.

Chione mitis, Deshayes, Cat. Conchif. Brit. Mus., 1853, p. 143. Swan River; Reeve, Conch. Icon., XIV., 1864, pl. 25, f. 127.

Chione striatissima, Sowerby.—*Erycina cardioides*, Lamarck, An. s. vert., V., 1818, p. 486. King George's Sound; *Venus striatissima*, Sowerby, Thes. Conch. II., 1853, p. 718, pl. 157, f. 103-5.

Salacia paucilamellata, Dunker.—*Mercenaria paucil.amellata*, Dunker, Novit. Conch., 1858, p. 52, pl. 16, f. 10–12; *Venus alatus*, Reeve, Conch. Icon., XIV., 1863, pl. 18, f. 83. Swan River.

Gomphina undulosa, Lamarck.—*Venus undulosa*, Lamarck, An. s. vert., V., 1818, p. 606. Shark Bay and King George's Sound; Reeve, Conch. Icon., XIV., 1864, pl. 25, f. 126. Swan River; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 205, Geraldton.

Venus zealandica, Quoy & Gaimard.—This is erroneously reported from King George's Sound by Q. & G., Zool. Astrolabe, III., 1835, p. 522, pl. 84, f. 5–6.

Venus anomala, Lamarck.—This is erroneously reported from Shark Bay by Lamarck, An. s. vert., V., 1818, p. 599.

Pitaria citrina, Lamarck.—*Cytherea citrina*, Lamarck, An. s. vert., V., 1818, p. 567; *Dione ustulata*, Reeve, Conch. Icon., XIV., 1863, pl. XI., f. 49. Swan River.

Venerupis carditoides, Lamarck, An. s. vert., V., 1818, p. 508; Delessert, Recueil, 1841, pl. 5, f. 3. Swan River (Capt. Mangles in Brit. Mus.).

Venerupis interjecta, Deshayes, Brit. Mus. Cat. Conchif., 1853, p. 196. Swan River; Sowerby, Thes. Conch., II., 1854, p. 767, pl. 164, f. 14.

Venerupis planicosta, Deshayes, Proc. Zool. Soc., 1853 (1854), p. 4. Swan River; Hedley, P.L.S.N.S.W., XXXVIII., 1913, p. 271, pl. 16, f. 25–6.

Venerupis rugosa, Sowerby, Thes. Conch., II., 1854, p. 768, pl. 165, f. 25. Swan River.

Petricola lapicida, Gmelin.—*Venus lapicida*, Gmelin, Syst., Nat., XIII., 1791, p. 3260; Sowerby, Conch. Thes., II., 1854, p. 776, pl. 166, f. 26; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 205. Geraldton; *Petricola lucinalis*, Lamarck, An. s. vert., V., 1818, p. 504. King George's Sound.

Family—Tellinidæ.

Tellina albinella, Lamarck, An. s. vert., V., 1818, p. 254; Roemer, Monog. Tellina., 1872, p. 112, pl. 27, f. 1–4; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 205. Geraldton.

Tellina chloroleuca, Lamarck, An. s. vert., V., 1818, p. 524; Menke, Moll. Nov. Holl., 1843, p. 41. W. Australia; Sowerby, Conch. Icon., XVII., 1866, pl. 12, f. 54.

Tellina jubar, Hanley, Thes. Conch., I., 1846, p. 229, pl. 63, f. 214; Bertin, Nouv. Arch. Mus., (2), I., 1878, p. 232. Sharks Bay.

Tellina margaritina, Lamarck, An. s. vert., V., 1818, p. 525. King George's Sound ; Delessert, Recueil, 1841, pl. 6, f. 4.

Tellina perna, Spengler, Skrift. nat. Selsk. Kiob., IV., 1798, p. 79 ; Hanley, Thes. Conch., I., 1846, p. 236, pl. 63, f. 202, 217, 219 ; Bertin, Nouv. Arch. Mus., (2), I., 1878, p. 232. Shark's Bay ; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 205. Geraldton ; Monte Bello Isl. (T. Haynes in Brit. Mus.).

Tellina sowerbii, Hanley, Proc. Zool. Soc.,, 1844, p. 62 ; Sowerby, Conch. Icon., XVII., 1867, pl. 40, f. 228. Swan River (Capt. Mangles in Brit. Museum).

Tellina virgata, Linne, Syst. Nat., X., 1758, p. 674 ; Hanley, Thes. Conch., I., 1846, p. 228, pl. 63, f. 212. Swan River (Brit. Museum).

Arcopagia remies, Linne.—*Tellina remies*, Linne, Syst. Nat., X., 1758, p. 678 ; Hanley, Thes. Conch., I., 1846, p. 258, pl. 64, f. 226 ; *T. sulcata*, Lamarck, An. s. vert., V., 1818, p. 528. Sharks Bay.

Arcopagia linguafelis, Linne.—*Tellina linguafelis*, Linne, Syst. Nat., X., 1758, p. 674 ; Menke, Moll. Nov. Holl., 1843, p. 41. W. Australia ; Hanley, Thes. Conch., I., 1846, p. 266, pl. 64, f. 236.

Arcopagia Victoriæ Gatliff and Gabriel, Vict., Nat., XXXI., 1914, p. 83 ; *Tellina decussata* Bertin, Nouv. Arch, Mus. (2), I., 1878, p. 265, King George Sound ; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 205, Geraldton.

Family—Psammobiidæ.

Gari alba, Lamarck, An. s. vert., V. 1818, p. 514, King George's Sound ; Dautsenberg and Fischer, Journ. of Conch. LXI., 1914, p. 218, pl. VI., fig. 8, 9, 10, 11. *Soletellina hedleyi*, Sowerby Proc. Malac. Soc. VII., 1907, p. 302, pl. XXV. fig. 12.

Gari biradiata, Wood.—*Solen biradiata*, Wood, Gen. Conch., 1815, p. 135, pl. 33, f. 1 ; *P. flavicans* Lamarck, An. s. vert., V., 1818, p. 514. King George's Sound.

Gari ecolorata, Preston, Proc. Malac. Soc. XI., 1914, p. 18, text fig. Monte Bello Is.

Gari fragilis, Lamarck. An. s. vert., V., 1818, p. 515. Sharks Bay ; Delessert, Recueil, 1841, pl. 5, f. 8.

Soletellina haynesi, Preston, Proc. Malac. Soc., XI., 1914, p. 18, text fig. Monte Bello Is.

Family Donacidæ.

Donax australis, Lamarck, An. s. vert., V., 1818, p. 548 ; Bertin, Nouv. Archiv., (2), IV., 1881, p. 114. King George's Sound ; *D. bicolor*, Sowerby, Thes. Conch., III., 1866, p. 311, pl. 283, f. 102–103.

Donax brazieri, Smith, Proc. Zool. Soc., 1891, p. 491, pl. 40, f. 10 ; Verco. Trans. Roy. Soc. S.A., XXXVI., 1912, p. 205. Geraldton.

Donax columbella, Lamarck, An. s. vert., V., 1818, p. 547. King George's Sound ; Delessert, Recueil, 1841, pl. 6, f. 11 ; *D. sulcarius*, Menke, Moll. Nov. Holl. 1843, p. 40. W. Australia ; *D. splendens*, Dunker, Novit. Conch., 1865, p. 79, pl. 27, f. 5–7. Swan River ; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 205. Geraldton.

Donax deltoides, Lamarck, An. s. vert., V., 1818, p. 547 ; Sowerby, Thes. Conch., II., 1866, p. 310, pl. 283, f. 100–101 ; Bertin, Nouv. Arch. Mus., (2), IV., 1881, p. 115. Swan River ; *D. epidermia*, Tate, Trans. Roy. Soc. S.A., IX., 1887, p. 86. King George's Sound.

Donax elongatus, Lamarck, An. s. vert., V., 1818, p. 550 ; Bertin, Nouv. Arch. Mus. (2), IV., 1881, p. 84. King George's Sound.

Donax faba, Gmelin, Syst. Nat., XIII., 1791, p. 3264; Sowerby, Thes. Conch., III., 1866, p. 312, pl. 283, f. 108–109. Swan River (Brit. Museum).

Donax lineolatus, Bory St. Vincent, Encycl. Meth., 1824, pl. 262, f. 8 ; Menke, Moll. Nov. Holl., 1843, p. 40. W. Australia.

Donax ringens, Lamarck.—This record by Menke, Moll. Nov. Holl., 1843, p. 40, from W. Australia of an African Shell is considered an error by Von Martens. Jahr. deut. Malak. Gessell., I., 1874, p. 143.

Donax triqueter, Lamarck, An. s. vert., V., 1818, p. 549. King George's Sound ; Deshayes, An. s. vert., (2), VI., 1835, p. 243 footnote—considered this to be a young *Cytherea corbicula*.

Family—Solenidæ.

Solen timorensis, Reeve, Conch. Icon., XIX., 1874, pl. 6, f. 27 ; Brazier, P.L.S.N.S.W., IX., 1884, p. 798. Cossack.

Family—Mactridæ.

Mactra abbreviata, Lamarck, An. s. vert., V., 1818, p. 477 ; Menke, Moll. Nov. Holl., 1843, p. 45. W. Australia ; Smith, Proc. Malac. Soc. XI., 1914, p. 137.

Mactra australis, Lamarck, An. s. vert., V., 1818, p. 475. King George's Sound ; *M. polita*, Reeve, Conch. Icon., VIII., 1854, pl. 10, f. 39. Swan River.

Mactra cumingi, Reeve, Conch. Icon., VIII., April, 1854, pl. 6, f. 24 ; *M. cuvieri*, Deshayes, Proc. Zool. Soc., 1853 (July, 1854), p. 17. Swan River (Brit. Museum).

Mactra decussata, Menke, Moll. Nov. Holl., 1843, p. 46, W. Australia.

Mactra explanata, Reeve, Conch. Icon., VIII., 1854, pl. 14, f. 70. Swan River.

Mactra incarnata, Reeve, Conch. Icon., VIII., 1854, pl. 13, f. 61. Swan River.

Mactra rufescens, Lamarck, An. s. vert., V., 1818, p. 476. Sharks Bay ; *M. rugifera*, Dunker, Novit. Conch., 1862, p. 41, pl. 13, f. 1–3. Swan River.

Mactra trigonella, Lamarck, An. s. vert., V., 1818, p. 479, and Encycl. Meth., pl. 259, f. 2. Sharks Bay.

Mactra pura, Reeve, Conch. Icon., VIII., 1854, pl. XII., f. 53 ; Smith, Proc. Malac. Soc. XI., 1914, p. 147. Swan River, Eucla.

Mactra helvacea, Chemnitz, Menke-Moll. Nov. Holl., 1843, p. 45—erroneously ascribes this European species to W. Australia.

Lutraria rhynchaena, Jonas, Zeit, f. malak., I., 1844, p. 34 ; Reeve, Conch. Icon., VIII., 1854, pl. 3, f. 10. Swan River.

Family—Mesodesmatidæ.

Amphidesma cornea, Lamarck.—*Amphidesma corneum*, Lamarck An. s. vert., V., 1818, p. 491 ; Delessert, Recueil, 1841, pl. 4, f. 5 ; Menke, Moll. Nov. Holl., 1843, p. 45. W. Australia.

Amphidesma heterodon, Reeve, Mesodesma heterodon, Conch. Icon., VIII., 1854, pl. 2, f. 13. N.W. Australia.

Amphidesma lanceolata, Reeve, Mesodesma lanceolata, Conch. Icon., VIII., 1854, pl. 4, f. 25. N.W. Australia.

Amphidesma nitida, Reeve, Mesodesma nitida, Conch. Icon., VIII., 1854, pl. 1, f. 6. Swan River.

Amphidesma præcisa, Reeve, Mesodesma præcisa, Conch. Icon., VIII., 1854, pl. 4, f. 31 ; Tate, Trans. Phil. Soc., Adelaide, II., 1879, p. 138. King George's Sound.

Family—Corbulidæ.

Corbula crassa, Hinds, Proc. Zool. Soc., 1843, p. 55 ; Hinds, Zool. Sulphur Moll., 1845, p. 67, pl. 20, f. 13 ; Brazier, P.L.S.N.S.W., IX., 1884, p. 799. Cossack.

Corbula semen, Lamarck, An. s. vert., V., 1818, p. 497. King George's Sound.

Corbula thecoida, Jonas, Zeit, f. malak., 1844, p. 185. W. Australia.

Family—Saxicavidæ.

Saxicava australis, Lamarck.—*Corbula australis*, Lamarck, An. s. vert., V., 1818, p. 495 ; Blainville, Malac., pl. 78, f. 3 ; Brazier, P.L.S.N.S.W., IX., 1884, p. 799. Cossack.

Family—Pholadidæ.

Martesia australis, Gray, Ann. Mag. Nat. Hist., (2), VIII., 1851, p. 384. N.W. Australia.

Martesia multistriata, Sowerby.—*Pholas multistriata*, Sowerby, Thes. Conch., II., 1849, p. 494, pl. 104, f. 35–36. Turtle Island.

Martesia obtecta, Sowerby.—*Pholas obtecta*, Sowerby, Thes. Conch., II., 1849, p. 496, pl. 108, f. 80–81. Turtle Island.

Pholas australasiæ, Sowerby, Thes. Conch. II., 1849, p. 488, pl. 106, f. 73 ; Verco. Trans. Roy. Soc., S.A., XXXVI., 1912, p. 205. Geraldton.

Family—Teredinidæ.

Nausitoria saulii, Wright.—*Calobates saulii,* Wright, Trans. Linn. Soc., XXV., 1865, p. 567, pl. 65, f. 9–15; Hedley, Proc. Linn. Soc., N.S. Wales, XXIII., 1898, p. 94, f. 7–9. Fremantle (Prof. Dakin).

Nausitoria thoracites, Gould.—*Calobates thoracites,* Gould, Proc. Bost. Soc. Nat. Hist. VII., 1856, p. 15; *C. australis,* Wright, Trans. Linn. Soc., XXV., 1866, p. 564, pl. 64, f. 1–5. Fremantle.

CLASS—CEPHALOPODA.

Order—Tetrabranchiata.

Family—Nautilidæ.

Nautilus pompilius, Linne, Syst. Nat., X., 1758, p. 708; Woodward's Manual, 1866, Frontispiece. Menke, Moll. Nov. Holl. 1843, p. 5. Port Leschenault.

Order—Dibranchiata.

Family—Spirulidæ.

Spirula spirula, Linne.—*Nautilus spirula,* Linne, Syst. Nat. XII., 1767, p. 1163; Woodward's Manual, 1866, pl. 1, f. 9; Verco. Trans. Roy. Soc., S.A., XXXVI., 1912, p. 202, Geraldton.

Family Sepiidæ.

Sepiadarium auritum, Robson, Proc. Zool. Soc., 1914, p. 678, text fig. 1. Monte Bello Is.

Sepia braggi, Verco, Trans. Roy. Soc., S.A., XXXI., 1907, p. 213, pl. 27, f. 6; S. sp. Meyer. Faun. Sudwest. Austr. II., 1909, p. 335, f. 11. Cockburn Sound.

Sepia galei, Meyer, Faun. Sudwest. Austr. II., 1909, p. 332, f. 4, 5, 6. Sharks Bay, Dirk Hartog.

Sepia irvingi, Meyer, Faun. Sudwest. Austr., II., 1909, p. 333, f. 7–10. Cockburn Sound.

Sepia indica, D'Orbigny, Ceph. Acet., 1839, p. 288, pl. 21; Brazier, Cat. Austr. Ceph., 1892, p. 12. W. Australia.

Sepia latimanus, Quoy and Gaim., Zool. Astrolabe, II., 1832, p. 68, pl. 2, f. 2; Meyer Faun. Sudwest. Austr., II., 1909, p. 331. Sharks Bay.

Sepia rostrata, D'Orbigny, Acet, 1826, p. 284, pl. 8, f. 6; Brazier Cat. Australian Cephalopoda, 1892, p. 12. W. Australia.

Sepioteuthis australis, Quoy and Gaim., Zool. Astrolabe, II., 1832, p. 77, pl. 4, f. 1; von Martens, Forsch. Gazelle, III., 1889, p. 191. Mermaid Straits.

Sepioteuthis mauritiana, Quoy and Gaim., Zool. Astrolabe, II., 1832, p. 76, pl. 4, f. 2–6 ; Meyer, Faun. Sudwest. Australia, II., 1909, p. 329, f. 1–2. Albany.

Symplectoteuthis oualaniensis, Lesson.—*Loligo oualaniensis*, Lesson, Voy. Coquille, Zool. 1830, p. 240, pl. 1, f. 2 ; Brazier, Cat. Australian Cephalopoda, 1892, p. 17. Nicol Bay.

Loligo uncinata, Quoy and Gaim., Voy. Uranie and Physicienne, 1825, p. 410, pl. 66, f. 7. Off Endraeht's Land.

Sepioloidea lineolata, Quoy and Gaim, Zool. Astrolabe, II., 1832, p. 82, pl. 5, f. 8 ; Meyer Faun. Sudwest. Austr., II., 1909, p. 330, f. 3. W. Australia.

Family—Polypidæ.

Polypus boscii, Lesueur.—*Sepia boscii*, Lesueur, Journ. Acad. Nat. Sci. Philad., II., 1821, p. 101 ; Brazier, Cat. Australian Cephalopoda, 1892, p. 3. W. Australia.

CLASS—AMPHINEURA.

Order—Aplacophora.

Family—Proneomeniidæ.

Epimenia australis, Thiele, Zeitsch. f. Wiss. Zool. LXXII., 1902, p. 255 ; Nierstrasz, Nat. Antarct. Exped., Zool., IV., 1909, Solenogastres, p. 11. N.W. Australia.

Order—Polyplacophora.

Family—Lepidopleuridæ.

Lepidopleurus niger, Torr, Trans. Roy. Soc., S.A., XXXV., 1911, p. 105, pl. 25, f. 5. Hopetoun.

Family—Ischnochitonidæ.

Callochiton platessa, Gould,—*Chiton platessa*, Gould, Proc. Bost. Soc. Nat. Hist., II., 1846, p. 143; Pilsbry, Man. Conch., XIV., 1892, p. 49, pl. 10, f. 1–5 ; Torr, Trans. Roy. Soc., S.A., XXXV., 1911, p. 95. Albany, Rottnest Is., Ellensbrook.

Callochiton rufus, Ashby, Trans. Roy. Soc., S.A., XXIV., 1900, p. 87, pl. 1., f. 2 ; Thiele, Faun. Sudwest Austr. III., 1911, p. 402. Sharks Bay.

Chætopleura biarmata, Rochebrune, Bull. Soc. Philom, 1882, p. 195, King George's Sound ; Thiele, Revision II., 1910, p. 73, pl. 7, f. 19, 26.

Ischnochiton albinus, Thiele, Faun. Sudwest Austr., III., 1911, p. 400, pl. 6, f. 4. Sharks Bay.

Ischnochiton cariosus, Pilsbry, Man. Conch., XIV., 1892, p. 65, pl. 24, f. 20–23 ; Thiele, Faun. Sudwest Austr., III., 1911, p. 400, Bunbury ; Torr, Trans. Roy. Soc., S.A., XXXV., 1911, p. 96. Rottnest Is., Albany, Hopetoun, Yallingup, and Ellensbrook.

Ischnochiton contractus, Reeve.—*Chiton contractus*, Reeve, Conch. Icon., IV., 1847, pl. 15, f. 78, Swan River ; Torr, Trans. Roy. Soc., S.A.,, XXXVI., 1912, p. 97. Albany, Hopetoun.

Ischnochiton crispus, Reeve,—*Chiton crispus*, Reeve, Conch. Icon., IV., 1847, pl. 19, f. 120. Torr, Trans. Roy. Soc., S.A., XXXV., 1911, p. 96. Esperance, Hopetoun.

Ischnochiton decussatus, Reeve,—*Chiton decussatus*, Reeve, Conch. Icon., IV., 1847, pl. 18, f. 107. Torr, Trans. Roy. Soc., S.A., XXXV., 1911, p. 97. Fremantle.

Ischnochiton indifferens, Thiele, Fauna Sudwest Austr., III., 1911, p. 401, pl. 6, f. 5–6. Sharks Bay.

Ischnochiton juloides, Adams & Angas.—*Stenochiton juloides*, Adams & Angas, Proc. Zool. Soc., 1864, p. 193 ; Pilsbry, Man. Conch., XIV., 1892, p. 55, pl. 16, f. 6–8 ; Torr, Trans. Roy. Soc., S.A., XXXV., 1911, p. 96. Albany, Rottnest Is., Hopetoun, Yallingup, and Ellensbrook.

Ischnochiton ptychius, Pilsbry, Nautilus, VIII., 1894, p. 53 ; Bednall, P. Malac. Soc., II., 1897, p. 147 ; Torr, Trans. Roy. Soc., S.A., XXXV., 1911, p. 97. Fremantle.

Ischnochiton resplendens, Bednall & Matthews, Proc. Mal. Soc., VII., 1906, p. 91, pl. 9, f. 4 ; Torr, Trans. Roy. Soc., S.A., XXXV., 1911, p. 97. Albany, Yallingup, and Ellensbrook.

Ischnochiton sulcatus, Quoy & Gaim.—*Chiton sulcatus*, Quoy & Gaim., Zool. Astrolabe, III., 1835, p. 385, pl. 75, f. 31–36. King George's Sound.

Callistochiton antiquus, Reeve.—*Chiton antiquus*, Reeve, Conch. Icon., IV., 1847, pl. 25, f. 169 ; Torr, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 150. Albany, Ellensbrook, and Yallingup.

Callistochiton recens, Thiele, Faun. Sudwest Austr., III., 1911, p. 402. Sharks Bay.

Family—Plaxiphoridæ.

Plaxiphora costata, Blainville,—*Chiton costata*, Blainville, Dict. Sci. Nat., XXXVI., 1825, p. 548 ; *Chiton glauca*, Quoy and Gaim., Zool. Astrolabe, III., 1834, p. 376, pl. 74, f. 7-11 ; Torr, Trans. Roy. Soc., S.A., XXXV., 1911, p. 99. King George's Sound, Albany, Rottnest Is., Bunbury, Ellensbrook, and Yallingup.

Plaxiphora hedleyi, Torr, Trans. Roy. Soc., S.A., XXXV., 1911, p. 103, pl. 24, f. 2. Albany.

Plaxiphora pustulosa, Torr, Trans. Roy. Soc., S.A., XXXV., 1911, p. 107, pl. 25, f. 7. Albany.

Plaxiphora zebra, Torr, Trans. Roy. Soc., S.A., XXXV., 1911, p. 106, pl. 25, f. 6. Port Esperance.

Family—Acanthochitonidæ.

ACANTHOCHITONA BEDNALLI, Pilsbry, Proc. Acad. Nat. Sci., Philad., 1894, p. 81, pl. 2, f. 7–11 ; Thiele, Faun. Sudwest Austr., III., 1911, p. 403, Albany, Dirk Hartog, and Sharks Bay.

ACANTHOCHITONA BREVISPINOSUS, Sowerby.—*Chiton brevispinosus,* Menke, Moll. Nov. Holl., 1843, p. 34, Arthur's Head ; Pilsbry, Man. Conch., XIV., 1892, p. 231, pl. 47, f. 18–21.

ACANTHOCHITONA DELICIOSUS, Thiele, Faun. Sudwest. Austr., III., 1911, p. 403, pl. 6, f. 5–10. Bunbury.

ACANTHOCHITONA SPECIOSUS, H. Adams.—*Cryptoplax speciosa,* H. Adams, Proc. Zool. Soc., 1861, p. 385 ; Pilsbry, Proc. Nat. Sci. Philad., 1894, p. 83, pl. 4, f. 31–3 ; Torr, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 159. Albany.

ACANTHOCHITONA SUBVIRIDIS, Torr., Trans. Roy. Soc., S.A., XXXV., 1911, p. 104, pl. 25, f. 3. Albany.

ACANTHOCHITONA VERCONIS, Torr and Ashby, Trans. Roy. Soc., S.A., XXII., 1898, p. 217, pl. 6, f. 4 ; Torr. op. cit., XXXV., 1911, p. 99. Geographe Bay.

ACANTHOCHITONA SUERII, Blainville.—*Chiton suerii,* Blainville, Dict. Sci. Nat., XXXVI., 1825, p. 553, King George's Sound ; *Chiton asbestoides,* Smith, Zool. Alert, 1884, p. 83, pl. 6, f. G. ; Torr, Trans. Roy. Soc., S.A., XXXV., 1911, p. 99. Albany.

Family—Cryptoconcheidæ.

CRYPTOCONCHUS GUNNII, Reeve.—*Chitonellus gunnii,* Reeve, Conch. Icon., IX., 1847, pl. 1, f. 5 ; Thiele, Faun. Sudwest Austr. III., 1911, p. 405. Fremantle.

CRYPTOCONCHUS HARTMEYERI, Thiele, Faun. Sudwest Austr. III., 1911, p. 405. pl. 6, f. 18-26. Sharks Bay.

CRYPTOCONCHUS MICHAELSENI, Thiele, Faun. Sudwest Austr., III., 1911, p. 404, pl. 6, f. 11–17. Sharks Bay.

Family—Chitonidæ.

RHYSSOPLAX BEDNALLI, Pilsbry.—*Chiton bednalli,* Pilsbry, Nautilus IX., 1895, p. 90 ; Bednall, Proc. Malac. Soc., II., 1897, p. 153, pl. 12, f. 8 ; Torr, Trans. Roy. Soc., S.A., XXXV., 1911, p. 98. Geographe Bay.

CHITON COCCUS, Menke, Zeit. f. malak., I., 1844, p. 62. N.W. Australia.

RHYSSOPLAX EXOPTANDUS, Bednall.—*Chiton exoptandus,* Bednall, , Proc. Mal. Soc., II., 1897, p. 152, pl. 12, f. 7 ; Torr, Trans. Roy. Soc., S.A., XXXV., 1911, p. 98. Geographe Bay.

RHYSSOPLAX TORRIANUS, Hedley and Hull.—*Chiton torri,* Hedley and Hull, Rec. Austr. Mus. VII., 1909, p. 262, pl. 73, f. 6–11. *C. torrianus,* Hedley and Hull, op. cit., p. XI., 1910 ; Torr, Trans. Roy. Soc., S.A., XXXV., 1911, p. 98. Esperance, Albany, Yallingup, Ellensbrook, Rottnest Is.

Rhyssoplax tricostalis, Pilsbry.—*Chiton tricostalis*, Pilsbry, Nautilus, VIII., 1894, p. 54; Torr, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 151. Ellensbrook.

Tonicia hullianus, Torr, Trans. Roy. Soc., S.A., XXXV., 1911, p. 104, pl. 25, f. 4. Ellensbrook.

Acanthopleura spinosa, Bruguiere, *Chiton spinosa*, Nat. Hist., I., 1792, p. 25; Iredale, Proc. Zool. Soc., 1914, p. 668. Monte Bello Is.

Acanthopleura georgiana, Quoy and Gaim..—*Chiton georgiana*, Quoy & Giam., Zool. Astrolabe III., 1835, p. 379, pl. 75, f. 25–30, King George's Sound; Menke, Moll, Nov. Holl., 1843, p. 34, Arthur's Head; Thiele, Faun. Sudwest Austr., III., 1911, p. 399, pl. 6, f. 3. Albany, Geraldton.

Acanthopleura gemmata, Blainville. Dict. Sci. Nat. XXXVI., 1825, p. 544. *Chiton spiniger*, Sowerby, Mag. Nat. Hist., 1840, p. 287, suppl., pl. 16, f. 2; Thiele Faun. Sudwest Austr., III., 1911, p. 398, Bernier, Turtle Is. and Cossack; Iredale, Proc. Zool. Soc. 1914., p. 668. Monte Bello Is.

Lorica volvox, Reeve.—*Chiton volvox*, Reeve, Conch. Icon., II., 1847, pl. 6, f. 31; Torr, Trans. Roy. Soc., S.A., XXXV., 1911, p. 98. Rottnest Is., Ellensbrook.

Onithochiton scholvieni, Thiele, Zool. 1910, p. 99, pl. 10, f. 60, 61, and Faun. Sudwest Austral., III., 1911, p. 397. Fremantle, Bunbury, Rottnest Is.

Lucilina dilecta, Thiele, Faun. Sudwest Austr., III., 1911, p. 397, pl. 6, f. 1, 2. Sharks Bay.

Chiton exiguus, Sowerby.—It is improbable that Menke, Moll. Nov. Holl. 1843, p. 34, correctly identified this from N.W. Australia.

CLASS—GASTEROPODA.

Order—Diotocardia.

Family—Pleurotomariidæ.

Schismope atkinsoni, Ten. Woods.—*Scissurella atkinsoni.*, T. Woods, Proc. Roy. Soc. Tasm., 1876 (1877), p. 149; *Schismope carinata*, Watson (not Adams, 1862), Chall. Zool., XV., 1886, p. 119, pl. 8, f. 6; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 201. Bunbury.

Schismope pulchra, Petterd, Journ. of Conch., IV., 1884, p. 139; Hedley, P.L.S.N.S.W., XXV., 1901, p. 726, f. 25; Verco, Trans. Roy. Soc. S.A., XXXVI, 1912, p. 201. King George's Sound, Hopetoun.

Family—Fissurellidæ.

Scutus anatinus, Donovan.—*Patella anatinus*, Donovan, Rees. Encycl., 1820, Conchology, pl. 16; *Parmophorus australis*, Lamarck, An. s. vert., VI., 1822, p. 5; Quoy & Gaim., Zool. Astrolabe, III., 1834, p. 321, pl. 69, f. 1–4. King George's Sound; Menke, Moll. Nov. Holl., 1843, p. 33. Torbay.

HEMITOMA SUBEMARGINATA, Blainville.—*Emarginula subemarginata*, Dict. Sci., Nat., XIV., 1819, p. 382; *Emarginula australis*, Quoy & Gaim., Zool. Astrolabe, III., 1834, p. 328, pl. 68, f. 11, 12. King George's Sound.

HEMITOMA RUGOSA, Quoy & Gaim.—*Emarginula rugosa*, Quoy & Gaim., Zool. Astrolabe, III., 1834, p. 331, pl. 68, f. 17, 18. King George's Sound.

EMARGINULA DILECTA, A. Adams, Proc. Zool. Soc., 1851 (1852), p. 85. King George's Sound; Sowerby, Thes. Conch., III., 1863 p. 211, pl. 245, f. 5.

TUGALIA CICATRICOSA, A. Ad. Thes. Conch., III., 1863, p. 222, pl. 249, f. 14. Geographe Bay (Austral. Museum).

LUCAPINELLA OBLONGA, Menke.—*Fissurella oblonga*, Menke, Moll. Nov. Holl., 1843, p. 33, W. Australia; *L. pritchardi*, Hedley, Proc. Roy. Soc., Vict., VII., 1895, p. 198, pl. 11, f. 3–7. Geraldton. (A. U. Henn.)

MEGATEBENNUS JAVANICENSIS, Lamarck.—*Fissurella javanicensis*, Lamarck, An. s. vert., VI., 1822, p. 14; Delessert, Recueil, 1841, pl. 24, f. 8. King George's Sound and Geographe Bay (Austr. Museum).

MEGATEBENNUS OMICRON, Crosse & Fischer. — *Fissurella omicron*, Crosse & Fischer, Journ. de Conch., 1864, p. 348; l.c., 1865, p. 41, pl. 3, f. 4–6; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 202. Geraldton.

MACROSCHISMA TASMANIÆ, Sowerby, Thes. Conch., III., 1862, p. 206, pl. 244, f. 223; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 202. Geraldton.

Family—Haliotidæ.

HALIOTIS ALBICANS, Quoy & Gaim., Zool. Astrolabe, III., 1834, p. 311, pl. 68, f. 1, 2. King George's Sound.

HALIOTIS AUSTRALIS, Gmelin, Syst. Nat., XIII., 1791, p. 3689; Chemnitz Conch. Cab., X., 1788, p. 311, pl. 166, f. 1603, 1604; Menke, Moll. Nov. Holl., 1843, p. 32. W. Australia.

HALIOTIS CONICOPORA, Peron, Voy. Terr. Austr., II., 1816, p. 80; *H. naevosa*, Phil. (not Martyn), Abbild, Besch., I., 1844, p. 147, pl. 2, 3; *H. cunninghami*, Gray, Append. King's Intertrop. Austr., II., 1826, p. 493; Reeve, Conch. Icon., III., 1846, pl. 1 f. 3; *H. gigantea*, Menke, Moll. Nov. Holl., 1843, p. 31. Mistaken Island; Verco. Trans. Roy. Soc., S.A., XXXVI., 1912, p. 200. Esperance, King George's Sound, Ellensbrook, Rottnest Island.

HALIOTIS ELEGANS, Philippi, Abbild, Beschr., I., 1844, p. 119, pl. 1, f. 1, 2; Hedley, P.L.S.N.S.W., XXI., 1896, p. 817. Dongara; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 200. Rottnest Island, Sharks Bay (Henn).

Haliotis funebris, Reeve, Conch. Icon., III., 1846, pl. 12 f. 38 ; Hedley, P.L.S.N.S.W., XXXVIII., 1913, p. 277. Swan River.

Haliotis pulcherrima, Martyn.—This Polynesian species was in error originally (Martyn, Univ. Conch., II., 1784, f. 62), reported from King George's Sound.

Haliotis roei, Gray, Append. King Intertrop, Austr., II., 1826, pp. 157, 493 ; Reeve, Conch. Icon., III., 1846, pl. 4, f. 10 ; *H. scabricosta*, Menke, Moll. Nov. Holl., 1843, p. 31. Mistaken Island ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 200. Esperance, King George's Sound, Ellensbrook, Bunbury, and Rottnest Island.

Haliotis scalaris, Leach.—*Padollus scalaris*, Leach, Zool. Miscell., I., 1814, p. 66, pl. 28 ; *P. rubicundus*, Gray, Append. King Intertrop. Austr., II., 1826, p. 32 ; *H. tricostalis*, Menke, Moll. Nov. Holl., 1843, p. 32. W. Australia ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 200. Esperance, Albany, Ellensbrook, Bunbury, and Rottnest Island.

Haliotis semiplicata, Menke, Moll. Nov. Holl., 1843, p. 32. W. Australia ; *H. lauta*, Reeve, Conch. Icon., III., 1846, pl. 17, f. 68 ; Hedley, P.L.S.N.S.W., XXVI., 1902, p. 702, Cottesloe.

Haliotis squamata, Reeve, Conch. Icon., III., 1846, pl. 12, f. 35. N.W. Australia. Iredale, Proc. Zool. Soc., 1914, p. 666. Monte Bello Island.

Haliotis striata, Linne, Menke erroneously records—Moll. Nov. Holl., 1843, p. 32—this species from W. Australia.

Haliotis varia, Linne, Syst. Nat., X., 1758, p. 780 ; Menke, Moll. Nov. Holl., 1843, p. 32. W. Australia ; Sowerby, Thes. Conch., V., 1882, p. 28, pl. 428, f. 5–7, 11, 12, 61. Iredale, Proc. Zool. Soc., 1914, p. 666. Monte Bello Island.

Family—Stomatiidæ.

Gena auricula, Lamarck.—*Stomatella auricula*, Lamarck, An. s. vert., VI., 1822, p. 210 ; Quoy & Gaim., Zool. Astrolabe, III., 1834, p. 309, pl. 66, bis. f. 17–19. King George's Sound.

Gena nigra, Quoy & Gaim.—*Stomatella nigra*, Quoy & Gaim. Zool. Astrolabe III., 1834, p. 307, pl. 66, f. 10–12 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 202, Geraldton.

Gena striatula, A. Adams, Proc. Zool. Soc., 1850, p. 37 ; Thes. Conch., II., 1854, p. 829, pl. 173, f. 9, 10. Swan River.

Stomatia sculpturata, Preston, Proc. Malac. Soc., XI., 1914, p. 17, fig. Monte Bello Island.

Stomatella baconi, A. Adams, Thes. Conch., II., 1854, p. 38, pl. 174, f. 25, 26. Swan River, Exmouth Gulf, and Monte Bello Island (T. H. Haynes, in Brit. Museum).

Stomatella clathratula, A. Adams, Proc. Zool. Soc., 1854 (1855), p. 133 ; Sowerby, Conch. Icon., XIX., 1874, pl. 5, f. 31. N.W. Australia (Brit. Museum).

STOMATELLA DUPLICATA, Sowerby, Thes. Conch., II., 1854, p. 841, pl. 175, f. 61–63. Monte Bello Island (Brit. Museum).

STOMATELLA IMBRICATA, Lamarck, An. s. vert., VI., 1822, p. 209; Menke, Moll. Nov. Holl., 1843, p. 33. W. Australia; Sowerby, Thes. Conch., II., 1854, p. 833, pl. 174, f. 1.

STOMATIA PHYMOTIS, Helbling, Beitrage, 1779, p. 124, pl. 2, f. 34, 35. Monte Bello Island (British Museum).

Family—Trochidæ.

TROCHUS ARCHITECTONICUS, A. Adams.—*Pyramis architectonicus*, A. Ad., Proc. Zool. Soc., 1851 (1853), p. 152. Signet (? Cygnet) Bay; Reeve, Conch. Icon., XIII., 1861, pl. 4, f. 22.

TROCHUS CÆRULESCENS, Lamarck, An. s. vert., VII., 1822, p. 18; King, Intertrop, Australia, II., 1826, p. 204. Dirk Hartog, Point Cunningham; *T. prasinus*, Menke, Moll. Nov. Holl., 1843, p. 16. W. Australia; Philippi, Abbild. Besch., II., 1845, p. 35 pl. 7, f. 10.

TROCHUS CARINIFERUS, Reeve, Syst. Conch., II., 1842, pl. 118, f. 8; A. Adams, Proc. Zool. Soc., 1851 (1853), p. 152. Signet (? Cygnet) Bay; *T. baccatus*, Sowerby, Journ. Linn. Soc., XX., 1889, p. 397, pl. 25, f. 8, 9.

TROCHUS FENESTRATUS, Gmelin, Syst. Nat., XIII., 1791, p. 3582; Reeve, Conch. Icon., XIII., 1861, pl. 4, f. 18. Swan River (Brit. Museum).

TROCHUS HANLEYANUS, Reeve, Proc. Zool. Soc., 1842, p. 184, and Conch. Icon., XIII., 1862, pl. 1, f. 2; A. Adams, Proc. Zool. Soc., 1851 (1853), p. 154. Swan Point.

TROCHUS MONTEBELLOENSIS, Preston, Malac. Soc., XI., 1914, p. 16, fig. Monte Bello Island.

TROCHUS MACULATUS, Linne.—Syst. Nat., X., 1758, p. 756; Menke, Moll. Nov. Holl. 1843, p. 16., N.W. Australia; Reeve, Conch. Icon., XIII., 1862, pl. 1, f. 4, pl. 12, f. 4.

TROCHUS OBELISCUS, Gmelin.—Syst. Nat., XIII., 1791, p. 3579; Pilsbry Man. Conch., XI., 1889, p. 19, pl. 2, f. 13, 14; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 202. Geraldton.

TROCHUS PULLIGO, Martyn.—This Californian species was originally reported—Martyn, Universal Conchologist, 1784, pl. 76—from King George's Sound, as von Martens has noted, Mal. Blatt., XIX., 1872, p. 42.

TROCHUS COSTATUS, Martyn.—Like the foregoing, this American species was originally introduced as from King George's Sound. Martyn, Univ. Conch., 1784, f. 34.

CLANCULUS ANUS, Philippi.—*Trochus anus*, Philippi, Zeit. f. malak., 1848, p. 101; Fischer Coq. Viv., 1878, p. 324, pl. 101, f. 3. King George's Sound.

CLANCULUS DENTICULATUS, Gray.—*Monodonta denticulatus*, Gray, Append. King intertrop. Austr. II., 1826, p. 479; Menke, Zeit. f. malak., 1844, p. 58. W. Australia; *Trochus lupinus*, Philippi, Conch. Cab., II., 1846, p. 237, pl. 36, f. 3.

Clanculus dunkeri, Philippi.—*Trochus dunkeri*, Philippi, Abbild. Besch., I., 1843, p. 67, pl. 2, f. 5 ; Brazier, Proc. Roy. Soc. Tasm., 1886, p. 202. Cape Riche ; *C. rubens*, Tate, Trans. Phil. Soc. Adelaide, II., 1879, p. 137. King George's Sound.

Clanculus consorbrinus, Tate, Trans. Roy. Soc., S.A., XVII., 1893, p. 193, pl. 1, f. 1. Bunbury and Geraldton (Henn).

Clanculus leucomphalus, Verco, Trans. Roy. Soc., S.A., XXIX., 1905, p. 168, pl. 31, f. 9–11 ; 1 c., XXXVI., 1912, p. 207. 72 fath. Western Bight.

Clanculus maxillatus, Menke.—*Monodonta maxillatus*, Menke, Moll. Nov. Holl, 1843, p. 14. W. Australia ; *Trochus maxillatus*, Philippi, Conch. Cab., II., 1846, p. 236, pl. 36, f. 2.

Clanculus plebeius, Philippi.—*Trochus plebeius*, Philippi, Zeit. f. mal., 1851, p. 41, and Conch. Cab., p. 326, pl. 46, f. 10 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 202. Geraldton.

Clanculus ringens, Menke.—*Monodonta ringens*, Menke, Moll. Nov. Holl., 1843, p. 14, W. Australia. Fischer, Coq. Viv., 1877, p. 213, pl. 71, f. 1.

Trochus impervius, Menke.—This African species, as von Martens points out—Jahrb. deut. Malak. Gessel., I., 1874, p. 143, footnote—was wrongly ascribed to W. Australia by Menke–Moll. Nov. Holl. 1843, p. 18.

Monodonta adelaidæ, Philippi.—*Trochus adelaidæ*, Philippi, Conch. Cab., II., 1849, p. 140, pl. 24, f. 1 ; Brazier, Proc. Roy. Soc. Tasm., 1886 (1887), p. 199. Cape Riche.

Monodonta carbonaria, Phillipi, Zeit. f. Malak., V., 1848, p. 103, and Conch. Cab., II., 1849, p. 276, pl. 40, f. 9. King George's Sound.

Monodonta constricta, Lamarck, An. s. vert., VII., 1822, p. 36 ; Delessert Recucil, 1841, pl. 36, f. 11 ; Menke, Moll. Nov. Holl., 1843, p. 13. W. Australia.

Monodonta labio, Linne.—*Trochus labio*, Linn, Syst. Nat. X., 1758, p. 750 ; Fischer, Coq. Viv., 1877, p. 223, pl. 73, f. 1, pl. 74, f. 4 ; Hedley, Proc. Roy. Soc. Queensland, VI., 1890, p. 242. Cambridge Gulf ; Swan River (Brit. Museum).

Monodonta rudis, Gray in Append. King. Intertrop. Austr. ii., 1826, p. 480 ; *Monodonta melanoloma*, Menke, Moll. Nov. Holl., 1843, p. 14 ; Philippi, Abbild. Besch., I., 1845., p. 188, pl. 5, f. 2 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 202. Geraldton.

Monodonta zeus, Fischer, Coq. Viv., 1878, p. 334, pl. 104, f. 1 ; Hedley, P.L.S., N.S.W., XXI., 1896, p. 817. Dongara ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 202. Geraldton.

Cantharidus apicinus, Menke.—*Monodonta apicinus*, Menke, Moll. Nov. Holl., 1843, p. 15. W. Australia ; Philippi, Conch. Cab., II., 1846, p. 133, pl. 23, f. 5.

Cantharidus chlorites, Philippi.—*Trochus chlorites*, Philippi, Conch. Cab., II., 1846, p. 60, pl. 13, f. 2. W. Australia.

Cantharidus chlorostomus, Menke.—*Trochus chlorostomus*, Menke, Moll. Nov. Holl., 1843, p. 17 ; Philippi, Abbild., Beschr., I., 1843, p. 68, pl. 2, f. 8 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

CANTHARIDUS CONICUS, Gray.—*Monodonta conicus,* Gray, in King Intertrop. Austr., II., 1826, p. 479 ; *Thalotia woodsiana,* Angas, Proc. Zool. Soc., 1872, p. 611, pl. 42, f. 4,5 ; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 203. Geraldton.

CANTHARIDUS BAUDINI, Fischer.—*Trochus baudini,* Coq. Viv., 1879, p. 356, pl. 110, f. 5. Sharks Bay.

CANTHARIDUS FLINDERSI, Fischer.—*Trochus flindersi,* Fischer, Journ. de Conch., XXVI., 1878, p. 65 ; Coq. Viv., 1879, p. 354, pl. 110, f. 3. King George's Sound.

CANTHARIDUS INDISTINCTUS, Wood.—*Trochus indistinctus,* Wood, Test. Index suppl., pl. 6, f. 41 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

CANTHARIDUS IRISODONTES, Quoy and Gaim. — *Trochus irisodontes,* Quoy and Gaim, Zool. Astrolabe, III., 1834, p. 246, pl. 63, f. 12 ; King George's Sound ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

CANTHARIDUS LEHMANI, Menke.—*Trochus lehmani,* Menke, Moll. Nov. Holl., 1843, p. 18 ; Philippi, Abbild., Besch., II., 1845, p. 37, pl. 7, f. 2 ; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 202. Geraldton.

CANTHARIDUS LEPIDUS, Philippi.—*Trochus lepidus,* Philippi, Conch. Cab., II., 1846, p. 84, pl. 15, f. 4. Swan River ; *C. punctulosus,* A. Ad., Proc. Zool. Soc., 1851 (1853), p. 169 ; Hedley, P.L.S., N.S.W., XXXVIII., 1913, p. 280, pl. 17, f. 47. Monte Bello Islands (T. H. Haynes in Brit. Museum).

CANTHARIDUS NEGLECTUS, Tate.—*Thalotia neglectus,* Tate, Trans. Roy. Soc., S.A., XVII., 1893, p. 194, pl. 1, f. 6, and Verco, op. cit., XXXVI., 1912, p. 203. Geraldton.

CANTHARIDUS OCTONA, Tate.—*Leiopyrga octona,* Tate, Trans. Roy. Soc., S.A., XIV., 1891, p. 260, pl. 11, f. 5. King George's Sound ; Verco, op. cit., XXVIII., 1904, p. 140, pl. 26, f. 15–18 ; and XXXVI., 1912, p. 203. Geraldton.

CANTHARIDUS PULCHERRIMUS, Wood.—*Trochus pulcherrimus,* Wood, Ind. Test., suppl. 1828, p. 18, pl. 6, f. 45. *Trochus preissii,* Menke, Moll. Nov. Holl., 1843, p. 17 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912 p. 203. Geraldton.

CANTHARIDUS PYRGOS, Philippi.—*Trochus pyrgos,* Philippi, Zeit. f. Malak., VI., 1849, p. 189, and Conch. Cab., II., 1846, pl. 43, f. 14 ; *C. moniliger,* A. Adams, Proc. Zool. Soc., 1851 (1853), p. 169. Swan River.

CANTHARIDUS STRIGATUS, A. Adams.—*Thalotia strigata,* A. Adams, Proc. Zool. Soc. 1851 (1853), p. 172. Swan Point. Hedley, P.L.S., N.S.W., XXXIII., 1908, p. 482, pl. 7, f. 3

GIBBULA COXI, Angas, Proc. Zool. Soc. 1867, p. 115, pl. 13, fig. 26. Cottesloe (Henn).

GIBBULA LEHMANI, Menke.—*Turbo lehmani,* Menke, Moll, Nov. Holl., 1843, p. 13, Leschenault Harbour. *Trochus lehmani,* Philippi, Conch. Cab., II., 1846, p. 185, pl. 28, f. 15.

Gibbula preissiana, Philippi.—*Trochus preissiana*, Philippi, Conch. Cab., II., 1846, p. 177, pl. 28, f. 3. West Australia.

Monilea lentiginosa, A. Adams, Proc. Zool. Soc., 1851 (1853), p. 188; Fischer, Coq., Viv., 1878, p. 317, pl. 100, f. 1. Swan River and Sharks Bay.

Monilea solandri, Philippi.—*Trochus solandri*, Philippi, Conch. Cab., II., 1846, p. 180, pl. 28, f. 8. W. Australia.

Monilea simulans, Smith.—Erroneously reported from W. Australia by a clerical error. Zool. Rec., 1899, p. 80.

Monilea vitiliginea, Menke.—*Trochus vitiligineus*, Menke, Moll. Nov. Holl., 1843, p. 18. W.A. Philippi, Conch. Cab., II., 1846, p. 167, pl. 28, f. 2.

Calliostoma broderipi, Philippi.—*Trochus broderipi*, Philippi, Conch., Cab., II., 1846, p. 257, pl. 38, f. 5.—Garden Island.

Calliostoma ciliaris, Menke.—*Trochus ciliaris*, Menke, Moll. Nov. Holl., 1843, p. 17. N.W. Australia ; Philippi, Abbild. Beschr., II., 1845, p. 36, pl. 7, f. 11. Swan River ; *Ziziphinus castra*, Reeve, Conch. Icon., XIV., 1863, pl. 2, f. 14.

Calliostoma deceptum, Smith.—Proc. Malac. Soc., III., 1899, p. 312, f. 5. Holothuria Bank and Baleine Bank ; *C. deceptum*, Hedley, P.L.S., N.S.W., XXXII., 1907, p. 490, pl. 16, f. 3.

Calliostoma hedleyi, Pritchard and Gatliff, Proc. Roy. Soc. Vict., 1901 (1902), XIV., p. 182, pl. 9, f. 4 ; Verco. Trans. Roy. Soc., S.A., XXXVI., 1912, p. 207, 80 fath. Western Bight.

Calliostoma jujubinum, Gmelin.—Erroneously reported by Reeve, Conch. Icon., XLV., 1863, Ziziphinus, pl. 2, f. 12, from Swan River, but is really West Indian.

Calliostoma nobilis, Philippi.—*Trochus nobilis*, Philippi. Conch. Cab., II., 1846, p. 86, and 255, pl. 15, f. 6, and pl. 38, f, 1. W. Australia.

Astele stenomphala, Smith, Proc. Malac. Soc., III., 1899, p. 209, f. 3. Holothuria Banks.

Tallorbis ampullus, Tate.—*Euchelus ampullus*, Tate, Trans. Roy. Soc. S.A., XVII., 1893, p. 197, pl. 1, f. 5. Cambridge Gulf ; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 203. Geraldton.

Euchelus annectans, Tate, Trans. Roy. Soc., S.A., XVII., 1893, p. 196. W.A.

Euchelus atratus, Gmelin.—*Turbo atratus*, Gmelin, Syst. Nat., XIII., 1791, p. 3601 ; *Monodonta canaliculata*, Delossert. Recueil, 1841, pl. 37, f. 1 ; *M. sulcifera*, A. Adams, Proc. Zool. Soc., 1851, (1853), p. 175, Roebuck Bay ; Iredale, Proc. Zool. Soc., 1914, p. 666. Monte Bello Island.

Euchelus baccatus, Menke.—*Monodonta baccatus*, Menke, Moll. Nov. Holl., 1843, p. 14, Phillipi, Conch. Cab., II., 1846, p. 173, pl. 27, f. 13 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

Euchelus fenestratus, Tate, Trans. Roy. Soc., S.A., XVII., 1893, p. 195, pl. 1, f. 2. W. Australia.

EUCHELUS VIXUMBILICATUS, Tate, Trans. Roy. Soc., S.A., XVII., 1893, p. 196, pl. 1, f. 4. W. Australia.

ANGARIA DELPHINUS, Linn, var. INCISA, Reeve.—*Delphinula, incisa.* Reeve, Conch. Syst., II., 1842, pl. 212, f. 11. Turtle Island (Dring, in Brit. Museum).

Var. TYRIA, Reeve, Conch. Syst. II., 1842, pl. 211, f. 1–6. Rottnest Island.

Var. LACINATA, Lamarck, Gray, King Intertrop. Austr., II., 1827, p. 482, and 56. Prince Regents River ; Brazier, P.L.S.N.S.W., IX., 1884, p. 798. Cossack.

Family—Turbinidæ.

PHASIANELLA AUSTRALIS, Gmelin.—*Buccinum australis,* Gmelin, Syst. Nat., XIII., 1791, p. 3490 ; *P. bulimoides,* Quoy & Gaim, Zool. Astrolabe III., 1834, p. 235, pl. 59, f. 1–7. King George's Sound ; Vereo, Trans. Roy. Soc., S.A., XXXVI. , 1912, pp. 202, 206. Geraldton, 100 fath., Western Bight.

PHASIANELLA MONTEBELLOENSIS, Preston, Proc. Malac. Soc., XI., 1914, p. 14, fig. Monte Bello Islands.

PHASIANELLA ROSEA, Angas.—*Eutropia rosea,* Angas, Proc. Zool. Soc., 1867, p. 144, pl. 13, f. 24 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 202. Geraldton.

PHASIANELLA VARIEGATA, Lamarck, An. s. vert., VII., 1822, p. 53 ; Delessert, Recueil, 1841, pl. 37, f. 10 ; Verco, Trans. Roy Soc., S.A., XXXVI., 1912, p. 202. Geraldton ; *P. lentiginosa,* Reeve, Conch. Icon., XIII., 1862, pl. 4, f. 10. Swan River.

PHASIANELLA PERDIX, Wood, Ind. Test. Suppl., 1828, pl. 6, fig. 46. King George's Sound ; *P. ventricosa,* Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 202. Geraldton ; *P. reticulata,* Reeve, Conch. Icon., XIII., 1862, pl. 3, f. 7. Swan River.

TURBO GRUNERI, Philippi, Zeit. f. malak., III., 1846, p. 89 ; *T. circularis,* Sowerby, Thes. Conch., V., 1886, p. 203, pl. 496, f. 37. Swan River.

TURBO INTERCOSTALIS, Philippi, Zeit, f. malak, 1846, p. 98 ; and Conch. Cab., II., 1847, p. 42, 68, pl. 16, f. 4, 5. W. Australia.

TURBO JOURDANI, Kiener, Rev. Zool. Soc. Cuvier, 1839, p. 324 ; Verco, Trans. Roy. Soc., S.A., XXXII., 1908, p. 338, pl. 18, XXXV., 1911, p. 213 ; XXXVI., 1912, p. 202, Geographe Bay, Esperance, Rottnest Island, Geraldton.

TURBO PETHOLATUS, Linne, Syst. Nat., X., 1758, p. 762 ; Reeve, Conch. Icon., IV., 1848, pl. 3, f. 12 ; Hedley, Proc. Roy. Soc., Q'land., VI., 1890, p. 242. Cambridge Gulf.

TURBO PORPHYRITES, Martyn, var. PORCATUS, Reeve.—*T. porcatus,* Reeve, Conch. Icon., IV., 1848, pl. 11, f. 52. Point Swan.

TURBO PULCHER, Reeve, Proc. Zool. Soc. 1842 (1843), p. 185, and Conch. Icon., IV., 1848, pl. 3, f. 9. Turtle Island ; Sowerby Proc. Malac., Soc., V., 1902, p. 12. Fremantle ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 202. Geraldton.

TURBO SQUAMOSUS, Gray, Voy. Fly., II., 1847, p. 359, pl. 2, f. 8 ; Iredale, Proc. Zool. Soc., 1914, p. 669. Monte Bello Islands.

Vars. SCABROSUS, HAYNESI, AND TURRIFORMIS, Preston, Proc. Malac. Soc., XI., 1914. p. 15, figs. Monte Bello Islands.

TURBO STAMINEUS, Martyn, var. LAMELLOSUS, Broderip, Zool. Journ., V., 1831, p. 331, suppl. pl. 49, f. 2. Garden Island ; *T. torquatus*, Quoy & Gaim., Zool. Astrolabe, III., 1834, p. 222, pl. 60, f. 15, 18. King George's Sound ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 202. Geraldton.

TURBO TICAONICUS, Reeve, Conch. Icon., IV., 1848, pl. 5, f. 23 ; Verco. Trans. Roy. Soc., S.A., XXXVI., 1912, p. 202. Geraldton.

TURBO UNDULATUS, Martyn.—*Limax undulatus.*, Martyn, Univ. Conch., I., 1784, f. 29 : Fischer, Coq. Viv., 1875, p. 30, pl. 14, f. 2. Swan River.

ASTRÆA AUREA, Jonas.—*Trochus aurea*, Jonas, Zeit. f. malak., 1844, p. 168 ; *Calcar aurea*, Fischer, Coq. Viv., 1875, p. 43, pl. 104, f. 3. King George's Sound.

ASTRÆA CALCAR, Linne.—*Turbo calcar.*, Linne, Syst. Nat., X., 1758, p. 762 ; A. c., Pilsbry, Man. Conch., X., 1888, p. 231, pl. 52, f. 27, 29, 30, pl. 56, f. 74. Swan River (in Brit. Museum.)

ASTRÆA CHEMNITZI, Valenciennes.—*Trochus chemnitzi* Val., Voy. Venus, 1846, pl. 2 bis, f. 1 ; *T. asteriscus*, Reeve, 1861, not T. a., Reeve, 1842. Monte Bello Islands (in Brit. Museum).

ASTRÆA FIMBRIATA, Lamarck.—*Trochus fimbriatus* Lamarck, An. s. vert., VII., 1822, p. 12 ; Turbo f., Quoy & Gaim., Zool. Astrolabe, III., 1834, pl. 61, f. 8–12. King George's Sound ; Brazier, P.L.S.N.S.W., IX., 1884, p. 797. Cossack ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 202. Geraldton.

ASTRÆA ROTULARIA, Lamarck.—*Trochus rotularius*, Lamarck, An. s. vert., VII., 1822, p. 12 ; Delessert Recueil, 1841, pl. 34, f. 9 ; *Imperator nobilis*, Gray, Append. Voy. Fly, II., 1847, p. 358, pl. 2, f. 7. Swan River (in Brit. Museum).

ASTRÆA STELLARIS, Gmelin.—*Turbo stellaris*, Gmelin, Syst. Nat., XIII., 1791, p. 3600 ; von Martens, Forsch. Gazelle, III., 1889, p. 191. Mermaid Strait ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 202. Geraldton.

ASTRÆA TENTORIFORMIS, Jonas.—*Trochus tentoriformis* Jonas, Zeit. f. malak., 1845, p. 66 ; Fischer, Coq. Viv., 1875, p. 44, pl. 31, f. 2, pl. 79, f. 3. King George's Sound.

CYCLOSTREMA TATEI, Angas, Proc. Zool. Soc., 1878, p. 862, pl. 54, f. 10 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 202. Geraldton.

LIOTINA AUSTRALIS, Kiener.—*Delphhinula australis*, Coq. Viv. X., 1839, p. 8, pl. IV., f. 7. Dongara. (Austr Mus.).

LIOTINA PERONII, Kiener.—*Delphinula peronii*, Coq. Viv., X., 1839, p. 9, pl. III., fig. 5 ; Adams, Proc. Zool. Soc., 1850, p. 50, pl. VIII., fig. 18–20. Abrolhos (Henn).

LIOTINA DEVEXA, Hedley, P.L.S.N.S.W., XXVI., 1901, p. 18, pl. 2, f. 4–6 ; *L. walkeri*, Sowerby, Proc. Malac. Soc., VIII., 1908, p. 16, pl. 1, f. 2. Baudin Island.

LIOTINA REEVIANA, Hinds.—*Delphinula reeviana*, Hinds, Zool. Sulphur, 1845, p. 52, pl. 16, f. 17–15–30 fath., Holothuria Banks (J. J. Walker in Brit. Museum).

CHARISMA ROSEA, Tenison Woods.—*Monilea rosea* Ten. Woods, Proc. Roy. Soc., Tasm., 1876, p. 154 ; *Collonia roseopunctata*, Angas, Proc. Zool. Soc., 1880 p. 417, pl. 40, f. 8. Geraldton (Henn).

Family—Neritidæ.

NERITA ALBICILLA, Linne, Syst. Nat., X., 1758, p. 778 ; v. Martens, Conch. Cab., II., 1889, p. 25, 101, pl. 8, f. 1, 2. Sharks Bay, Fremantle ; Iredale, Proc. Zool. Soc., 1914, p. 666. Monte Bello Islands.

NERITA COSTATA, Gmelin, Syst. Nat., XIII., 1791, p. 3684 ; v. Martens, Conch. Cab., II., 1889, pp. 62, 112, pl. 1, f. 11, 12, pl. 4, f. 8–11. N.W. Australia.

NERITA INSCULPTA, Recluz, Rev. Zool., 1841, p. 152 ; v. Martens Conch. Cab., II., 1889, p. 88, pl. 11, f. 1–4. King George's Sound.

NERITA LINEATA, Gmelin, Syst. Nat., XIII., 1791, p. 3684 ; v. Martens, Conch. Cab., II., 1889, p. 15, pl. 1, f. 3, 4, pl. 4, f. 12–15 ; Hedley, Proc. Roy. Soc., Q'land., VI., 1890, p. 242. Cambridge Gulf.

NERITA MELANOTRACUS, Smith, Zool. Coll. Alert, 1884, p. 69 ; v. Martens, Conch. Cab., II., 1889, p. 100, pl. 13, f. 5–10. King George's Sound.

NERITA PLANOSPIRA, Anton, Verzeichn. Conch., 1839, p. 30 ; v. Martens, Conch. Cab. II., 1889, p. 23, 110, pl. 4, f. 4–7. King George's Sound.

NERITA PLICATA, Linne, Syst. Nat., X., 1758, p. 779 ; v. Martens, Conch. Cab., II., 1889, p. 63, pl. 10, f. 6–10. Dana Island ; and Forsch. Gazelle, III., 1889, p. 191. Mermaid Straits.

NERITA POLITA, Linne, Syst. Nat., X., 1758, p. 778 ; v. Martens, Conch. Cab., II., 1889, p. 72, pl. 3, f. 10–26, King George's Sound ; var. *antiquata*, Recluz, Hedley, Proc. Roy. Soe., Q'land, VI., 1890, p. 242, Cambridge Gulf, Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

NERITA RETICULATA, Karsten, Mus. Lesk, 1789, p. 296, pl. 2, f. 8 ; v. Martens, Conch. Cab., II., 1889, p. 22, pl. 5, f. 1–4, King George's Sound ; Hedley, Proc. Roy. Soc., Q'land., VI., 1890, p. 242. Cambridge Gulf.

NERITA SEMIRUGOSA, Recluz, Rev. Zool. 1841, p. 102 ; v. Martens, Conch. Cab., II., 1889, p. 31, pl. 1, f. 5–6, pl. 5, f. 6–9. King George's Sound.

NERITA UNDATA, Linne, Syst. Nat., X., 1758, p. 779 ; Tryon, Man. Conch., X., 1888, p. 28, pl. 5, f. 86–95 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

THEODOXIS BACONI, Reeve.—*Neritina baconi*, Reeve, Conch. Icon., IX., 1856, pl. 28, f. 127. Swan River.

THEODOXIS CREPIDULARIA, Lamarck.—*Neritina crepidularia*, Lamarck, An. s. vert., VI., 1822, p. 186; von Martens, Conch. Cab., II., 1879, p. 37, pl. 7, f. 1–4; Smith, Journ. Linn. Soc. Zool., XVI., 1881, p. 297. Swan River.

THEOXODIS DRINGI, Recluz.—*Neritina dringi*, Recluz, Proc. Zool. Soc., 1845, p. 121; Sowerby, Thes. Conch., II., 1849, p. 521, pl. 115, f. 197, 198. Hanover Bay.

NAVICELLA ENTRECASTEAUII, Recluz, Rev. Zool. 1841, p. 380; Reeve, Conch. Icon., IX., 1856, pl. 8, f. 32; Gray, Proc. Zool. Soc., 1867, p. 999. King George's Sound (loc. doubtful).

Family—Helicinidæ.

HELICINA WALKERI, Smith, Proc. Malac. Soc., I., 1894, p. 99, pl. 7, f. 26, Queen's, Baudin and Parry Islands; *Aphanoconia baudinensis*, Wagner, Conch. Cab., I., 1909, p. 217, pl. 43, f. 11-13.

Family—Acmaeidæ.

PATELLOIDA ALTICOSTATA, Angas.—*Patella alticostata*, Angas. Proc. Zool. Soc., 1865, p. 56, pl. 2, f. 11; Verco, Trans. Roy. Soc, S.A., XXXVI., 1912, p. 197. Esperance Bay, King George's Sound, Ellensbrook, Yallingup, Bunbury, Rottnest.

PATELLOIDA CALAMUS, Crosse and Fischer.—*Patella calamus*, Crosse and Fischer, Journ. de Conch. 1864, p. 348 and 1865, pl. 3, f. 7, 8; var *polyactina*, Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 199. King George's Sound, Yallingup, Bunbury, Geographe Bay, Cottesloe, Rottnest Island, and Geraldton.

PATELLOIDA CONOIDEA, Quoy and Gaimard, Zool. Astrolabe, III., 1834, p. 355, pl. 71, f. 5–7, King George's Sound. Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 198, Ellensbrook, Rottnest Island.

PATELLOIDA ELONGATA, Quoy and Gaimard, Zool. Astrolabe, III., 1834, p. 358, pl. 71, f. 12–14. King George's Sound.

PATELLOIDA MIXTA, Reeve.—*Patelloida flammea*, Quoy and Gaimard, Zool. Astrolabe, III., 1834, p. 354, pl. 71, f. 15, 16; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 198, King George's Sound, Ellensbrook, Yallingup, Bunbury, and Rottnest Islands; *P. mixta*, Reeve, Conch. Icon., VIII., 1855, pl. XXXIX., fig. 129; Hedley P.L.S. N.S.W., XXXIX., 1914, p. 713.

PATELLOIDA PATELLAVECTA, Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 195, pl. 15, f. 5–7. Cape Naturaliste, King George's Sound, Ellensbrook and Yallingup.

PATELLOIDA PUNCTATA, Quoy and Gaimard, Zool. Astrolabe, III., 1834, p. 365, pl. 71, f. 40-42; Verco. Trans. Roy. Soc., S.A., XXX., 1906, p. 214. King George's Sound.

PATELLOIDA SEPTIFORMIS, Quoy and Gaimard, Zool. Astrolabe, III., 1834, p. 362, pl. 71, f. 43–44. King George's Sound;

Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 199, Ellensbrook, Yallingup.

PATELLOIDA SACCHARINA, Linne.—*Patella s*, Syst. Nat., X., 1758, p. 751 ; Iredale, Proc. Zool. Soc., 1914, p. 670. Monte Bello Islands.

PATELLOIDA SUBUNDULATA, Angas, Proc. Zool. Soc., 1865, p. 155 ; Verco. Trans. Roy. Soc., S.A., XXXVI., 1912, p. 199. Esperance Bay.

Family—Patellidæ.

PATELLA ACULEATA, Reeve, Conch. Icon., VII., 1855, pl. 32, f. 90 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 194. King George's Sound, Yallingup, Ellensbrook.

PATELLA AXIAERATA, Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 193, pl. 15, f. 3, 4. King George's Sound, Rottnest Island.

PATELLA COMPRESSA, Lamarck.—This African species is erroneously recorded by Quoy and Gaimard, Zool. Astrolabe, III., 1834, p. 338, from King George's Sound.

PATELLA CUPREA, Reeve.—This Hawaiian species is erroneously recorded by Reeve, Conch. Icon., VIII., 1854, p. 8, f. 15, from Swan River.

PATELLA HEPATICA, Pritchard and Gatliff, Proc. Roy. Soc., Vict., XV., 1903, p. 194 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 194. Esperance Bay, Albany, Yallingup, Bunbury.

PATELLA INSIGNIS, Menke, Moll. Nov. Holl., 1843, p. 34. W. Australia.

PATELLA GRANATINA, Linne.—Dr. von Martens, Jahrb. Malak. Gesell, I., 1874, p. 143, footnote, notes that Menke, Moll. Nov. Holl., 1843, p. 33, 34, erred in recording three African species, this, *P. granularis*, Linn, and *P. pectinata*, Linn, as W. Australian.

PATELLA NEGLECTA, Gray, King's Intertrop. Austr. II., 1826, pp. 156, 182, 492, King George's Sound ; *P. zebra*, Reeve, Conch. Icon., VIII., 1854, pl. 4, f. 7, Swan River ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 192, Esperance, Hopetoun, King George's Sound, Ellensbrook, Yallingup, Rottnest Island.

PATELLA ONYCHITIS, Menke, Moll. Nov. Holl., 1843, p. 34. W. Australia.

PATELLA PERONII, Blainville, Dict. Sc. Nat., XXXVIII., 1825 p. 111. King George's Sound.

PATELLA STELLÆFORMIS, Reeve, Conch. Syst., II., 1842, p. 15, pl. 136, f. 3 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 194. Esperance Bay, Albany, Ellensbrook, Rottnest Island.

PATELLA USTULATA, Reeve, Conch. Icon., VIII., 1855, pl. 31, f. 88 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 193. Esperance Bay, King George's Sound, Ellensbrook, Yallingup, Bunbury,

CELLANA ILLABRATA, Verco, Trans. Roy. Soc., S.A., XXX., 1906, p. 205, pl. 10, f. 6–14, XXXVI., 1912, p. 192. King

George's Sound, Ellensbrook, Yallingup, Bunbury, Rottnest Island.

CELLANA LIMBATA, Philippi.—*Patella limbatus,* Philippi, Abbild. Beschr., III., 1849, p. 71, pl. 3, f. 2 ; Reeve, Conch. Icon., VIII., 1854, pl. 13, f. 29. Signet (?Cygnet) Bay.

NACELLA CREBRISTRIATA, Verco, Trans. Roy. Soc., S.A., XXVIII., 1904, p. 144, pl. 26, f. 20, 21 ; XXXVI., 1912, p. 195, King George's Sound, Yallingup, Rottnest ; var. *roseoradiata,* Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 195. Ellensbrook, Yallingup.

NACELLA STOWAE, Verco, Trans. Roy. Soc., S.A., XXX., 1906, p. 209, pl. 10, f. 4, 5. King George's Sound, Bunbury, Rottnest.

PHENACOLEPAS ALBORADIATA, Verco, *Scutellina alboradiata,* Verco, Trans. Roy. Soc., S.A., XXX., 1906, p. 217 ; XXXVI., 1912, p. 200. King George's Sound.

PHENACOLEPAS CALVA, Verco.—*Scutellina calva,* Verco, Trans. Roy. Soc., S.A., XXX., 1906, p. 217, pl. 8, f. 9, 10 ; XXXVI., 1912, p., 199. King George's Sound.

ORDER—MONOTOCARDIA.

SUB-ORDER—TÆNIOGLOSSA.

Family—Paludinidæ.

VIVIPARA AMPULLARIOIDES, Reeve. *Paludina ampullarioides,* Conch. Icon., XIV., 1863, pl. 6, f. 30 ; Smith, Zool. Erebus and Terror, 1874, p. 3, pl. 4, f. 19. Fitzroy River.

Family—Cyclophoridæ.

CYCLOPHORUS LIRICINCTUS, Benson.—*Cyclostoma liricinctus,* Benson, Ann. Mag. Nat. Hist., XI., 1853, p. 106 ; Reeve, Conch. Icon., XIII., 1861, pl. 20, f. 100. Swan River.

CYCLOPHORUS ORBICULATUS, Benson.—*Cyclostoma orbiculatus,* Benson, Ann. Mag. Nat. Hist., XI., 1853, p. 106 ; Reeve, Conch. Icon., XIII., 1861, pl. 20, f. 101. Swan River. It is probable that both these Cyclophori are exotic and erroneously referred to Australia.

Family—Littorinidæ.

MELARAPHE UNIFASCIATA, Gray, *Littorina, unifasciata,* Gray, Append. King's Intertrop. Austr., II., 1826 p. 483 ; *Littorina mauritiana,* Reeve, Conch. Icon., X., 1857, pl. 17, f. 100 ; Verco. Trans. Roy, Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

MELARAPHE SCABRA, Linne.—*Helix scabra,* Linne, Syst. Nat., X., 1758, p. 770 ; *Littorina articulata,* Philippi. Abbild. Besch. II., 1847, p. 223, pl. 5, f. 8–11. Swan Point.

MELARAPHE SULCULOSA, Philippi.—*Littorina sulculosa*, Philippi, Proc. Zool. Soc., 1845 (1846), p. 142 ; Abbild., Besch. III., 1847, p. 18, pl. 6, f. 10, Mangrove Island ; von Martons, Forsch. Gazolle, III., 1889, p. 193. Mermaid Strait.

MELARAPHE UNDULATA, Gray.—*Littorina undulata*, Gray, Zool. Beecheys Voy., 1839, p. 140 ; Reeve, Conch. Icon., X., 1857, pl. 13, f. 67 ; Angas, Proc. Zool. Soc., 1865, p. 172. King George's Sound.

TECTARIUS RUGOSUS, Menke.—*Litorina rugosa.*, Menke, Moll. Nov. Holl., 1843, p. 9. Arthur's Head ; Roove, Conch. Icon., X., 1857, pl. 7, f. 32 ; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 203. Goraldton.

PAGODUS BULLATUS, Martyn.—*Trochus bullatus*, Martyn, Univ., Conch., 1784, f. 38 ; *Littorina papillosa*, Lam., Phillipi, Abbild. Beschr., II., 1846, p. 140, pl. 2, f. 2–7. Point Swan. Queen's Islet (J. J. Walker in Brit. Mus).

BEMBICIUM MELANOSTOMA, Gmolin.—*Trochus melanostoma*, Gmelin, Syst. Nat., XIII., 1791, p. 3581 ; *Risella lutea*, Fischer, Coq. Viv. 1879, p. 463, pl. 38, f. 2. King Georgo's Sound ; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 203. Goraldton.

Family—Planaxidæ.

HINEA BRASILIANA, Lamarck.—*Buccinum brasilianum*, Lamarck, An. s. vort., VII., 1822, p. 272 ; Kiener, Coq. Viv., 1834, p. 70, pl. 18, f. 59 ; *Planaxis fulva*, A. Adams, Proc. Zool. Soc., 1851 (1853), p. 271. Swan River.

PLANAXIS SULCATUS, Born.—*Buccinum sulcatus*, Born, Tost. Mus. Caes. Vindob., 1780, p. 256, pl. 10, f. 5, 6 ; Vorco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 203. Geraldton ; Swan Point (in Brit. Mus).

Family—Rissoidæ.

RISSOINA CRASSA, Angas, Proc. Zool. Soc., 1871, p. 17, pl. 1, f. 16 ; Tato, Trans. Roy. Soc. S.A., XXIII., 1899, p. 243. King Goorge's Sound.

RISSOINA FLEXUOSA, Gould, Proc. Bost. Soc. Nat. Hist., VII., 1861, p. 386 ; Sowerby, Conch. Icon., XX., 1878, pl. 11, f. 97 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 204. Geraldton.

RISSOINA NIVEA, A. Adams, Proc. Zool. Soc., 1851 (1853), p. 265 ; Schwartz, Rissoiden, I., 1860, p. 47, pl. 2, f. 10 ; Tate, Trans. Roy. Soc., S.A., XXIII., 1899, p. 239. King George's Sound.

RISSOINA TOXOPLEURA, Tatc.—*Rissoina lirata*, Angas, Proc. Zool. Soc., 1880, p. 417, pl. 40, f. 11 ; *Rissoina toxopleura*, Tate, Trans. Roy. Soc., S.A., XVII., 1893, p. 200. King George's Sound.

RISSOINA WALKERI, Smith, Conchologist, II., 1893, p. 98, text fig. Baudin Island.

Alvania nitens, Frauenfeld.—*Setia nitens*. Frauenfeld, Novara Exped. Moll., 1867, p. 13, pl. 2, f. 22; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

Alvania novariensis, Frauenfeld, Novara Moll., 1867, p. 11, pl. II., f. 16. Cottesloe (Henn).

Amphithalamus petterdi, Brazier.—*Rissoa petterdi*, Brazier, P.L.S., N.S.W., IX., 1895, p. 697; Tate & May, op. cit., XXVI., 1901, pl. 26, f. 73; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

Epigrus ischnus, Tate, Trans. Roy. Soc., S.A., XXIII., 1899, p. 233; Hedley, Mem. Austr. Mus., IV., 1903, p. 356, f. 78. Cottesloe (Henn).

Diala imbricata, A. Adams.—*Alaba imbricata*, A. Adams, Ann. Mag. Nat. Hist., (3), X., 1862, p. 397; Hedley, P.L.S., N.S.W., XXXVIII., 1913, p. 287, pl. 18, f. 61; Tate, Trans. Phil. Soc., Adelaide, II., 1879, p. 137. King George's Sound.

Diala lauta, A. Adams, Ann. Mag. Nat. Hist. (3), X., 1862, p. 298; Tate, Trans. Phil. Soc., Adelaide, II., 1879, p. 137. King George's Sound; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203, Geraldton; Hedley, P.L.S.N.S.W., XXXVIII., 1913, p. 286, pl. 18, f. 58.

Diala monile, A. Adams.—*Alaba monile*, A. Adams, Ann. Mag. Nat. Hist., (3), X., 1862, p. 296; Hedley, P.L.S., N.S.W., XXX., 1906, p. 523, pl. 33, f. 36; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

Diala pagodula, A. Adams.—*Alaba pagodula*, A. Adams, Ann. Mag. Nat. Hist., (3), X., 1862, p. 297; Tate, Trans. Phil. Soc., Adelaide, II., 1879, p. 137; Hedley, P.L.S., N.S.W., XXXVIII., 1913, p. 287, pl. 18, f. 60. King George's Sound.

Alaba vibex, A. Adams, Ann. Mag. Nat. Hist., (3), X., 1862, p. 296; Hedley, P.L.S., N.S.W., XXXVIII., 1913, p. 288, pl. 18, f. 62. Sharks Bay.

Family—Hydrobiidæ.

Assemania (?) granum, Menke.—*Paludina granum*, Menke, Moll. Nov. Holl., 1843, p. 8, Swan River; Philippi, Abbild. Besch., I., 1844, p. 118; *Paludina*, pl. 1, f. 16.

Tatea preissii, Philippi.—*Paludina acuta* (not *Draparnaud*), Menke, Moll. Nov. Holl., 1843, p. 8, Swan River; *P. preissii*, Philippi, Abbild. Beschr., II., 1846, p. 137, pl. 2, f. 12; *Hydrobia p.*, von Martens, Arch. Naturg., XXIV., 1856, p. 185.

Family—Truncatellidæ.

Acmea marginata, Kuster.—*Truncatella marginata*, Kuster, Conch. Cab., I., 1855, p. 12, pl. 2, f. 24–26; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 203. Geraldton.

Acmea scalarina, Cox.—*Truncatella scalarina*, Cox, Mon. Austr. Land Shells, 1868, p. 93, pl. 15, f. 10; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

Coxiella striatula, Menke.—*Truncatella, striatula,* Menke, Moll. Nov. Holl., 1843, p. 9 ; *Blanfordia pyrrhostoma,* Cox, Mon. Austr. Land Shells, 1868, p. 95, pl. 15, f. 14 ; Smith, Proc. Malac. Soc., III., 1898, p. 75. Esperance Bay, Sharks Bay, Cossack.

Coxiella gilesi, Angas.—*Paludina gilesi,* Angas, Proc. Zool. Soc., 1877, p. 170, pl. 26, f. 2 ; var. *mamillata,* Smith, Proc. Malac. Soc., III., 1898, p. 76. Murchison.

Family—Hipponicidæ.

Hipponix antiquata, Linne.—*Patella antiquata,* Linne, Syst. Nat., XII., 1767, p. 1259 ; H. & A. Adams, Genera Rec. Moll., pl. 41, f. 3 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

Hipponix conicus, Schumacher.—*Amalthea conicus,* Schumacher, Essai, 1817, p. 81, pl. 21, f. 4 ; *H. australis,* Quoy & Gaim. not Lamarck, Zool. Astrolabe, III., 1835, p. 434, pl. 72, f. 25–34. King George's Sound ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

Hipponix barbatus, Sowerby, Thes. Conch., I., 1846, p. 369, pl. XIII., fig. 26, 27. Geraldton (Henn).

Family—Capulidæ.

Capulus calyptra, Martyn.—*Patella calyptra,* Martyn, Univ. Conch., 1784, pl. 18 ; *Capulus subfuscus,* Tate, Trans. Phil. Soc., Adelaide, II., 1879, p. 137. King George's Sound ; Hedley, "Endeavour" Results, 1911, p. 109.

Capulus intortus, Lamarck, An. s. vert., VI., 1822, p. 18 ; Pease, Am. Journ. Conch., III., 1867, pl. 24, f. 2. Geraldton (Henn).

Family—Calyptræidæ.

Crepidula aculeata, Gmelin.—*Patella aculeata,* Gmelin, Syst. Nat., XIII., 1791, p. 3693 ; Reeve, Conch. Icon., XI., 1859, pl. 4, f. 22, 27 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

Crepidula capensis, Quoy & Gaimard, Zool. Astrolabe, III., 1835, p. 424, pl. 72, f. 13, 14. Sharks Bay.

Crepidula immersa, Angas, Proc. Zool. Soc., 1865, p. 57, pl. 2, f. 12 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 207, Western Bight, 75 fath.

Sigapatella calyptræformis, Lamarck.—*Trochus,* An. s. vert., VII., 1822, p. 12 ; Quoy & Gaim., Astrolabe Zool., III., 1835, p. 419, pl. 72, f. 1–15. Cottesloe (Henn).

Family—Melaniidæ.

Melania australis, Lea, Proc. Zool. Soc., 1850, p. 185 ; Smith, Zool., Erebus & Terror, 1784, pl. 4, f. 3 ; Journ. Linn. Soc. Zool., XVI., 1881, p. 258. Swan River, Dampier's Archipelago.

Family—Cerithiidæ.

CLAVA BITUBERCULATA, Sowerby.—*Cerithium semigranosum*, Lamarck, 1822, not *Cerithium semigranosum*, Lamarck, 1804 ; Kiener, Coq. Viv., 1842, p. 26, pl. 21, f. 2 ; *Vertagus bituberculata*. Sowerby, Conch. Icon., XV., 1865, pl. 4, f. 17 ; *C. cordigerum*, Bayle, Journ. de Conch., XXVIII., 1880, p. 249 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1812, p. 204. Geraldton, Irwin River.

CLAVA FASCIATA, Bruguiere.—*Cerithium*, Encycl. Meth. vers. (2), 1792, p. 474 ; Iredale, Proc. Zool. Soc., 1914, p. 666. Monte Bello Islands, Irwin River (Austr. Mus.).

CLAVA SINENSIS, Gmelin.—*Murex sinensis*, Gmelin, Syst. Nat., XIII., 1791, p. 3542 ; *Cerithium obeliscus*, Menke, Moll. Nov. Holl., 1843, p. 19 ; N.W. Australia. Sowerby, Conch. Icon, 1865, pl. 2, f. 7.

CERITHIUM ALUCO, Linne.—*Murex aluco*, Linne, Syst. Nat., X., 1758, p. 755 ; Sowerby, Conch. Icon., XV., 1865, pl. 1, f. 3 ; Menke, Moll., Nov. Holl., 1843, p. 19. N.W. Australia.

CERITHIUM CUMINGII, Sowerby, Thes. Conch., II., 1855, p. 850, pl. 176, f. 19. N.W. Australia (Austr. Museum).

CERITHIUM COLUMNA, Sowerby, Genera of Shells, II., 1834, pl. 204, f. 7 ; Menke, Moll. Nov. Holl., 1843, p. 19. W. Australia.

CERITHIUM ICARUS, Boyle, Journ. de Conch., 1880, p. 249; *Bittium variegatum*, Brazier, P.L.S.N.S.W., XIX., 1894, p. 172, pl. 14, fig. 9. Cottesloe (Henn).

CERITHIUM DORSUOSUM, Menke, Zeit. f. Malak., I., 1844, p. 60. W. Australia.

CERITHIUM NOVÆHOLLANDIÆ, Sowerby, Thes. Conch., II., 1855, p. 864, pl. 178, f. 54. West Australia (Dr. Cleland).

ATAXOCERITHIUM SEROTINUM, A. Adams, Thes. Conch., II., 1855, p. 861, p. 180, f. 102. Cottesloe (Henn).

PYRAZUS PALUSTRIS, Linne.—*Strombus palustris*, Linne, Syst. Nat., XII., 1767, p. 1213 ; Reeve, Conch. Icon., XV., 1865, pl. 1, f. 2 ; von Martens, Forsch. Gazelle, III., 1889, p. 193. Mermaid Strait.

PYRAZUS CINGULATUS, Gmelin.—*Murex cingulatus*, Gmelin, Syst. Nat. XIII., 1791, p. 3561 ; *Martini*, Conch. Cab., IV., pl. 157, f. 1492 ; von Martens, Forsch. Gazelle, III., 1889, p. 193. Mermaid Strait.

PYRAZUS SULCATUS, Born.—*Murex sulcatus*, Born, Index Mus. Cæs. Vindob., 1778, p. 324 ; Reeve, Conch. Icon., XV., 1865, pl. 1, f. 1 ; von Martens, Forsch. Gazelle, III., 1889, p. 193. Mermaid Strait.

TELESCOPIUM TELESCOPIUM, Linne.—*Trochus telescopium*, Linne, Syst. Nat. X., 1758, p. 760 ; Reeve, Conch. Icon., XV., 1865, pl. 1 ; f. 1 ; von Martens, Forsch. Gazelle, III., 1889, p. 193. Mermai Strait ; Hedley, Proc. Roy. Soc., Queensland, VI., 1890, p. 241. Cambridge Gulf.

Bittium lawleyanum, Crosse, Journ. de Conch., XI., 1863, p. 87, pl. 1, f. 4 ; Tate, Trans. Phil. Soc., Adelaide, II., 1879, p. 137. King George's Sound.

Bittium granarium, Kiener.—*Cerithium granarium*, Kiener, Coq. Viv., 1842, p. 72, pl. 19, f. 3 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 204. Geraldton.

Triphora aureovincta, Verco, Trans. Roy. Soc., S.A., XXXIV., 1910, p. 126. Rottnest Island (Verco).

Triphora granifera, Brazier, P.L.S., N.S.W., XIX., 1894, p. 173, pl. 19, f. 10 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 204. Geraldton.

Plesiotrochus monachus, Crosse & Fischer.—*Cerithium monachus*, Crosse & Fischer., Journ. de Conch.. 1864, p. 347 ; 1865, p. 43, pl. 3, f. 17, 18 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 204. Geraldton.

Plesiotrochus pagodiformis, Hedley, P.L.S., N.S.W., XXXII., 1907, p. 498, pl. XVII., fig. 16. N.W. Australia (Austr. Museum).

Batillaria diemenense, Quoy & Gaim. — *Cerithium diemenense* Quoy & Gaim, Zool. Astrolabe, III., 1834, p. 128, pl. 55, f. 11–13 ; *C. turritella*, Menke, Moll. Nov. Holl., 1843 p. 19. N.W. Australia.

Ceratoptilus lævis, Quoy & Gaim.—*Cerithium lævie*, *Quoy* and Gaim., Zool. Astrolabe, III., 1834, p. 106, pl. 54, f. 1–3, King George's Sound ; Menke, Moll. Nov. Holl., 1843, p. 19. Garden Island ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 204. Geraldton ; *C. truncatum*, Griffith & Pidgeon, Anim. Kingdom, XII., pl. 13, fig. 1. Irwin's Inlet (S. W. Jackson).

Family—Modulidæ.

Modulus tectus, Gmelin.—*Trochus tectus*, Gmelin, Syst. Nat., XIII., 1791, p. 3569 ; *M. candidus*, Petit, Journ. de Conch, IV., 1853, p. 136, pl. 5, f. 11 ; *M. disculus*, Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton, Monte Bello Islands (in Brit. Museum).

Family—Turritellidæ.

Turritella terebra, Linne.—*Turbo terebra*, Linn, Syst. Nat., X., 1758, p. 766 ; Mawe, Conchology, 1823, pl. 28, f. 3 ; Hedley, Proc. Roy. Soc., Q'land., VI., 1890, p. 242. Cambridge Gulf.

Turritella runcinata, Watson, Chall. Zool. XV., 1886, p. 475, pl. XXX., f. 3 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 208. Western Bight.

Family—Vermetidæ.

Vermicularia flava, Verco, Trans. Roy. Soc., S.A., XXXI., 1907, p. 214, text fig. 1 ; XXXVI., 1912, p. 208. Western Bigh 100 fath.

Vermicularia novæhollandiæ, Rousseau.— *Vermetus, novæhollandiæ,* Chenu, Conch. 1843, Illusts., pl. 1, f. 4. Swan River (Brit. Museum).

Siliquaria anguina, Linne.— *Serpula anguina,* Linne, Syst. Nat., X., 1758, p. 787 ; *Siliquaria anguina,* Sowerby, Conch. Icon., XX., 1878, pl. 2, f. 6 ; von Martens, Forsch. Gazelle, III., 1889, p. 191. Mermaid Straits ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912 p. 209. Western Bight, 100 fath.

Siliquaria ponderosa, Morch.—*Tenagodes ponderosa,* Morch, Proc. Zool. Soc., 1860, p. 409 ; Sowerby, Conch. Icon., XX., 1878, pl 2, f. 3 ; Hedley, Proc. Roy. Soc., Q'land, VI., 1890, p. 241. Cambridge Gulf.

Siliquaria weldii, Tenison Woods.—*Tenagodes weldii,* Ten. Woods, Proc. Roy. Soc., Tasm., 1875 (1876), p. 144 ; Tryon, Man. Conch., VIII., 1886, p. 191, pl. 48, f. 28 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, pp. 204, 209. Geraldton and Western Bight, 100 fath.

Serpulus sipho, Lamarck, An. s. vert., V., 1818, p. 367 ; *Vermetus arenarius,* Quoy & Gaim, Zool. Astrolabe, III., 1834, p. 289, pl. 67, f. 8–19. King George's Sound ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 204. Geraldton.

Family—Ianthinidæ.

Ianthina ianthina, Linne.—*Helix ianthina,* Linn. Syst. Nat., X., 1758, p. 1246 ; Woodward's Manual, 1866, p. 271, f. 117 ; *I. communis,* Menke, Moll. Nov. Holl., 1843, p. 11. Fremantle.

Family—Naricidæ.

Vanikoro expansa, Sowerby, Journ. Malac., VIII., 1901, p. 102, pl. 9, f. 3. North-West Australia.

Vanikoro ligata, Recluz.—*Narica ligata,* Recluz, Proc. Zool. Soc., 1843 (1844), p. 138 ; Recluz, Mag. de. Zool., 1845, p. 22, pl. 121, f. 2 ; Holothuria Banks, 15 fath. (Brit. Museum).

Family—Strombidæ.

Strombus aratum, Martyn.—*Alata aratum,* Martyn, Univ. Conch., 1789, f. 1 ; *Strombus melanostomus,* Menke, Moll. Nov. Holl., 1843, p. 26. North-West Australia.

Strombus australis, Gray, King's Intertropical Austr., II., 1826, p. 489 ; Sowerby, Thes. Conch., I., 1842, p. 36, pl. 9, f. 96, 97 ; Brazier, P.L.S.N.S.W., X., 1886, p. 87, Nicol Bay and Rowley Shoals.

Strombus campbelli, Griffiths & Pidgeon, Cuvier Anim. Kingdom, XII., 1834, p. 600, pl. 25, f. 6 ; Hedley, Proc. Roy. Soc., Qld., VI., 1890, p. 241. Cambridge Gulf.

Strombus dentatus, Linne, Syst. Nat., X., 1758, p. 745 ; Sowerby, Thes. Conch. I., 1842, pl. 7, f. 43, 48 ; Hedley, Proc. Roy. Soc. Queensland, VI., 1890, p. 241. Cambridge Gulf, Torres Island. (Brit. Museum).

Strombus lamarckii, Sowerby, Thes. Conch., I., 1842, p. 35, pl. 9, f. 88, 99 ; Menke. Moll. Nov. Holl., 1843, p. 26. North-West Australia.

Strombus luhuanus, Linne, Syst. Nat., X., 1758, p. 744 ; Sowerby, Thes. Conch., I., 1842, pl. 7, f. 54 ; Menke, Moll. Nov. Holl., 1843, p. 27. West Australia.

Strombus lentiginosus, Linne, Syst. Nat., X., 1758, p. 743 ; Sowerby, Thes. Conch., I., 1842, p. 37, pl. 8, f. 79 ; Menke, Moll. Nov. Holl., 1843, p. 26. West Australia.

Strombus minimus, Bolten.— *Lambis minimus*, Bolten, Mus. Bolt., (2), 1798, p. 65 ; Chemnitz Conch. Cab., X., 1788, pl. 156, f. 1491, 1492 ; *S. turritus*, von Martens, Forsch. Gazelle, III., 1889, p. 194, Mermaid Straits, 4 fath.

Strombus urceus, Linne, Syst. Nat., X., 1758, p. 745 ; *S. floridus*, Sowerby, Thes. Conch., I., 1842, pl. 7, f. 45 ; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 204. Geraldton.

Strombus vittatus, Linne, Syst. Nat., X., 1758, p. 745 ; Sowerby, Thes. Conch., I., 1842, p. 26, pl. 6, f. 27, 31 ; Menke, Moll. Nov. Holl., 1843, p. 27. West Australia.

Pterocera lambis, Linne.—*Strombus lambis*, Linn., Syst. Nat., X., 1758, p. 743 ; Sowerby, Thes. Conch. I., 1842, p. 41, pl. 11, f. 5 ; Menke, Moll. Nov. Holl., 1843, p. 27. West Australia.

Family—Scalariidæ.

Epitonium aculeatum, Sowerby.—*Scalaria aculeata*, Sowerby, Thes. Conch., I., 1844, p. 86, pl. 32, f. 35-37 ; Verco, Trans. Roy. S.A., XXXVI., 1912, p. 203. Geraldton.

Epitonium acuminatum, Sowerby.—*Scalaria acuminata*, Sowerby, Thes. Conch., I., 1844, p. 106, pl. 35, f. 130 ; Brazier, P.L.S., N.S.W., IX., 1884, p. 797. Cossack.

Epitonium australe, Lamarck.—*Scalaria australis*, Lamarck, An. s. vert., VI., 1822, p. 228 ; Sowerby Thes. Conch., I., 1844, p. 103, pl. 35, f. 135. Swan River.

Epitonium confusum, Smith.—*Scalaria confusa*, Smith, Proc. Zool. Soc. 1890, p. 273. West Australia. 92 bis., pl. 33. *S. turricula partim*, Sowerby, Thes. Conch. I., 1844, p. 92, bis., pl. 33, f. 61.

Epitonium costulatum, Kiener.—*Scalaria costulata*, Kiener, Coq. Viv., 1839, p. 5, pl. 2, f. 4 ; Menke, Moll. Nov. Holl., 1843, p. 18. West Australia.

Epitonium friable, Sowerby.— *Scalaria friablis*, Soworby, Thes. Conch., I., 1844, p. 95, pl. 33, f. 74. Swan River.

Epitonium granosum, Quoy & Gaim.—*Turritella granosa*, Quoy & Gaim., Zool. Astrolabe, III., 1834, p. 138, pl. 35, f. 29, 30. King George's Sound ; *Scalaria granulosa*, Sowerby, Thes. Conch., I., 1844, p. 104, pl. 35, f. 144. Swan River.

Epitonium imperiale, Sowerby.—*Scalaria imperialis*, Sowerby, Thes Conch., I., 1844, p. 91, pl. 33, f. 56, 57. Swan River.

Epitonium jukesianum, Forbes.—*Scalaria jukesiana* Forbes, Voy. "Rattlesnake," II., 1852, p. 383, pl. 3, f. 7; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 203. Geraldton.

Epitonium philippinarum, Sowerby.—*Scalaria philippinarum*, Sowerby, Thes. Conch., I., 1844, p. 86, pl. 32, f. 1–3; Brazier, P.L.S., N.S.W., IX., 1884, p. 797. Cossack.

Mesalia melanioides, Reeve, Conch. Icon. V., 1849, pl. 1., fig. 3; *Mesalia exilis*, Sowerby, Ann. Mag. Nat. Hist. XII., p. 236, pl. III., f. 9. West Australia. Smith, op. cit., XV., 1915, p. 370.

Crossea labiata, Tenison Woods, Proc. Roy. Soc., Tasm., 1875 (1876), p. 151; Hedley, P.L.S., N.S.W., XXV., 1900, p. 500, pl. 26, f. 18; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

Family—Pyramidellidæ.

Pyramidella turrita, Adams, Thes. Conch., II., 1854, p. 807, pl. 171, f. 17. Abrolhos.

Turbonilla fusca, Adams.—*Chemnitzia fusca*, Adams, Proc. Zool. Soc., 1853 (1855), p. 181; *Turbonilla erubescens*, Tate, Trans. Phil. Soc., Adelaide, II., 1879, p. 138, pl. 5, f. 10. King George's Sound.

Turbonilla hofmani, Angas.—*Turbonilla nitida*, Angas (not Adams), Proc. Zool. Soc., 1867, p. 112, pl. 13, f. 9; *Turbonilla hofmani*, Angas. Proc. Zool. Soc., 1877, p. 183; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

Cingulina spina, Crosse & Fischer.—*Turritella spina*, Crosse & Fischer, Jour. de Conch., XII., 1864, p. 347; XIII., 1865, p. 44, pl. 3, f. 13–14; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 203. Geraldton.

Syrnola tincta, Angas, Proc. Zool. Soc., 1871, p. 15, pl. 1, f. 11; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

Odostomia pupaeformis, Souverbie.—*Pyramidella pupaeformis*, Souverbie, Journ. de Conch., XIII., 1865, p. 152, pl. 5, f. 4; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

Odostomia simplex, Angas, Proc. Zool. Soc. 1871, p. 15, pl. 1, f. 10; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 203. Geraldton.

Odostomia vincentina, Tryon, Man. Conch., VIII., 1886, p. 362, pl. 79, f. 72; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

Oscilla tasmanica, Tenison Woods.—*Parthenia tasmanica*, T. Woods, Proc. Roy. Soc., Tasmania, 1876 (1877), p. 150; *Oscilla ligata*, Angas, Proc. Zool. Soc. 1877, p. 173, pl. 26, f. 11; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

Family—Strombiformidæ.

EULIMA MONTAGUEANA, Iredale, Proc. Zool. Soc., 1914, p. 672, figs. A. B. Monte Bello Islands.

STROMBIFORMIS MONTEBELLOENSIS, Iredale, Proc. Zool. Soc., 1914, p. 673, fig. C. Monte Bello Islands.

Family—Architectonicidæ.

ARCHITECTONICA PERDIX, Hinds.—*Solarium perdix*, Hinds, Proc. Zool. Soc., 1844, p. 22 ; Hanley, Thes. Conch., III., 1863, p. 233, pl. 251, f. 17, 18. N.W. Australia.

Family— Cymatiidæ.

CHARONIA LAMPAS LINNE VAR. EUCLIA, Hedley, Zool. Results "Endeavour," II., 1914, p. 65, pl. VIII., fig. 1. Western Bight, 100 fath.

CHARONIA AUSTRALASIA, Perry.—*Biplex australasia*, Perry, Conchology, 1811, pl. 4, f, 2, 4 ; Quoy & Gaim., Zool. Astrolabe, II., 1833, p. 546, pl. 40, f. 3, 4. King George's Sound ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 220. Western Bight, 100 fath.

CYMATIUM AQUATILE, Reeve, Triton, Conch. Icon. II., 1844, pl. VII., f. 24 ; Iredale, Proc. Zool. Soc., 1844, p. 666. Monte Bello Islands.

CYMATIUM AUSTRALASIÆ, Perry, Monoplex, Conchology, 1811, pl. 3, f. 3 ; Hedley, P.L.S., N.S.W., XXXIX., 1914, p. 719. Western Bight.

CYMATIUM CANALIFERUM, Lamarck.—*Triton canaliferum*, Lamarck, An. s. vert., VII., 1822, p. 184 ; Kiener, Coq. Viv., 1842, p.5, pl. 13, f. 2. N.W. Australia (Brit. Museum).

CYMATIUM EXARATUM, Reeve.—*Triton exaratum*, Reeve, Conch. Icon., II., 1844, pl. 13, f. 50. Exmouth Gulf (Brit. Museum).

CYMATIUM LABIOSUM, Wood.—*Triton labiosum*, Wood, Index Test. Suppl., 1828, pl. 5, f. 18 ; Reeve, Conch. Icon., II., 1844, pl. 14, f. 52, West Australia ; var *rutilum*, Menke Moll. Nov. Holl. Spm. 1843, p. 25, Cottesloe (Henn).

CYMATIUM QUOYI, Reeve.—*Triton quoyi*, Reeve, Conch. Icon., II., 1844, pl. 19, f. 93. Irwin River (Australian Museum).

CYMATIUM SUBDISTORTUM, Lamarck.—*Triton subdistortum*, Lamarck, An. s. vert., VII., 1822, p. 186 ; Reeve, Conch. Icon., II., 1844, pl. 1, f. 2. King George's Sound.

CYMATIUM TABULATUM, Menke.—*Triton tabulatum*, Menke, Moll. Nov. Holl., 1843, p. 25. West Australia.

CYMATIUM TUBEROSUM, Lamarck.—*Triton tuberosum*, Lamarck, An. s. vert., VII., 1822, p. 185 ; Reeve, Conch. Icon., II., 1844, pl. 1, f. 1. Irwin River (Austr. Museum).

CYMATIUM VESPACEUM, Lamarck.—*Triton vespaceum*, Lamarck, An. s. vert., VII., 1822, p. 185 ; Kiener, Coq. Viv., 1842, p. 18, pl. 3, f. 2 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 218, Western Bight, 100 fath. Roebuck Bay (Brit. Museum).

Cymatium verrucosum, Reeve.—*Triton verrucosum*, Reeve, Conch. Icon., II., 1844, pl. 17, f. 71; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 218. Western Bight, 100 fath.

Argobuccinum tumidum, Dunker.—*Ranella tumidum*, Dunker, Proc. Zool. Soc., 1862, p. 239; *Bursa tumidum*, Dunker, Nov. Conch., 1864, p. 56, pl. 18, f. 8, 9; *Ranella vexillum*, Menke, Moll. Nov. Holl., 1843, p. 24. West Australia.

Bursa granularis, Bolten.—*Tritonium granulare*, Bolten, Mus. Bolt. (2), 1798, p. 127; *Ranella granifera*, Menke, Moll. Nov. Holl., 1843, p. 24, West Australia; Reeve, Conch. Icon., II., 1844, pl. 6. f. 30, Abrolhos. (Austr. Museum).

Gyrineum ranelloides, Reeve.—*Triton ranelloides*, Reeve, Conch. Icon. I., 1844, pl. 3, f. 10; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 219. Western Bight, 100 fath.

Family—Cassidæ.

Cassidea adcocki, Sowerby.—*Cassis adcocki*, Sowerby, Proc. Malac. Soc., II., 1896, p. 14, text fig.; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 217. Western Bight, 100 fath.

Cassidea paucirugis, Menke.—*Cassis paucirugis*, Menke, Moll. Nov. Holl., 1843, p. 23, West Australia; Reeve, Conch. Icon., V., 1848, pl. 8, f. 19.

Cassidea pyrum, Lamarck.—*Cassis pyrum*, Lamarck, An. s. vert., VII., 1822, p. 226; Kiener, Coq. Viv., 1835, p. 39, pl. 13, f. 25; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 217. Western Bight, 100 fath.

Cassidea semigranosa, Lamarck.—*Cassis semigranosa*, Lamarck, An. s. vert., VII., 1822, p. 228; Kiener, Coq. Viv., 1835, p. 36, pl. 14, f. 29; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 217. Western Bight, 100 fath.

Cassis fimbriata, Quoy & Gaimard, Zool. Astrolabe, II., 1833, p. 596, pl. 43, f. 7, 8; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 216. Western Bight, 100 fath.

Family—Tonnidæ.

Tonna kieneri, Philippi.—*Dolium kieneri*, Philippi, Abbild. Besch., III., 1847, p. 36, Exmouth Gulf (Brit. Museum). ; Kiener Coq. Viv., pl. 2, f. 3.

Tonna perdix, Linne.—*Buccinum perdix*, Linn. Syst. Nat., X., 1758, p. 734; Quoy & Gaimard, Zool. Astrolabe, II., 1833, p. 598, pl. 41, f. 1, f, 8. Dirk Hartog.

Tonna variegata, Lamarck.—*Dolium variegata*, Lamarck, An. s. vert., VII., 1822, p. 261; Philippi, Abbild. Besch., III., 1847, p. 36, pl. 1, f. 2, Sharks Bay; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, pp. 204, 216. Geraldton, Western Bight, 100 fath.

Malea pomum, Linne.—*Buccinum pomum*, Linn. Syst. Nat., X., 1758, p. 735; Menke, Moll. Nov. Holl., 1843, p. 22, W. Australia; Reeve, Conch. Icon. V., 1848, pl. 4, f. 6, Abrolhos (Austr. Museum).

FICUS TESSELLATUS, Kobelt.—*Ficula tessellatus*, Kobelt, Conch. Cab., III., 1881, p. 12, pl. 2, f. 3; Smith, Journ. Malac., III., 1894, p. 69, Swan River, Dampier Archipelago; Brazier, P.L.S., N.S.W., IX., 1884, p. 796, Cossack; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 218, Western Bight, 100 fath.

Family—Naticidæ.

NATICA ALBULA, Bolten.—*Cochlis albula*, Bolten, Mus. Bolt. (2), 1798, p. 146; *Natica globosa*, Reeve, Conch. Icon., IX., 1853, pl. 11, f. 46; Brazier, P.L.S., N.S.W., IX., 1884, p. 796. Cossack.

NATICA EUZONA, Recluz Journ. de Conch., I., 1850, pl. 14, f. 3. Torres Island, N. W. Australia (Brit. Museum).

NATICA MICROSTOMA, Quoy & Gaimard, Zool. Astrolabe, II., 1832, p. 232, pl. 66, f. 9. King George's Sound. Jay. Cat. shells (4) 1850, p. 293.

NATICA COLLIEI, Recluz, Proc. Zool. Soc., 1843 (1844), p. 206, Swan River; Reeve, Conch. Icon., IX., 1855, pl. 24, f. 112; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203, Geraldton; ? *Natica sertata*, Menke, Moll. Nov. Holl., 1843, p. 10. W.A.

NATICA ROBILLARDI, Sowerby, var. *ren* Preston.—*Natica ren*, Preston, Proc. Malac. Soc., XI., 1914, p. 14, fig. *Natica robillardi*, Sowerby, Proc. Malac. Soc., I., 1894, p. 43, pl. 4, f. 12. Monte Bello Islands.

NATICA SOLIDA, Blainville, Man. Malac., 1827, pl. 36, bis., f. 8; Brazier, P.L.S., N.S.W., IX., 1884, p. 797, Cossack; Torres and Gartier Islands. (Brit. Museum).

NATICA VITELLUS, Linne, Syst. Nat. X., 1758, p. 776; Hedley, P.L.S., N.S.W., XXXVIII., 1913, p. 299; Iredale, Proc. Zool. Soc. 1914, p. 674, Monte Bello Islands.

NATICA TIGRINA, Bolten.—*Cochlis tigrina*, Bolten, Mus. Bolt. (2), 1798, p. 147; Sowerby, Thes. Conch., V., 1883, p. 81, pl. 460, f. 83. Swan River.

POLINICES CONICUS, Lamarck.—*Natica conica*, Lamarck, An. s. vert., VI., 1822, p. 198; *Natica pyramis*, Reeve, Conch. Icon., IX., 1855, pl. 21, f. 93, Swan River; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203, Geraldton.

POLINICES FILOSUS, Reeve.—*Natica filosa*, Reeve, Conch. Icon., IX., 1855, pl. 17, f. 72. West Australia (Australian Museum).

POLINICES GRUNERIANUS, Philippi. — *Natica grunerianus*, Philippi, Conch. Cab., III., 1852, p. 47, pl. 7, f. 6; Brazier, P.L.S., N.S.W., IX., 1884, p. 797. Cossack.

POLINICES INCEI, Philippi.—*Natica incei*, Philippi. Proc. Zool. Soc., 1851 (1853), p. 233; *N. baconi*, Reeve, Conch. Icon., IX., 1855, pl. 10, f. 37. Swan River.

POLINICES JUKESI, Reeve.—*Natica jukesi*, Reeve, Conch. Icon., IX., 1855, pl. 19, f. 84; Brazier, P.L.S., N.S.W., IX., 1884, p.797. Cossack.

POLINICES, MAMMILA, Linne.—*Nerita mammila*, Linne, Syst. Nat., X., 1758, p. 776 ; *N. pyriformis*, Reeve, Conch. Icon., IX., 1855, pl. 5, f. 16. Swan River.

POLINICES MELANOSTOMA, Gmelin. — *Nerita melanostoma*, Gmelin, Syst. Nat., XIII., 1791, p. 3674 ; Reeve, Conch. Icon., IX., 1855, pl. 8, f. 30. Shark Bay (Australian Museum).

POLINICES PLUMBEA, Lamarck.—*Natica plumbea*, An. s. vert., VI., 1822, p. 198 ; Quoy & Gaimard, Zool. Astrolabe, II., 1832, p. 321, pl. 66, f. 13–15. King George's Sound.

SINUM ZONALE, Quoy & Gaimard.—*Cryptosoma zonale*, Quoy and Gaim., Zool. Astrolabe, II., 1832, p. 221, pl. 66 bis, f. 1–3. King George's Sound.

EUNATICINA PAPILLA, Gmelin.—*Nerita papilla*, Gmelin, Syst. Nat., XIII., 1791, p. 3675 ; Tryon, Man. Conch., VIII., 1886, p. 58, pl. 25, f. 78, 79, 87, 88 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 203. Geraldton.

Family—Lamellaridæ.

MARSENIOPSIS CONTUSIFORMIS, Basedow.—*Caledoniella contusiformis*, Basedow, Trans. Roy. Soc., S.A., XXIX., 1905, p. 183, pl. 27–29, f. 1 ; Verco, op. cit., XXXVI., 1912, p. 207. Western Bight, 100 fath.

Family—Cypræidæ.

CYPRÆA ANNULUS, Linne, Syst. Nat., 1758, p. 723 ; Menke, Moll. Nov. Holl., 1843, p. 30. West Australia ; Sowerby, Thes. Conch., IV., 1870, pl. 26, f. 252–3.

CYPRÆA ARABICA, Linne, Syst. Nat., X., 1758, p. 718 ; Sowerby, Thes. Conch., IV., 1870, pl. 10, f. 59–61 ; Menke, Moll. Nov. Holl., 1843, p. 29. West Australia.

CYPRÆA CAPUTSERPENTIS, Linne, Syst. Nat., X., 1758, p. 720 ; Sowerby, Thes. Conch., IV., 1870, pl. 12, f. 72, 73 ; Menke, Moll. Nov. Holl., 1843, p. 29. Garden and Carnac Islands ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 204. Geraldton ; Iredale, Proc. Zool. Soc., 1914, p. 667. Monte Bello Islands.

CYPRÆA CARNEOLA, Linne, Syst. Nat., X., 1758, p. 719 ; Sowerby, Thes. Conch., IV., 1870, pl. 3, f. 11 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 204. Geraldton.

CYPRÆA CAURICA, Linne, Syst. Nat., X., 1758, p. 723 ; Sowerby, Thes. Conch., IV., 1870, pl. 23, f. 188–193 ; Menke, Moll. Nov. Holl., 1843, p. 30. W. Australia ; Iredale, Proc. Zool. Soc., 1914, p. 667. Monte Bello Islands.

CYPRÆA CITRINA, Gray, Zool Journ., I., 1824, p. 509 ; Sowerby, Thes. Conch., IV., 1870, pl. 25, f. 218–9 ; Brazier, P.L.S., N.S.W., VII., 1882, p. 322, Rowley Shoals.

CYPRÆA COXI, Brazier, Proc. Zool. Soc., 1872, p. 617, pl. 44, f. 3. Depuch Island.

CYPRÆA CYLINDRICA, Born, Index Mus. Cæs. Vind., 1778, p. 169 ; Sowerby, Thes. Conch., IV., 1870, pl. 27, f. 266–268 ; Brazier, P.L.S., N.S.W., VII., 1882, p. 322. Rowley Shoals ; Iredale, Proc. Zool Soc., 1914, p. 667. Monte Bello Islands.

Cypræa decipiens, Smith, Proc. Zool. Soc., 1880, p. 482, pl. 48, f. 8 ; 1881, p. 558. Port Walcot.

Cypræa erosa, Linne, Syst. Nat., X., 1758, p. 723 : Sowerby, Thes. Conch., IV., 1870, pl. 18, f. 110–115 ; Iredale, Proc. Zool. Soc., 1914, p. 667. Monte Bello Islands.

Cypræa errones, Linne, Syst. Nat., X., 1758, p. 723 ; Sowerby, Thes. Conch. IV., 1870, pl. 20, f. 156–8 ; Menke, Moll. Nov. Holl., 1843, p. 30, W. Australia ; Iredale, Proc. Zool. Soc., 1914, p. 667. Monte Bello Islands.

Cypræa fallax, Smith, Ann. Mag. Nat. Hist., (5), VIII., 1881, p. 441. W. Australia ; Hidalgo, Monog. Cypræa, 1907, p. 324.

Cypræa friendii, Gray, Zool. Miscell., 1831, p. 29 ; *C. scotti*, Reeve, Conch. Icon., III., 1845, pl. 4, f. 10. Swan River.

Cypræa helvola, Linne, Syst. Nat., X., 1758, p. 724 ; Sowerby, Thes. Conch., IV., 1870, pl. 25, f. 214–7 ; Brazier, P.L.S., N.S.W., VII., 1882, p. 322. Rowley Shoals.

Cypræa irvinæ, Cox, P.L.S., N.S.W., IV., (2), 1900, p. 659, pl. 19, f. 7–9. Cape Naturaliste.

Cypræa isabella, Linne, Syst. Nat., X., 1758, p. 722 ; Sowerby, Thes. Conch., IV., 1870, pl. 4, f. 16–18 ; Menke, Moll. Nov. Holl., 1843, p. 29. W. Australia.

Cypræa lutea, Gronovius, Zoophylac., III., 1781, p. 5, pl. 19, f. 17 ; Brazier, Proc. Zool. Soc., 1872, p. 84. Nicol Bay.

Cypræa lynx, Linne, Syst. Nat., X., 1758, p. 721 : Reeve, Conch. Icon., III., 1845, pl. 9, f. 33 ; Menke, Moll. Nov. Holl., 1843, p. 28. W. Australia.

Cypræa mauritiana, Linne, Syst. Nat., X., 1758, p. 721 ; Sowerby, Thes. Conch., IV., 1870, pl. 9, f. 51–2 ; Brazier, P.L.S., N.S.W., VII., 1882, p. 322. Rowley Shoals.

Cypræa moneta, Linne, Syst. Nat. X., 1758, p. 723 ; Sowerby, Thes. Conch., IV., 1870, pl. 26, f. 244–251 ; Menke, Moll. Nov. Holl., 1843, p. 30. W. Australia ; Iredale, Proc. Zool. Soc., 1914, p. 667. Monte Bello Islands.

Cypræa piperita, Gray, Zool. Journ., I., 1825, p. 498 ; Reeve, Conch. Icon., III., 1846, pl. 17, f. 87 ; Menke, Moll. Nov. Holl., 1843, p. 30. W. Australia.

Cypræa pulicaria, Reeve, Conch. Icon., III., 1846, pl. 17, f. 84 ; Hidalgo, Mon. Cyp., Viv., 1907, p. 480. Geographe Bay ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 210. Western Bight, 100 fath.

Cypræa reevei, Sowerby, Conch., Illustr., Cypræa, 1832, f. 52 ; Reeve, Conch. Icon., III., 1845, pl. 11, f. 41, Garden Island ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 210. King George's Sound, Western Bight, 100 fath.

Cypræa reticulata, Martyn, Univ. Conch., 1784, pl. 15 ; Brazier, P.L.S., N.S.W., VII., 1882, p. 322. Rowley Shoals.

Cypræa scurra, Gmelin, Syst. Nat., XIII., 1791, p. 3409; Sowerby, Thes. Conch., IV., 1870, pl. 9, f. 53–56; Menke, Moll. Nov. Holl., 1843, p. 29. W. Australia.

Cypræa subcylindrica, Sowerby, Thes. Conch., IV., 1870, p. 21, pl. 27, f. 269, 270; Brazier, P.L.S., N.S.W., VII., 1882, p. 322. Rowley Shoals.

Cypræa subviridis, Reeve, Conch. Icon., III., 1845, pl. 12, f. 48. Depuch Island; Brazier, Journ. of Conch., II., 1879, p. 321. Nicol Bay.

Cypræa thersites, Gaskoin, Proc. Zool. Soc., 1848, p. 90; Sowerby, Thes. Conch., IV., 1870, pl. 8, f. 49–50; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 209. Western Bight, 100 fath.

Cypræa tigris, Linne, Syst. Nat., X., 1758, p. 721; Sowerby, Thes. Conch., IV., 1870, pl. 21, f. 172, 175; Menke, Moll. Nov. Holl., 1843, p. 28. West Australia.

Cypræa umbilicata, var. armeniaca, Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 211, pl. 10. Western Bight, 100 fath.

Cypræa vinosa, Gmelin, Syst. Nat., XIII., 1791, p. 3421; *C. pantherina*, Sowerby, Thes. Conch. IV., 1870, pl. 11, f. 69–71; Brazier, P.L.S., N.S.W., VII., 1887, p. 322. Rowley Shoals.

Cypræa vitellus, Linne, Syst. Nat., X., 1758, p. 721; Sowerby, Thes. Conch., IV., 1870, pl. 6, f. 31–33; Menke, Moll. Nov. Holl., 1843, p. 29. W. Australia.

Cypræa venusta, Sowerby, Ann. Mag. Nat. Hist., XIX., 1847, p. 346; Cox, P.L.S., N.S.W., IV., 1889, p. 187, pl. 15, f. 1, 2. Cape Naturaliste; *C. thatcheri*, Cox, Proc. Zool. Soc., 1869, p. 358, pl. 26, f. 1. Dampier's Archipelago.

Cypræa wilhelmina, Kenyon, P.L.S., N.S.W., XXII., 1897, p. 145. West Australia.

Trivia australis, Lamarck.—*Cypræa australis*, Lamarck, An. s. vert., VII., 1822, p. 404; Reeve, Conch. Icon., III., 1846, pl. 24, f. 138; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 215, Western Bight, 80 fath.

Trivia globulus, Linne.—*Cypræa globulus*, Linne, Syst. Nat., X., 1758, p. 725; Sowerby, Thes. Conch., IV., 1870, p. 41, pl. 322, f. 347–8. West Australia (Austr. Museum).

Trivia napolina, Kiener.—*Cypræa napolina*, Kiener, Coq. Viv., 1845, p. 144, pl. 53, f. 3; *C. obscura*, Gaskoin, Proc. Zool. Soc., 1848 (1849), p. 94. Abrolhos and Depuch Islands.

Ovulum depressum, Sowerby, Proc. Zool. Soc., 1875, p. 128, pl. 24, f. 1. North-West Australia.

Ovulum haynesi, Sowerby, Journ. Linn. Soc. Zool., XX., 1889, p. 397, pl. 25, f. 1, 2. Exmouth Gulf.

Ovulum philippinarum, Sowerby, Proc. Zool. Soc., 1848, p. 136; Thes. Conch., II., 1855, p. 481, pl. 100, f. 57, 58; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 216. Western Bight, 72 fath.

Sub-Order—Stenoglossa.

Family—Volutidæ.

Ericusa fulgetrum, Sowerby.—*Voluta fulgetrum*, Sowerby, Tank. Cat., 1825, p. 81, pl. 4, 5; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 222, pl. 11, 12. Western Bight, 100 fath.

Ericusa papillosa, Swainson.—*Voluta papillosa*, Swainson, App. Bligh Cat., 1822; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 228, pl. 14, f. 1–3. Western Bight, 100 fath.

Livonia roadnightæ, McCoy.—*Voluta roadnightæ*, McCoy, Ann. Mag. Nat. Hist., 1881, 5. (VIII.), p. 89, pl. 7, f. 1, 2; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 226. Western Bight, 100 fath.

Cymbiola coniformis, Cox.—*Voluta coniformis*, Journ. de Conch., XIX., 1871, p. 74, pl. 4, f. 1, Nicol Bay.

Cymbiola irvinæ, Smith.—*Voluta irvinæ*, Smith, Ann. Mag. Nat. Hist., 8. (IV.), 1909, p. 97, pl. 5. Rottnest Island.

Cymbiola nivosa, Lamarck.—*Voluta nivosa*, Lamarck, Ann. du Mus., V., 1804, p. 158, pl. 12, f. 2, 3. Sharks Bay; var. *oblita*, Smith; *Voluta oblita*, Smith, Ann. Mag. Nat, Hist., 8, (IV.), 1909 p. 96. Depuch Island, Nicol Bay, Monte Bello Islands, Camden Harbour, King George's Sound.

Cymbiola nodiplicata, Cox.—*Voluta nodiplicata* Cox, Proc. Malac. Soc., IX., 1910, p. 146, pl. 3. Rottnest Island; *S. dannevigi*, Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 225, pl. 13, f. 1, 2. Western Bight, 100 fath.

Cymbiola verconis, Tate.—*Voluta verconis* Tate, Trans. Roy. Soc., S.A., XV., 1892, p. 125, pl. 1, f. 5; Verco, XXXVI., 1912, p. 224. Western Bight, 100 fath.

Cymbiola guntheri, Smith.—*Voluta guntheri*, Smith, Journ. of Conch., V., 1886, p. 62. W. Australia; Sowerby, Thes. Conch., V., 1887, p. 302, pl. 516, f. 162, 163.

Scaphella damoni, Gray.—*Amoria damoni*, Ann. Mag. Nat. Hist., 1864, p. 237. *V. reticulata*, Reeve, Conch. Icon., VI., 1849, pl. XI., fig. 25; Petterd, Journ. of Conch., II., 1879, p. 342. Ashburton River and Tien Tsin Creek; von Martens, Forsch. Gazelle, III., 1889, p. 191. Mermaid Strait; *Scaphella hedleyi*, Iredale, Proc. Zool. Soc., 1914, p. 674. Monte Bello Islands, Baudin Island.

Scaphella mariaemma, Gray.—*Scapha mariaemma*, Gray, Proc. Zool. Soc., 1859, p. 230, pl. 48, North-West Australia; *V. grayæ*, Crosse, Journ. de Conch., XIX., 1871, p. 287.

Voluta ruckeri, Crosse.—Described from Nicol Bay, West Australia, by Crosse, Journ. de Conch., XVI., 1868, p. 97, pl. 1, f. 1., locality shown to be erroneous by Brazier, Proc. Zool. Soc., 1869, p. 560.

Scaphella translucida, Verco.—*Voluta translucida*, Verco, Trans. Roy. Soc., S.A., XX., 1896, p. 217, pl. 6, f. 4; XXXVI., 1912, p. 225. Western Bight, 100 fath.

Scaphella turneri, Griffith & Pidgeon.—*Voluta turneri,* Griffith & Pidgeon, Cuvier Anim. Kingd. Moll., XII., 1834, p. 601, pl. 40, f. 1.

Scaphella undulata, Lamarck.—*Voluta undulata,* Lamarck, Ann. Mus. Hist. Nat., V., 1804, p. 157, pl. 12, f. 1 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 222. Western Bight, 100 fath.

Scaphella volva, Gmelin.—*Voluta volva,* Gmelin, Syst. Nat. XIII., 1791, p. 3457 ; *Voluta pallida,* Griffith & Pidgeon, Cuvier Anim. Kingd., V., 1834, p. 601, pl. 30, f. 4 ; Petterd, Journ. of Conch., II., 1879, p. 342. North-West Australia.

Var. macandrewi, Sowerby, Thes. Conch., V., 1887, p. 297, pl. 513, f. 140–1 ; Barrow Island (Brit. Museum).

Var. ellioti, Sowerby, Aug.. 1864 (= *jamrachi,* Gray, Sept., 1864), Journ. de Conch., XIII., 1865, p. 25, pl. 3, f. 19. Nicol Bay.

Var. cumingii, Gray, Ann. Mag. Nat. Hist., 1864, p. 237.

Var. broderipii, Gray, Ann. Mag. Nat. Hist., 1864, p. 237.

Scaphella prætexta, Reeve, Conch. Icon., VI., 1849, pl. 12, f. 29, Petterd, Journ. of Conch., II., 1879, p. 343, Tien Tsin Creek, Flying Foam Passage, Dolphin Island.

Scaphella zebra, Leach.—*Voluta zebra,* Leach, Zool. Miscell., I., 1814, p. 31, pl. XII., f. 1. ; Iredale, Proc. Zool. Soc., 1914, p. 667. Monte Bello Island.

Cymbium flammeum, Bolten, Mus. Bolt. (2), 1798, p. 151 ; *V. æthiopica,* Blainville, Zool. Uranie & Physicienne, 1825, p. 447. Shark Bay ; *V. georginæ,* Gray, Cuvier Anim. Kingd., 1834, p. 601, pl. 34, Swan River ; *C. diadema,* Menke, Moll. Nov. Holl., 1843, p. 31, W. Australia ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 229. Western Bight, 95 fath.

Family—Olividæ.

Ancilla cingulata, Sowerby.—*Ancillaria cingulata,* Sowerby, Spec. Conch., 1830, p. 6, f. 36, 37 ; Bailey, P.L.S., N.S.W., IX., 1884, p. 508. Cossack.

Ancilla coccinea, Hedley, Zool. Result "Endeavour," 1914, ii., p. 67, pl. 10, f. 3. Western Bight, 100 fath.

Ancilla elongata, Gray.—*Ancillaria elongata,* Gray, Append. Voy. Fly, II., 1847, p. 357, pl. 1, f. 5, Depuch Island ; Bailey, P.L.S., N.S.W., IX., 1884, p. 508, Cossack ; Iredale, Proc. Zool. Soc., 1914, p. 667. Monte Bello Island.

Ancilla lineata, Kiener.—*Ancillaria lineata,* Kiener, Coq. Viv., 1844, p. 16, pl. 3, f. 2 ; *A. monilifera,* Reeve, Conch. Icon., XV., 1864, pl. 10. f. 36. Swan River.

Ancilla oblonga, Sowerby.—*Ancillaria oblonga,* Sowerby, Spec. Conch., 1830, p. 7, F. 38, 39 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 230. Western Bight, 100 fath.

Oliva australis, Duclos, Monog. Oliva, 1835, sp. 54, pl. 8, f. 3, 4 ; Gray, Cat. Olividæ, Brit. Museum, 1865, p. 15. Swan River ; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 204. Geraldton.

Oliva bicincta, Lamarck, An. s. vert., VII., 1822, p. 429, Encyclop. pl. 364, f. 1 ; Menke, Moll. Nov. Holl., 1843, p. 28. North-West Australia.

Oliva brettinghami, Bridgeman, Proc. Malac. Soc., VIII., 1909, p. 203, text fig. North-West Australia.

Oliva caerulea, Bolten.—*Porphyria caerulea,* Bolten, Mus. Bolt. (2), 1798, p. 33 ; Marrat, Thes. Conch., IV., 1871, p. 8, pl. 331, f. 48–50 ; *O. episcopalis and lugubris,* Menke, Moll. Nov. Holl. 1843, p. 28. North-West Australia.

Oliva caldania, *Duclos.*—Mon. Oliv. 1835, pl. 6, f. 3, 4 ; Bailey, P.L.S., N.S.W., IX., 1884, p. 508. Cossack.

Oliva sericea, Bolten var., miniacea, Bolten.—*Porphyria sericea,* Bolten, Mus. Bolt., 1798, for Conch. Cab., II., 1773, pl. 51, f. 559 ; *Porphyria miniacea,* Bolten, Mus. Bolt. (2), 1798, p. 33 ; *O. erythrostoma,* Quoy & Gaimard, Zool. Astrolabe, III., 1834, p. 8, pl. 48, f. 7–19 ; Menke, Moll. Nov. Holl., 1843, p. 27. North-West Australia.

Oliva sericea, Bolten var., ornata, Marrat, Ann. Mag. Nat. Hist. (3), XX., 1867, p. 214. West Australia ; Marrat, Thes. Conch., IV., 1871, p. 13, pl. 334, f. 102, 103.

Oliva scripta, Lamarck.—This West Indian species was erroneously recorded from North-West Australia by Menke, Moll., Nov. Holl., 1843, p. 28.

Oliva venulata, Lamarck.—Menke recorded this, Moll. Nov. Holl., 1843, p. 28, from West Australia, but Weinkauff, Jahrb. Malak. Gesell., V., 1878, p. 116, points that out it is really from West America.

Family—Marginellidæ.

Marginella albina, Gaskoin.—This is a synonym for the Sydney shell *M. turbinata,* Sowerby, and was wrongly reported from N.W. Australia by Gaskoin, Ann. Mag. Nat. Hist., 2 (XI.), 1853, p. 358.

Marginella angasi, Crosse, Journ. de Conch., XIX., 1871, p. 324, pl. 12, f. 3 ; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 204. Geraldton.

Marginella australis, Hinds, Proc. Zool. Soc., 1844, p. 75. North-West Australia ; Sowerby, Thes. Conch., I., 1846, p. 386, pl. 75, f. 64, 65.

Marginella deburghi, A. Adams, Proc. Zool. Soc., 1863, p. 509. Swan River ; Reeve, Conch. Icon., XV., 1865, pl. 15, f. 68.

Marginella laevigata, Brazier, P.L.S., N.S.W., I., 1877, p. 225 ; Hedley, Rec. Aust. Mus., VIII., 1912, p. 146, pl. 42, f. 27 ; *M. baudinensis,* Smith, Proc. Malac. Soc., III., 1899, p. 209, f. 2. Baudin Islands, and Holothuria Banks.

Marginella liturata, Menke, Moll. Nov. Holl., 1843, p. 28. West Australia. Locality doubtful.

MARGINELLA PHILIPPINARUM, Redfield, Ann. N.Y., Lyc. Nat. Hist., IV., 1846, p. 492, pl. 17, f. 3. Holothuria Banks (Brit. Museum).

MARGINELLA PULCHELLA, Kiener, Coq. Viv., 1830, p. 27, pl. 9, f. 40; *M. shepstonensis*, Smith, Ann. Natal Mus., I., 1906, p. 31, pl. 7, f. 5, Cossack (Brit. Museum); *M. fulgurata*, Hedley, Endeavour Zool. Results, 1911, p. 110, pl. 19, f. 30-33.

MARGINELLA SAGITTATA, Hinds.—This Atlantic form was wrongly reported from King George's Sound by Tryon, Man. Conch. V., 1883, p. 39.

MARGINELLA WALKERI, Smith, Proc. Malac. Soc., III., 1899, p. 208, f. 1. Baudin and Holothuria Banks.

Family—Cancellariidae.

CANCELLARIA PALLIDA, Smith, Proc. Malac. Soc., III., 1899, p. 313, text fig. 4. Cassini Island.

CANCELLARIA REEVIANA, Crosse, Journ. de Conch., IX., 1861, p. 237; *C. elegans*, Sowerby (not Deshayes), Thes. Conch. II., 1849, p. 446, pl. 93, f. 36; Smith, Proc. Malac. Soc., III., 1899, p. 311. Roebuck Bay.

CANCELLARIA SPIRATA, Lamarck, An. s. vert., VII., 1822, p. 115; Reeve, Conch. Icon., X., 1856, pl. 12, f. 56. Garden Island.

Family—Terebridae.

DUPLICARIA AUSTRALIS, Smith.—*Terebra australis*, Smith, Ann. Mag. Nat. Hist., 4 (XI.), 1873, p. 264, Swan River; Hedley, P.L.S., N.S.W., XXXIII., 1908, p. 486, pl. 7, f. 2.

DUPLICARIA DUPLICATA, Linne.—*Buccinum duplicata*, Linne, Syst. Nat., X., 1758, p. 742; Hinds, Thes. Conch. I., 1844, p. 155, pl. 41, f. 1-4; Brazier, P.L.S., N.S.W., IX., 1884, p. 795. Cossack.

TEREBRA ALBULA, Menke, Moll. Nov. Holl. 1843, p. 30, West Australia; Hinds, Thes. Conch., I., 1844, p. 182, pl. 45, f. 126.

TEREBRA STRIGILATA, Linne.—*Buccinum strigilata*, Linne, Syst. Nat. X., 1758, p. 741; Hinds, Thes. Conch. I., 1844, p. 180, pl. 45, f. 122; Brazier, P.L.S., N.S.W., IX., 1884, p. 795. Cossack.

TEREBRA SUBLATA, Linne.—*Buccinum sublata*, Linne, Syst. Nat. X., 1767, p. 1205; Hinds, Thes. Conch. I., 1844, p. 156, pl. 41, f. 16. Swan River (Brit. Museum).

TEREBRA (?) WALKERI, Smith.—Proc. Malac. Soc., III., 1899, p. 312, text fig 1. Holothuria Banks.

Family—Conidae.

CONUS ACULEIFORMIS, Reeve, Conch. Icon., I., 1844, pl. 44, f. 240b; Smith, Ann. Mag. Nat. Hist., 7 (XIII.), 1904, p. 454. Holothuria Banks.

Conus anemone, Lamarck, Ann. du Mus., XV., 1810, p. 272; *C. novaehollandiae*, A. Ad., Thes. Conch., III., 1858, p. 31, pl. 199, f. 298-9, Swan River; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 204, Geraldton; Iredale, Proc. Zool. Soc. 1914, p. 675, Monte Bello Islands.

Conus australis, Chemnitz, Conch. Cab., XI., 1795, p. 59, pl. 183, f. 1774-5; Smith, Ann. Mag. Nat. Hist., 6 (XIV.), 1894, p. 158, pl. 3, f. 1. Swan River.

Conus capitaneus, Linne, Syst. Nat. X., 1758, p. 713; Menke, Moll. Nov. Holl., 1843, p. 27, North-West Australia; Reeve, Conch Icon. I., 1843, pl. 11, f. 54.

Conus complanatus, Sowerby, Thes. Conch., III., 1866, p. 330, pl. 289, f. 650-1; Brazier, P.L.S., N.S.W., IX., 1884, p. 796, Cossack.

Conus cinereus, Hwass, Encycl. Meth. vers. I., p. 673, 1792; Menke, Moll. Nov. Holl., 1843, p. 27, North-West Australia; Reeve, Conch. Icon., I., 1844, pl. 41, f. 220.

Conus clarus, Smith, Ann. Mag. Nat. Hist., 5 (VIII.), 1881, p. 442, West Australia; Sowerby, Thes. Conch., V., 1887, p. 270, pl. 512 bis, f. 744.

Conus cuvieri, Crosse, Rev. and Mag. de Zool., 1858, X., p. 123; *C. deshayesii*, Reeve, Conch. Icon., I., 1843, pl. 5, f. 28, Swan River; locality doubted by Smith, Proc. Zool. Soc., 1891, p. 402.

Conus glans, Hwass, Encycl. Meth. vers. I., 1792, p. 735; Reeve, Conch. Icon., I., 1843, pl. 26, f. 145. Exmouth Gulf (Brit. Museum).

Conus kenyonae, Brazier, P.L.S., N.S.W., XXI., 1896, p. 346. Shark Bay.

Conus luteus, Quoy and Gaimard, Zool. Astrolabe, III., 1834, p. 103, pl. 53, f. 23, 24. King George's Sound.

Conus miliaris, Hwass, Encycl. Meth., vers., I., 1792, p. 629; Reeve, Conch. Icon. I., 1843, pl. 36, f. 198; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 204. Geraldton.

Conus nodulosus, Sowerby, Thes. Conch., III., 1866, p. 328, pl. 288, f. 635. Swan River.

Conus ochroleucus, Gmelin, Syst. Nat., XIII., 1791, p. 3391; *C. praefectus*, Reeve, Conch. Icon., I., 1843, pl. 25, f. 138. Swan River.

Conus pontificalis, Lamarck, Ann. du Mus., XV., 1810, p. 34; Delessert, Recueil, 1841, pl. 40, f. 15. Monte Bello Island, Exmouth Gulf (Brit. Museum).

Conus quercinus, Hwass, Encycl. Meth. vers., 1792, p. 681, pl. 332, f. 6; Watson, Chall. Zool., XV., 1886, p. 385. Swan River.

Conus rutilus, Menke, Moll. Nov. Holl. 1843, p. 27, North-West Australia; Sowerby, Thes. Conch., III., 1858, p. 5, pl. 200, f. 323. Swan River.

Conus stillatus, Reeve, Conch. Icon., I., 1849, suppl. pl. 5, f. 247; Brazier, P.L.S., N.W.S., IX., 1884, p. 796. Cossack.

Conus striatus, Linne, Syst. Nat., X., 1758, p. 716; Reeve, Conch. Icon., I., 1843, pl. 32, f. 179; Menke, Moll. Nov. Holl., 1843, p. 27. North-West Australia.

Conus terebra, Born, Index, Mus. Caes. 1778, p. 145; Reeve, Conch. Icon., I., 1843, pl. 7, f. 38. Swan River (Brit. Museum).

Conus textile, Linne, Syst. Nat., X., 1758, p. 717; Reeve, Conch. Icon., I., 1843, pl. 38, f. 209; Menke, Moll. Nov. Holl. 1843, p. 27. North-West Australia.

Conus turriculatus, Sowerby, Thes. Conch., III., 1866, p. 328, pl. 27, f. 643-4. Cassini Island (Brit. Museum).

Conus trigonus, Reeve, Conch. Icon., I., 1848, suppl. pl. 3, f. 286; Bailey, P.L.S., N.S.W., IX., 1884, p. 508. Cossack.

Conus varius, Linne, Syst. Nat., X., 1758, p. 715; *C. pulchellus,* Sowerby, Proc. Zool. Soc., 1834, p. 19, Fremantle; Reeve, Conch. Icon., I., 1843, pl. 12, f. 58.

Conus victoriae, Reeve, Conch. Icon., I., 1843, pl. 37, f. 202; Bailey, P.L.S., N.S.W., IX., 1884, p. 508. Cossack.

Family—Turridae.

Cythara compta, Adams and Angas, Proc. Zool. Soc., 1863, p. 419, pl. 37, f. 5; Verco, Trans. Roy. Soc. S.A., XXXIII., 1909, p. 327. Rottnest Island.

Cythara gibbosa, Reeve, *Mangelia gibbosa,* Reeve, Conch. Icon., III., 1846, pl. 3, f. 21: *M. novaehollandiae,* Reeve, op. cit., pl. 4, f. 27. Swan River.

Cythara guentheri, Sowerby, Proc. Zool. Soc., 1893, p. 491, pl. 38, f. 27, 28. Holothuria Banks and Cassini Island (Brit. Museum).

Cythara kingensis, Petterd—*Daphnella kingensis,* Petterd, Journ. of Conch., II., 1879, p. 102; *Mangilia emina,* Hedley, Rec. Aust. Museum, VI., 1905, p. 53, text fig. 20; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 204. Geraldton.

Clathurella rufozonata, Angas, Proc. Zool. Soc., 1877, p. 38, pl. 5, f. 13; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 204. Geraldton.

Daphnella souverbiei, Smith, Ann. Mag. Nat. Hist., 5 (X.), 1882, p. 300, Swan River; Hedley, P.L.S., N.S.W., XXXIII., 1908, p. 488, pl. 8, f. 9.

Drillia harpularia, Desmoulins.—*Pleurotoma harpularia,* Desmoulins, Act. Linn. Soc., Bordeaux, XII., 1842, p. 56; *P. harpula,* Kiener, not Brocchi, Coq. Viv., 1840, p. 58, pl. 18, f. 3; Tate, Trans. Phil. Soc., Adelaide, II, 1879, p 137. King George's Sound.

Drillia quoyi, Desmoulins.—*Pleurotoma quoyi,* Desm. Act. Linn. Soc. Bordeaux, XII., 1842, p. 61; *P. monile,* Kiener, Coq. Viv., 1840, p. 52, pl. 15, f. 3; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 231. Western Bight, 100 fath.

Mangelia anomala, Angas.—*Purpura anomala,* Angas, Proc. Zool. Soc. 1877, p. 34, pl. 5, f. 1. Cottesloe (Henn).

Mangelia australis, Adams and Angas, Proc. Zool. Soc. 1863, p. 420: Hedley, P.L.S., N.S.W., XXXVIII., 1913, p. 310, pl. XIX., f. 76. Cottesloe (Henn).

Family—Turbinellidae.

Tudicla spinosa, H. and A. Adams, Proc. Zool. Soc., 1863, p. 429; Smith, Zool. Coll. Alert, 1884, p. 54, pl. 5, f. H.; Holothuria Reef (Brit. Museum).

Tudicla inermis, Angas, Proc. Zool. Soc., 1878, p. 610, text fig. ; Smith, Ann. Mag. Nat. Hist., 3 (XIX.), 1887, p. 465, Exmouth Gulf and Nicol Bay.

Megalatractus aruanus, Linne.—*Murex aruanus,* Linne Syst. Nat., X., 1758, p. 275 ; Hedley, Rec. Austr. Mus., VI., 1905, p 98, pl. 21, Exmouth Gulf, Carnac Island ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 204, Geraldton.

Latirus pulleinei, Verco, Trans, Roy. Soc., S.A., XIX., 1895, p. 90, pl. 1, f. 1. Eyre's Sand Patch.

Latirus walkeri, Melvill, Proc. Malac. Soc., I., 1895, p. 223, pl. 14, f. 9. Cossack.

Peristernia incarnata, Deshayes. — *Turbinella incarnata,* Deshayes, in Laborde Voy. Arabie, pl. 65, f. 20–22, 1830 ; Kiener, Coq. Viv., 1840, p. 45, pl. 18, f. 3. Exmouth Gulf (Brit. Museum).

Altivasum typicum, Hedley, *nom. mut.*—*Latirus aurantiacum,* Verco (not Montfort, 1810). Trans. Roy. Soc., S.A., XIX., 1895, p. 89, Pl. II., f. 1 ; Hedley, Endeavour Results, II., 1914, p. 69, pl. IX., f. 2. Western Bight.

Family—Fusidæ.

Fusinus exilis, Menke, Moll. Nov. Holl., 1843, p. 26. West Australia.

Fusinus dunkeri, Jonas.—*Fusus dunkeri,* Jonas, Abhand. Naturw. ver. Hamburg, I., 1846, p. 129; Philippi, Abbild. Besch. II., 1847, p. 191, pl. 4, f. 4 ; Verco, Trans. Roy. Soc., S.A., XIX., 1895, p. 105. Eyre's Sand Patch.

Fusinus lincolnensis, Crosse & Fischer.—*Fusus lincolnensis* Crosse & Fischer, Journ. de Conch., XIII., 1865, p. 53, pl. 2, f. 4. Margaret River (Austr. Museum).

Fusinus longicaudus, Lamarck, Encycl. Meth., 1816, pl., 423, f. 2. Exmouth Gulf (Brit. Museum).

Fusinus morio, Lamarck. This Atlantic species is erroneously recorded from West Australia by Menke, Moll. Nov. Holl., 1843, p. 25.

Fusinus multicarinatus, Lamarck, An. s. vert., VII., 1822, p. 125 ; Kiener, Coq. Viv., 1840, p. 17, pl. 10, f. 1 ; Menke, Moll. Nov. Holl., 1843, p. 25. West Australia.

Fusinus novæ hollandiæ, Reeve, Conch. Icon., IV., 1847, pl. 18, f. 70 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 221. Western Bight, 100 fath.

FUSINUS PHILIPPI, Jonas, Abhand. natur. ver., Hamburg, I., 1846, p. 129 ; Philippi, Abbild. Besch. II., 1847, p. 191, pl. 4, f. 1. West Australia.

FUSINUS VENTRICOSUS, Menke, Moll. Nov. Holl., 1843, p. 26. West Australia.

FASCIOLARIA AUSTRALASIA, Perry, Conchology, 1811, pl. 54, f. 4; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 222. Western Bight, 100 fath.

VERCONELLA OLIGOSTIRA Tate, Trans. Roy. Soc., S.A., XIV., 1891, p. 258. pl. XI., f. 6 ; *Siphonalia dilatata*, Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 221. Western Bight, 100 fath.

Family—Mitridæ.

MITRA CITHAROIDEA, Dohrn, Proc. Zool. Soc., 1862, p. 203 ; Sowerby, Thes. Conch., IV., 1874, pl. 25, f. 567. Swan River (Brit. Museum).

MITRA CLATHRATA, Reeve, Conch. Icon., II., 1844, pl. 10, f. 71 ; von Martens, Forsch. Gazelle, III., 1889, p. 196. Mermaid Strait.

MITRA GLABRA, Swainson, Exotic Conch., I., 1821, pl. 24 ; *Mitra buccinata*, Quoy & Gaim., Zool. Astrolabe, II., 1833, p. 653, pl. 45 bis, f. 14, 15. King George's Sound.

MITRA LUTESCENS, Lamarck, Menke (Moll. Nov. Holl., 1843, p. 31) erroneously reports this Mediterranean shell from West Australia.

MITRA MITRA, Linne.—*Voluta mitra episcopalis*, Linne, Syst. Nat., X., 1758, p. 732 ; Reeve, Conch. Icon., II., 1844, pl. 1, f. 5 ; Menke, Moll. Nov. Holl., 1843, p. 30. West Australia.

MITRA SOLIDA, Reeve, Conch. Icon., II., 1844, pl. 3, f. 18. Swan River (Brit. Museum).

MITRA SUBDIVISA, Bolten, var. INTERMEDIA, Kiener.—*Mitra intermedia*, Kiener, Coq. Viv., 1839, p. 73, pl. 22, f. 70 ; Monte Bello Islands (Brit. Musenm).

MITRA SUPERBIENS, Melvill, Proc. Malac. Soc., I., 1895, p. 223, pl. 14, f. 6. West Australia.

Family—Harpidæ.

HARPA AMOURETTA, Bolten.—Mus. Bolt. (2), 1798, p. 150 ; *Harpa minor*, Menke, Moll. Nov. Holl., 1843, p. 23, West Australia ; Reeve, Conch. Icon., I., 1843, pl. 3, f. 6.

HARPA MAJOR, Bolten, Mus. Bolt. (2), 1798, p. 149 ; *Harpa, ventricosa*, Reeve, Conch. Icon., I., 1843, pl. 1, f. 2 ; Menke, Moll. Nov. Holl., 1843, p. 22. North-West Australia.

Family—Buccinidæ.

CANTHARUS ERYTHROSTOMA, Reeve.—*Buccinum erythrostoma*, Reeve, Conch. Icon., III., 1846, pl. 3, f. 14. Swan River and Exmouth Gulf (Brit. Museum).

CANTHARUS SUBRUBIGINOSUS, Smith.—*Tritonidea subrubiginosus*, Smith, Proc. Zool. Soc., 1879, p. 206, pl. 20, f. 40; *Pisania bednalli*, Sowerby, Proc. Mal. Soc., I., 1895, p. 215, pl. 13, f. 6. West Australia.

CANTHARUS TRANQUEBARICUS, Gmelin.—*Buccinum tranquebaricum*, Gmelin, Syst. Nat., XIII., 1791, p. 3491; Reeve, Conch. Icon., III., 1846, pl. 3, f. 17; von Martens, Forsch. Gazelle, III., 1889, p. 191. Mermaid Strait.

CANTHARUS UNDOSUS, Linne.—*Buccinum undosum*, Linne, Syst. Nat. X., 1758, p. 740; Kiener, Coq. Viv., 1834, p. 39, pl. 12, f. 41; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 204. Geraldton.

PHOS PLICATUS, A. Adams, Proc. Zool. Soc., 1853 (1854), p. 175; Sowerby, Thes. Conch., III., 1859, p. 90, pl. 222, f. 23. West Australia (Austr. Museum).

COMINELLA ACUTINODOSA, Reeve.—*Buccinum acutinodosum*, Reeve, Conch. Icon., III., 1846, pl. 4, f. 21. Swan River (Brit. Museum).

COMINELLA LINEOLATA, Lamarck.—*Buccinum lineolata*, Lamarck, An. s. vert., VII., 1822, p. 269; *Buccinum plurianulatum*, Reeve, Conch. Icon., III., 1846, pl. 5, f. 38. Swan River.

COMINELLA TASMANICA, Tenison-Woods.—*Josepha tasmanica*, Ten. Woods, Proc. Roy. Soc., Tasm., 1878 (1879), p. 32; *Phos. tasmanica*, Verco, Trans. Roy. Soc., S.A., XX., 1896, p. 227, pl. 6, f. 5, Eyre's Sand-patch; *Cominella suturalis*, Angas, Proc. Zool. Soc., 1865, p. 162. King George's Sound.

CYLLENE STRIATA, A. Adams., Proc. Zool. Soc., 1850 (1851), p. 205, Abrolhos; Sowerby, Thes. Conch., III., 1859, p. 79, pl. 217, f. 26.

NASSARIA SUTURALIS, A. Adams.—*Hindsia suturalis*, A. Adams, Proc. Zool. Soc., 1853, p. 183; Sowerby, Thes. Conch., III., 1859, p. 86, pl.220, f. 15, 16. Holothuria Banks (Brit. Museum).

NASSARIA TORRI, Verco.—*Cominella torri*, Verco, Trans. Roy, Soc., S.A., XXXIII., 1909, p. 271, pl. 21, f. 10, 11; *Nassaria torri*, op. cit., XXXVI., 1912, p. 220, pl. 13, f. 3, 4. Western Bight. 100 fath.

BUCCINUM FASCICULARE, Menke, Moll. Nov. Holl., 1843, p. 21. West Australia.

BUCCINUM LIRATUM, Martyn, Universal Conchologist, 1784, pl. 43, King George's Sound; Philippi, Abbild. Beschr., III., 1850, p. 126.

BUCCINUM LIMA, Martyn, Univ. Conch., 1784, pl. 46. This as well as the preceding species, were ascribed to King George's Sound, in Canada, not Australia.

BUCCINUM PLICATUM, Martyn, Von Martens has pointed out —Malak, Blatt., XIX., 1872, p. 42—that this is really from N.W. America, though ascribed by Martyn—Univ. Conch., 1784, pl. 44—to King George's Sound.

Buccinum saturum, Martyn. This Arctic species — *Tritonium fornicatum*, O. Fabr. 1780 — *Buccinum solutum*, Hermann, 1781 — *Chrysodomus heros*, Gray, 1850, was reported by Martyn, Univ. Conch., I., 1784, pl. 17, from King George's Sound.

Family—Arculariidæ.

Arcularia bicallosa, Smith.—*Nassa bicallosa*, Smith, Journ, Linne, Soc. Zool., XII., 1876, p. 543, pl. 30, f. 1; Brazier, P.L.S., N.S.W., IX., 1884, p. 794. Cossack, Nicol Bay, Swan River.

Arcularia crassa, Philippi.—*Buccinum crassum*, Phil., Abbild. Besch., III., 1849, p. 43, pl. 1, f. 4; A. Adams, Proc. Zool. Soc. 1851 (1852), p. 96. Swan River.

Arcularia dorsata, Bolten.—*Buccinum dorsatum*, Bolten, Mus. Bolt. (2), 1798, p. 111; *Buccinum unicolorum*, Kiener, Coq. Viv., 1834, p. 60, pl. 19, f. 69; Brazier, P.L.S., N.S.W., IX., 1884, p. 793, Cossack; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 204, Geraldton.

Arcularia victoriana, Iredale.—*Alectrion victorianus*, Trans. N.Z. Inst. XLVII., 1915, p. 467; *Buccinum fasciatum*, Lamarck, An. s. vert., VII., 1822, p. 271; Quoy & Gaimard, Zool. Astrolabe, II., 1833, p. 445, pl. 32, f. 18–21; Menke, Moll. Nov. Holl., 1843, p. 21. West Australia.

Arcularia glans, Linne.—*Buccinum glans*, Linne, Syst. Nat., X., 1758, p. 737; *Nassa g.*, Reeve, Conch. Icon., 1853, VIII., 1853, pl. 1, f. 5; Verco, Trans., Roy. Soc., S.A., XXVI., 1912, p. 204. Geraldton.

Arcularia globosa, Quoy & Gaimard.—*Buccinum globosum*, Quoy & Gaim., Zool. Astrolabe, II., 1833, p. 448, pl. 32, f. 25–27. Swan River (Brit. Museum).

Arcularia hirta, Kiener.—*Buccinum hirta*, Kiener, Coq. Viv., 1834, p. 63, pl. 19, f. 72, Reeve, Conch. Icon., VIII., 1853, pl. 1, f. 1. Swan River.

Arcularia optima, Sowerby.—*Nassa optima*, Sowerby, Journ. of Malac., X., 1903, p. 73, pl. 5, f. 1, 2. N.W. Australia.

Arcularia pauperata, Lamarck.—*Buccinum pauperatum*, Lamarck, An. s. vert., VII., 1822, p. 278; Kiener, Coq. Viv., 1834, p. 90, pl. 29, f. 118; A. Adams, Proc. Zool. Soc., 1851, (1852), p. 95, Cygnet Bay; Verco, Trans. Roy. Soc., S.A., XXVI., 1912, p. 204. Geraldton.

Arcularia rufula, Kiener.—*Buccinum rufulum*, Kiener, Coq. Viv., 1834, p. 89, pl. 24, f. 95; A. Adams, Proc. Zool. Soc., 1851 (1852), p. 104. Swan River.

Arcularia spirata, A. Adams.—*Nassa spiriata*, A. Adams, Proc. Zool. Soc., 1851 (1852), p. 106. Swan River; Reeve, Conch. Icon., 1853, VIII., 1853, pl. 2, f. 13.

Arcularia suturalis, Lamarck. — *Buccinum suturale*, Lamarck, An. s. vert., VII., 1822, p. 269; Kiener, Coq. Viv., 1834, p. 55, pl. 24, f. 96; A. Adams, Proc. Zool. Soc., 1851

(1852), p. 104 ; Swan River ; Iredale, Proc. Zool. Soc., 1914, p. 667. Monte Bello Islands.

ARCULARIA TÆNIA, Gmelin.—*Buccinum tœnia*, Gmelin, Syst. Nat., XIII., 1791, p. 3493 ; *B. olivaceum*, Kiener, Coq. Viv., 1834, p. 59, pl. 15, f. 53 ; Menke, Moll. Nov. Holl., 1843, p. 20. North-West Australia.

Family—Pyrenidæ.

PYRENE ACHATINA, Sowerby.—*Columbella achatina*, Sowerby, Thes. Conch., I., 1844, p. 132, pl. 39, f. 126. Swan River (?). This is perhaps based on the Mediterranean *C. gervillei*, Blainville.

PYRENE MENKEANA, Reeve.—*Columbella menkeana*, Reeve, Conch. Icon., XI., 1858, pl. XIV., f. 69. West Australia. *Buccinum acuminatum*, Menke (not Broderip, 1830). Moll. Nov. Holl., 1843, p. 20.

PYRENE AUSTRINA, Gaskoin.—*Columbella austrina*, Gaskoin, Proc. Zool. Soc., 1851 (1852), p. 9 ; Reeve, Conch. Icon., XI., 1858, pl. 19, f. 100 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 204. Geraldton.

PYRENE AUSTRALIS, Gaskoin.—*Columbella australis*, Gaskoin, Proc. Zool. Soc., 1851 (1852), p. 5 ; Reeve, Conch. Icon., XI. 1858, pl. 15, f. 78, pl. 29, f. 188. Swan River (Brit. Museum).

PYRENE DUCLOSIANA, Sowerby.—*Columbella duclosiana*, Sowerby, Thes. Conch., I., 1844, p. 113, pl. 26, f. 15, 16. Swan River and N.W. Australia (Brit. Museum).

PYRENE OBSCURA, Sowerby.—*Columbella obscura*, Sowerby, Thes. Conch., I., 1844, p. 121, pl. 37, f. 70, 71. Swan River and Monte Bello Islands (Brit. Museum).

PYRENE PARDALINA, Lamarck.—*Buccinum pardalina*, Lamarck, An. s. vert., VII., 1822, p. 295 ; Sowerby, Thes. Conch., I., 1844, p. 124, pl. 38, f. 90. Jones Island (Brit. Museum).

PYRENE SEMICONVEXA, Lamarck.—*Buccinum semiconvexum*, Lamarck, An. s. vert., VII., 1822, p. 272 ; Kiener, Coq. Viv., 1834, p. 49, pl. 17, f. 60 ; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 204. Geraldton.

PYRENE TAYLORIANA, Reeve.—*Columbella tayloriana*, Reeve, Conch. Icon., XI., 1859, pl. 35, f. 225. This New South Wales species was erroneously reported from North-West Australia.

PYRENE VARIANS, Sowerby.—*Columbella varians*, Sowerby, Proc. Zool. Soc., 1832, p. 118 ; Thes. Conch., I., 1857, p. 117, pl. 37, f. 47–50. Swan River (Brit. Museum).

PYRENE VERSICOLOR, Sowerby.—*Columbella versicolor*, Sowerby, Proc. Zool. Soc., 1832, p. 119 ; Thes. Conch., I., 1857, p. 117, pl. 37, f. 41–46 ; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 204. Geraldton.

Var. BIDENTATA, Sowerby, Thes. Conch., I., 1844, p. 118, pl. 37, f. 53, 54. Swan River.

Zafra atkinsoni, Tenison-Woods.—*Mangelia atkinsoni*, T. Woods, Proc. Roy. Soc., Tasm., 1875, p. 141; *Columbella speciosa*, Angas, Proc. Zool. Soc., 1877, p. 35, pl. 5, f. 3; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 204., Geraldton; Hedley, P.L.S., N.S.W., XXXIX., 1914, p. 744, pl. 83, fig. 72.

Engina alveolata, Kiener.—*Purpura alveolata*, Kiener, Coq. Viv., 1836, p. 42, pl. 9, f. 23. Jones Island (Brit. Museum).

Engina curtisiana, Smith.—*Tritonidea curtisiana*, Smith, Zool. Coll. Alert., 1884, p. 47, pl. 5, f. E.; Hedley, P.L.S., N.S.W., XXXIX., 1914, p. 733. West Australia.

Family—Muricidæ.

Murex acanthopterus, Lamarck, An. s. vert., VII., 1822, p. 165; Menke, Moll. Nov. Holl. pl. 16, f. 64, 1843, p. 24. North-West Australia; Reeve, Conch. Icon., III., 1845, pl. 16, fig. 64.

Murex banksi, Sowerby, Proc. Zool. Soc., 1840, p. 141; Reeve. Conch. Icon., III., 1845, pl. 10, f. 38; Brazier, Cat. Mar. Shells Australia, 1893, p. 47. Nicol Bay.

Murex brevispina, Lamarck, An. s. vert., VII., 1822, p. 159; Reeve, Conch. Icon., III., 1845, pl. 19, f. 77; Brazier, P.L.S., N.S.W., I., 1877, p. 169. Nicol Bay.

Murex cervicornis, Lamarck, An. s. vert., VII., 1822, p. 163; Sowerby, Thes. Conch., IV., 1879, p. 11, pl. 382, f. 30. Nicol Bay.

Murex cornucervi, Bolten.—*Purpura cornucervi*, Bolten, Mus. Bolt. (2), 1798, p. 142; *M. monodon*, Reeve, Conch. Icon., III., 1845, pl. 5, f. 21. Depuch Is.; Brazier, P.L.S., N.S.W., IX., 1884, p. 793. Cossack.

Murex haustellum, Linne, Syst. Nat., X., 1758, p. 746; Reeve, Conch. Icon., III., 1845, pl. 23, f. 95; von Martens, Forsch. Gazelle, III., 1889, p. 186. Dirk Hartog.

Murex miliaris, Gmelin, Syst. Nat., XIII., 1791, p. 3536; *M. purpura*, Reeve, Conch. Icon., III., 1845, pl. 25. f. 102; *M. vitulinus*, Menke, Moll. Nov. Holl. 1843, p. 24. North-West Australia.

Murex multiplicatus, Sowerby, Proc. Mal. Soc., I., 1895, p. 216, pl. 13, f. 5. West Australia.

Murex osseus, Reeve.—By error of identification, Brazier records this species from Nicol Bay, Cat. Marine Shells, Australia, 1893, p. 67.

Murex permæstus, Hedley, P.L.S., N.S.W., XXXIX., 1915, p. 745, pl. 85, fig. 91; *M. capucinus*, Hedley, Proc. Roy. Soc. Queensland, VI., 1889, p. 240. Cambridge Gulf.

Murex ramosus, Linne, Syst. Nat., X., 1758, p. 747; Sowerby, Thes. Conch., IV., 1879, p. 11, pl. 8, f. 69; Brazier, Cat. Marine Shells, Australia, 1893, p. 51. Nicol Bay.

Murex rarispina, Lamarck, An. s. vert., VII., 1822, p. 158; Reeve, Conch. Icon., III., 1845, pl. 21, f. 86; Hedley, Proc. Roy. Soc., Queensland, VI., 1889, p. 240. Cambridge Gulf.

MUREX SAULII, Sowerby, Conch. Illustr., 1840, f. 77; Brazier, Cat. Marine Shells, Australia, 1893, p. 55. Vlaming Head.

MUREX SCABER, Martyn.—*Purpura scaber*, Martyn, Univ. Conch., 1789, pl. 113; *M. adustus*, Menke, Moll. Nov. Holl., 1843, p. 24. North-West Australia.

MUREX SECUNDUS, Lamarck, An. s. vert., VII., 1822, p. 169; Reeve, Conch. Icon., III., 1845, pl. 24, f. 97; Holothuria Banks (Brit. Museum).

MUREX STAINFORTHII, Reeve, Conch. Icon., III., 1845, pl. 17, f. 68; Brazier, P.L.S., N.S.W., IX., 1884, p. 793. Cossack.

MUREX TRAPA, Bolten, Mus. Bolt., (2), 1798, p. 145; *M aduncospinosus*, Reeve, Conch. Icon., III., 1845, pl. 23, f. 93; Brazier, Cat. Marine Shells, Australia, 1893, p. 47. Nicol Bay.

MUREX TRIBULUS, Linne, Syst. Nat., X., 1758, p. 746; Sowerby, Thes. Conch., IV., 1879, p. 2, pl. 1, f. 3; Menke, Moll. Nov. Holl., 1843, p. 23. North-West Australia.

MUREX TORREFACTUS, Sowerby, Conch. Illustr., 1840, f. 120; Brazier, Cat. Marine Shells, Australia, 1893, p. 55. Nicol Bay.

MUREX TRIFORMIS, Reeve, Conch. Icon., III., 1845, pl. 13, f. 53; Verco, Trans. Roy. Soc. S.A., XIX., 1895, p. 95. King George's Sound.

MUREX VARICOSUS, Sowerby, Conch. Illustr., 1834, f. 49; Brazier, Cat. Marine Shells Australia, 1893, p. 68. Nicol Bay.

TROPHON RECURVUS, Philippi.—*Fusus recurvus*, Philippi, Abbild. Beschr., II., 1846, p. 119, pl. 3, f. 6; *T. paivæ*, Tate, Trans. Phil. Soc., Adelaide, II., 1879, p. 137. King George's Sound.

CRASPEDOTRITON FIMBRIATUS, Lamarck.—*Murex fimbriatus*, Lamarck, An. s. vert., VII., 1822, p. 176. King George's Sound; *M. planiliratus*, Reeve, Conch. Icon., III., 1845, pl. 31, f. 149. Swan River.

ASPELLA ANCEPS, Lamarck.—*Ranella anceps*, Lamarck, An. s. vert., VII., 1822, p. 154; Kiener, Coq. Viv., 1842, p. 36, pl. 4, f. 2; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 204. Geraldton, Cossack (Brit. Museum).

Family—Thaididæ.

THAIS AVELLANA, Reeve.—*Buccinum avellana*, Reeve, Conch. Icon., III., 1846, pl. 8, f. 52. Swan River and Monte Bello Islands (Brit. Museum).

THAIS ALVEOLATA, Reeve.—*Purpura alveolata*, Reeve, Conch. Icon., III., 1846, pl. 11, f. 60; Smith, Ann. Mag. Nat. Hist. 4 (XV.), 1875, p. 424. Swan River.

THAIS ECHINATA, Blainville.—*Purpura echinata*, Blainv., Nouv. Ann. Mus., I., 1832, pl. 11, f. 2. Swan River and Cossack (Brit. Museum).

THAIS GEMMULATA, Lamarck.—*Purpura gemmulata*, Lamarck, Encycl. Meth. vers., pl. 397, f. 3, 1816; *P. mancinella*, Reeve, Conch. Icon., III., 1846, pl. 1, f. 1, 2; Brazier, Journ. of Conch., II., 1879, p. 187. Nicol Bay, Dirk Hartog (W.A. Museum).

Thais persica, Linne.—*Buccinum persica,* Linne, Syst., Nat., X., 1758, p. 738 ; *Purpura persica,* Reeve, Conch. Icon., III., 1846, pl. 2, f. 8 ; Menke, Moll. Nov. Holl., 1843, p. 21. West Australia.

Thais pica, Blainville, Nouv. Ann. Mus. I., 1832, pl. 9. f. 9 ; Reeve, Conch. Icon., III., 1846, pl. 8, f. 36 ; Hedley, P.L.S., N.S.W., XXXIX., 1914, p. 747. Low Rocks (Brit. Museum).

Thais textilosa, Lamarck.—*Purpura textilosa,* Lamarck, An. s. vert., VII., 1822, p. 242 ; Kiener, Coq. Viv., 1835, p. 104, pl. 27, f. 72 ; von Martens, Forsch. Gazelle, III., 1889, p. 191, Mermaid Strait ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 204. Geraldton ; *P. ægrota,* Reeve, Conch. Icon., III., 1846, pl. 9, f. 42.

Purpura squamosa, Lamarck.—It has been noted by von Martens, Jahrb. deut. malak. Gesell., I., 1874, p. 143, that this shell, though recorded by Menke from West Australia (Moll. Nov. Holl., 1843, p. 22), is really South African.

Purpura cataractæ, Lamarck.—Menke, Moll. Nov. Holl., 1843, p. 21, as from West Australia. This South African species can also be rejected.

Purpura scobina, Quoy & Gaimard.—Menke, Moll. Nov. Holl., 1843, p. 22, as from West Australia. This is a native of New Zealand not Australia.

Purpura trochlea, Lamarck.—Menke, Moll. Nov. Holl., 1843, p. 22. This shell belongs to South Africa not to Australia.

Nassa sertum, Bruguiere.—*Buccinum sertum,* Bruguiere, Encycl. Meth. Vers., I., 1789, p. 262 ; Reeve, Conch. Icon., III., 1846, pl. 6, f. 42. Monte Bello Islands (Brit. Museum).

Drupa margariticola, Broderip.—*Murex margariticola,* Brod. Proc., Zool. Soc., 1832, p. 177 ; Reeve, Conch. Icon., III., 1845, pl. 34 f. 178 ; *Sistrum undatum,* Smith, Proc. Zool. Soc., 1879, p. 213. Swan River ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 204, Geraldton ; Hedley, P.L.S., N.S.W., XXXIX., 1914, p. 750 ; *Purpura squamulosa,* Deshayes, An. s. vert. 1844, X., p 104.

Drupa concatenata, Lamarck.—*Murex concatenata,* Lamarck, An. s. vert., VII., 1822, p. 176 ; *Ricinula concatenata,* Reeve, Conch., Icon., III., 1846, pl. 3, f. 18. Swan Point.

Sub-Order—Pulmonata.

Family—Amphibolidæ.

Salinator fragilis, Lamarck.—*Ampullaria, fragilis,* Lamarck, An. s. vert., VI., (2), 1822, p. 179 ; *Ampullaccra fragilis,* Quoy & Gaim., Zool. Astrolabe, II., 1832, p. 201, pl. 15, f. 10–16. King George's Sound.

Family—Auriculidæ.

Ellobium auris-judæ, Linne.—*Bulla auris-judæ,* Linne, Syst. Nat., X., 1758, p. 728 ; *Auricula auris-judæ,* Sowerby, Conch. Icon., XX., 1878, pl. 3, f. 16 ; von Martens, Forsch. Gazelle, III., 1889, p. 193. Mermaid Strait.

PYTHIA ARGENVILLEI, Pfeiffer, Zeit, Malak., X., 1853, p. 191 ; *Scarabus argenvillei*, Reeve, Conch. Icon., XII., 1860, pl. 3, f. 24. W. Australia (Brit. Museum).

MARINULA XANTHOSTOMA, H. and A. Adams, Proc. Zool. Soc., 1854, p. 35 ; Hedley, P.L.S., N.S.W., XXVI., 1901, p. 704, pl. 34, fig. 18 ; Connolly, Ann. S. Afric. Mus., XIII., 1915, p. 116. Fremantle, Cossack.

RHODOSTOMA ANGULIFERA, Petit.—*Auricula angulifera*, Petit, Rev. Zool. 1841, p. 101 ; *A. subrepta*, Hombr. & Jacq., Voy. Pole Sud., Zool., IV., 1856, p. 36, pl. 9, f. 13–15 ; Menke, Moll. Nov. Holl., 1843, p. 8. North-West Australia.

RHODOSTOMA AURISFELIS, Bruguiere.—*Bulimus aurisfelis*, Brug., Encycl. Meth. I., Vers., 1789, p. 343, pl. 460, f. 5 ; Iredale, Proc. Zool. Soc. 1914, p. 667. Monte Bello Island.

PLECOTREMA BINNEYI, Crosse, Journ. de Conch, XV., 1867, p. 448, op. cit., XVII., 1869, p. 395, pl. 12, f. 5. Shark Bay.

MELAMPUS FLEXUOSUS, Crosse, Journ de Conch, XV., 1867, p. 448, op. cit., XVII., 1869, p. 394, pl. 12, f. 4. Shark Bay.

Family—Siphonariidæ.

SIPHONARIA BACONI, Reeve, Conch. Icon., IX., 1856, pl. 6, f, 30. Swan River ; Verco. Trans. Roy. Soc. S.A., XXXVI., 1912, p. 204. Geraldton.

SIPHONARIA DENTICULATA, Quoy & Gaimard, Zool. Astrolabe, II., 1833, p. 340, pl. 25, f. 19–20. King George's Sound ; *Siphonaria alternicosta*. Pot. & Mich., Gal., de Moll. I., 1838, p. 55, pl. 10, f. 18-20 ; Menke, Moll. Nov. Holl., 1843, p. 5. West Australia.

SIPHONARIA DIEMENENSIS, Quoy & Gaimard, Zool., Astrolabe, II., 1833, p. 327, pl. 25, f. 1–12, Menke. Moll. Nov. Holl, 1843, p. 5. West Australia.

KERGUELENIA STOWÆ, Verco.—*Siphonaris stowæ*. Trans. Roy. Soc. S.A., XXX., 1906, p. 223, pl. 8, f. 3–8, XXXVI., 1912, p. 205. Geraldton.

Family—Limnæidæ.

LIMNÆA EGREGIA, Preston, Proc. Malac. Soc., VII., 1906, p. 36, text fig. North-West Australia.

ISIDORA AUSTRALIS, Kuster.—*Physa australis*, Kuster, Conch. Cab., II., p. 9, pl. 1, f. 15–17 ; *P. elongata*, Menke (not Say), Moll. Nov. Holl., 1843, p. 8 ; Smith, Journ. Linne, Soc. Zool., XVI., 1881, p. 278, pl. 6, f. 7, 8. West Australia.

ISIDORA BREVICULMEN, Smith.—*Physa breviculmen*, Smith, Journ. Linne, Soc. Zool., XVI., 1881, p. 290, pl. 6, f. 26. King George's Sound.

ISIDORA DISPAR, Sowerby.—*Physa dispar* Sowerby, Conch. Icon., XIX., 1873, pl. 8, f. 66. Swan River.

Isidora exarata, Smith.—*Physa exarata*, Smith, Journ. Linne, Soc. Zool., XVI., 1881, p. 292, pl. 6, f. 28. Depuch Island.

Isidora georgiana, Quoy & Gaimard.—*Physa georgiana*, Quoy & Gaimard, Zool. Astrolabe, II., 1833, p. 207, pl. 58, f. 23, 24. King George's Sound.

Isidora hainesii, Tryon.—*Physa hainesii*, Tryon, Am. Journ. Conch., II., 1866, p. 9, pl. 2, f. 9. Depuch Island.

Isidora quoyi, Smith.—*Physa quoyi*, Smith, Journ. Linne, Soc. Zool., XVI., 1881, p. 288, pl. 6, f. 24. King George's Sound.

Isidora tenuilirata, Smith.—*Physa tenuilirata*, Smith, Journ. Linne, Soc. Zool., XVI., 1881, p. 292, pl. 6, f. 27. Perth.

Family—Succineidæ.

Succinea aperta, Cox, Monog. Austr. Land Shells, 1868, p. 90, pl. 17, f. 6. King George's Sound.

Succinea scalarina, Pfeiffer, Proc. Zool. Soc., 1861, p. 28; Smith, Proc. Malac. Soc., I., 1894, p. 97, pl. 7, f. 24. King George's Sound, E. Wallaby Island, Abrolhos; Ancey, P.L.S.N.S.W., XXII., 1898, p. 775. Lennard River.

Succinea strigillata, Adams & Angas, Proc. Zool., Soc., 1864, p. 89; Cox, Mon. Austr. Land Shells, 1868, p. 89, pl. 15, f. 5, 5a. Sharks Bay.

Family—Bulimulidæ.

Bothriembrion baconi, Benson.—*Bulimus baconi*, Benson, Ann. Mag. Nat. Hist., 2 (XIII.), 1854, p. 99; Pilsbry, Man. Conch. XIII., 1900, p. 16, pl. 2, f. 42. Darling Range.

Bothriembryon bulla, Menke.—*Bulimus bulla*, Menke, Moll. Nov. Holl., 1843, p. 7; Kobelt, Conch. Cab., Lief. 467, 1901, p. 777, pl. 113, f. 15, 16. Darling Range.

Bothriembryon dux, Pfeiffer.—*Bulimus dux*, Pfeiffer, Proc. Zool. Soc., 1861, p. 24; Pilsbry, Man. Conch., XIII., 1900, p. 3, pl. 3, f. 62. King George's Sound, Israelite Bay, Fraser's Range.

Bothriembryon durus, Kobelt, Conch. Cab., Lief. 467, 1901, p. 930, pl. 131, f. 1, 2. Hab.?

Bothriembryon gratwicki, Cox.—*Bulimus gratwicki*, Cox., P.L.S.,N.S.W., XXV., 1899, p. 435, f. 1–3. Fifty miles East from Israelite Bay.

Bothriembryon inflatus, Lamarck.—*Bulimus inflatus*, Lamarck, An. s. vert, VI., 1822, p. 122; Pilsbry, Man. Conch., XIII., 1900, p. 3, pl. 1, f. 1–5. King George's Sound, Fremantle, Fraser Range.

Bothriembryon indutus, Menke.—*Bulimus indutus*, Menke, Moll. Nov. Holl., 1843, p. 6; Pilsbry, Man. Conch., XIII., 1900, p. 13, pl. 3, f. 58–60. Perth, Darling Range.

Bothriembryon kingii, Gray.—*Bulimus kingii*, Ann. of Philos., IX., 1825, p. 414; Pilsbry, Man. Conch., XIII., 1900, p. 7, pl. 2 f. 21–28. King George's Sound.

Bothriembryon leeuwinensis, Smith.—*Bulimus leeuwinensis,* Smith Proc. Malac. Soc., I., 1894, p. 94, pl. 7, f. 27. Cape Leeuwin.

Bothriembryon martensi, Kobelt, Conch. Cab. Lief. 463, 1901, p. 765, pl. 112, f. 3, 4. Hab. ?

Bothriembryon onslowi, Cox.—*Bulimus onslowi,* Cox, Ann. Mag. Nat. Hist. 3, (XIV.), 1864, p. 185. Pilsbry, Man. Conch., XIII., 1900, p. 11, pl. 3, f. 43–48. Dirk Hartog.

Bothriembryon physoides, Reeve.—*Bulimus physoides,* Reeve, Conch. Icon., V., 1849, pl. 70, f. 507. West Australia.

Bulimus ponsonbii, Angas, Proc. Zool. Soc., 1877, p. 170, pl. 26, f. 1 ; this name, a synonym for Hedleyella atomata, was erroneously recorded from West Australia.

Family—Pupidæ.

Bifidaria mooreana, Smith.—*Pupa mooreana,* Smith, Proc. Malac. Soc., I., 1894, p. 97, pl. 7, f. 25. Roebuck Bay.

Bifidaria wallabyensis Smith.—*Pupa wallabyensis,* Smith, Proc. Malac. Soc., I., 1894, p. 97. East Wallaby Island., Abrolhos.

Pupoides contrarius, Smith.—*Pupa contrarius,* Smith, Proc. Malac. Soc., I., 1894, p. 96 ; Tate, Horn Exped. Zool., 1896, p. 204, pl. 18, f. 15, pl. 19, f. 17. East Wallaby Island, Abrolhos.

Pupoides lepidulus, Adams & Angas.—*Buliminus lepidulus,* Adams & Angas, Proc. Zool. Soc., 1864, p. 38, Sharks Bay ; Cox, Monog. Austr. Land Shells, 1868, pl. XIX., f. 14.

Pupoides pacificus, Pfeiffer.—*Bulimus pacificus* Pfeiffer, Proc. Zool. Soc., 1864, p. 31 ; Pilsbry, Proc. Acad. N. Sci., Philad., 1900, p. 426, f. 1 ; Smith, Zool. Erebus & Terror, 1874, p. 3, pl. 4, f. 6., Pidgeon Island ; Smith, Proc. Malac. Soc., I., 1894, p. 96., Abrolhos, Roebuck Bay, Baudin, and Cassini Island.

Vertigo lincolnensis, Cox.—*Pupa lincolnensis,* Cox, Mon. Austr. Land Shells, 1868, p. 80, pl. 4, f. 16 ; Smith, Proc. Malac. Soc., I., 1894, p. 96. Pidgeon and East Wallaby Island, Abrolhos.

Family—Helicidæ.

Chloritis micromphala, Gude, Proc. Malac. Soc., VII., 1907, p. 231, pl. 21, f. 6. Barrier Range.

Chloritis millepunctata, Smith.—*Helix millepunctata,* Smith, Proc. Malac. Soc., I., 1894, p. 88, pl. 7, f. 11. Baudin Island.

Var. cassiniensis, Smith, op. cit., pl. 7, f. 12. Cassini Island.

Chloritis pelodes, Pfeiffer.—*Helix pelodes* Pfeiffer, Proc. Zool. Soc., 1845, p. 126 ; *H. prunum,* Reeve, Conch. Icon., VII., 1852, pl. 68, f. 353 ; *C. pseudoprunum,* Pilsbry, Man. Conch., VIII., 1892, p. 271, pl. 55, f. 13–5 ; Gude, Proc. Malac. Soc., VII., 1906, p. 114. North-West Australia.

CHLORITIS PRUNUM, Ferussac.—*Helix prunum*, Ferussac & Deshayes, Hist. Nat. Moll., I., 1850, p. 255, pl. 26, f. 7-9; Fischer, Journ. de Conch., L., 1902, p. 385. N.W. Australia.

CHLORITIS RECTILABRUM, Smith.—*Helix rectilabrum*, Smith, Proc Malac. Soc., I., 1894, p. 88, pl. 7, f. 14. Parry Harbour.

PLANISPIRA BATHURSTENSIS, Smith.—*Helix bathurstensis*, Smith, Proc. Malac. Soc., I., 1894, p. 93, pl. 7, f. 20. Heywood Island and Bathurst Island, King's Sound.

PLANISPIRA GASCOYNENSIS, Smith.—*Helix gascoynensis*, Smith, Proc. Malac. Soc., I., 1894, p. 93, pl. 7, f. 13. Gascoyne District.

PLANISPIRA FROGATTI, Ancey.—*Trachia frogatti*, Ancey, P.L.S., N.S.W., XXII., 1898, p. 774, pl. 36, f. 2. Oscar Range.

PLANISPIRA ORTHOCHEILA, Ancey.—*Trachia orthocheila*, Ancey. P.L.S., N.S.W., XXII., 1898, p. 774, pl. 36, f. 4. Oscar Range.

PLANISPIRA MONOGRAMMA, Ancey.—*Trachia monogramma*, Ancey, P.L.S., N.S.W., XXII., 1898, p. 775, pl. 36, f. 3. Oscar Range.

PLANISPIRA COLLINGII, Smith.—*Helix collingii*, Smith, Conchologist, II., 1893, p. 98, text fig. Baudin Island.

PLANISPIRA BAUDINENSIS, Smith.—*Helix baudinensis*, Smith, Conchologist, II., 1893, p. 97, text fig. Baudin Island.

RHAGADA AUSTRALIS, Menke. — *Helix australis*, Menke, Moll. Nov. Holl., 1843, p. 6, Mt. Eliza (?); Reeve, Conch. Icon., VII., 1852, pl. 131, f. 803; Benson, Ann. Mag. Nat. Hist., XI., 1853, p. 31.

RHAGADA ANGASIANA, Pfeiffer. — *Helix angasiana*, Pfeiffer, Journ. de Conch. X., 1862, p. 228, pl. 10, f. 2; Hedley, Proc. Malac. Soc., I., 1895, p. 260. Eucla.

RHAGADA BURNERENSIS, Smith. — *Helix burnerensis*, Smith, Proc. Malac. Soc., I., 1894, p. 91, pl. 7, f. 18, Barrier Range; Ancey, P.L.S., N.S.W., XXII., 1898, p. 776. Oscar Range.

RHAGADA CARCHARIAS, Pfeiffer. — *Helix carcharias*, Pfeiffer, Proc. Zool. Soc., 1863, p. 528, Sharks Bay; Cox, Monog. Austr. Land Shells, 1868, p. 45, pl. 20, f. 12.

RHAGADA CONVICTA, Cox. — *Helix convicta*, Cox, Proc. Zool. Soc., 1870, p. 171, pl. 16, f. 6; von Martens, Monat. Berl. Ak. Wiss., 1877, p. 272, pl. 1, f. 6, 7. Nicol Bay, Mermaid Strait, Cossack and Bezout Island.

RHAGADA CYRTOPLEURA, Pfeiffer. — *Helix cyrtopleura* Pfeiffer, Joun. de Conch, X., 1862, p. 227, pl. 10, f. 1; Hedley, Proc. Malac. Soc., I., 1895, p. 260. Eucla.

RHAGADA DERBYI, Cox. — *Helix Derbyi*, Cox, P.L.S., N.S.W., XVI., 1892, p. 566, pl. 20, f. 4, 5; *H. derbyana*, Smith, Proc. Malac. Soc., I., 1894, p. 92, pl. 7, f. 19. Barrier Range.

RHAGADA FODINALIS, Tate. — *Helix fodinalis*, Tate, Trans. Roy. Soc., S.A., XVI., 1892, p. 63, pl. 1, f. 1. Between Victoria Spring and Fraser Range.

RHAGADA IMITATA, Smith. — *Helix imitata*, Smith, Proc. Malac. Soc., I., 1894, p. 92, pl. 7, f. 15. Cape Bougainville, Baudin. N. Maret and Condillac Islands.

Var. CASSINIENSIS, Smith, op. cit., pl. 7, f. 16. Cassini Island.

RHAGADA LEPTOGRAMMA, Pfeiffer — *Helix leptogramma*, Pfeiffer, Proc. Zool. Soc., 1845, p. 127 ; Smith, Zool. Erebus and Terror, 1874, p. 2, pl. 4, f. 18. Cygnet Bay, King Sound, Roebuck Bay.

RHAGADA MONTALIVETENSIS, Smith. — *Helix montalivetensis*, Smith, Proc. Malac. Soc., I., 1894, p. 91, pl. 7, f. 21. Montalivet Island.

RHAGADA OBLIQUERUGOSA, Smith. — *Helix obliquerugosa*, Smith, Proc. Malac. Soc., I., 1894, p. 90, pl. 7, f. 17. Parry Harbour.

RHAGADA MONTEBELLOENSIS, Preston, Rhagada, Proc. Malac. Soc., XI., 1914, p. 13, fig. Monte Bello Island.

RHAGADA PLICATA, Preston, Rhagada, Proc. Malac. Soc., XI., 1914, p. 13, fig. Monte Bello Island.

RHAGADA OSCARENSIS, Cox.—*Helix oscarensis*, Cox, P.L.S., N.S.W., XVI., 1892, p. 565, pl. 20, f. 6, 7 ; *Helix inconvicta*, Smith, Proc. Malac. Soc., I., 1894, p. 90, pl. 7, f. 10. Oscar Range ; *Thersites woodwardi*, Fulton, Proc. Malac. Soc., V., 1902, p. 33, text fig.

RHAGADA PERINFLATA, Pfeiffer.—*Helix perinflata*, Pfeiffer, Proc. Zool., Soc., 1863, p. 528 ; Cox, Mon. Austr. Land Shells, p. 1868, p. 45, pl. 20, f. 2 ; Hedley, Proc. Malac. Soc., I., 1895, p. 259. Coolgardie, Cavanagh Range, Yilgarn.

RHAGADA PLECTILIS, Benson.—*Helix plectilis*, Benson, Ann. Mag. Nat. Hist., XI., 1853, p. 29. Sharks Bay and Swan River ; Reeve, Conch. Icon., VII., 1853, pl. 172, f. 1162.

RHAGADA PRUDHOENSIS, Smith.—*Helix prudhoensis*, Smith, Proc. Malac. Soc., I., 1894, p. 91, pl. 7, f. 9. Prudhoe Island.

RHAGADA RADLEYI, Preston. — *Rhagada radleyi*, Preston, Proc. Malac. Soc., VIII., 1908, p. 120, text fig. W.A.

RHAGADA RICHARDSONII, Smith.—*Helix richardsonii*, Smith, Zool. Erebus and Terror, 1874, p. 2, pl. 4, f. 14. Depuch Island ; *Helix elachystoma*, von Martens, Monat. Berl. Ak. Wiss., 1877, p. 273, pl. 1, f. 8, 9, Mermaid Strait.

RHAGADA SYKESI, Smith.—*Helix sykesi*, Smith, Proc. Malac. Soc., I., 1894, p. 92, pl. 7, f. 8. Parry Island, Admiralty Gulf.

RHAGADA TESCORUM, Benson.—*Helix tescorum*, Benson, Ann. Mag. Nat. Hist., XI., 1853, p. 30 ; Reeve, Conch. Icon., VII., 1853, pl. 171, f. 1154. Sharks Bay.

RHAGADA TORULUS, Ferussac.—*Helix torulus*, Ferussac, Hist. Nat. Moll., I., 1850, p. 114, pl. 27, f. 3, 4 ; *Helix reinga*, Reeve, Conch. Icon., VII., 1852, pl. 128, f. 772 ; Ancey, P.L.S., N.S.W., XXII., 1898, p. 776. Oscar Range, Barrier Range, Roebuck Bay and Dampier Archipelago.

ALBERSIA FORRESTIANA, Angas.—*Helix forrestiana*, Angas, Proc. Zool. Soc., 1875, p. 389, pl. 45, f. 3. North-West Australia. Hedley, P.L.S., N.S.W., XXXVIII., 1913, p. 260.

Helicella virgata, Linne.—This European species was recorded by Mr. Smith. Zool. Erebus and Terror, 1874, p. 2, from Foul Point, N.W. Australia.

Family—Rhytididæ.

Rhytida georgiana, Quoy and Gaimard.—*Helix georgiana*, Quoy and Gaim., Zool. Astrolabe, II., 1832, p. 129, pl. 10, f. 26–30. King George's Sound.

Family—Endodontidæ.

Endodonta albanensis, Cox.—*Helix albanensis*, Cox, Mon. Austr. Land Shells, 1868, p. 15, pl. 4, f. 2. King George's Sound.

Endodonta cuprea, Cox.—*Helix cuprea*, Cox, Monog. Austr. Land Shells, 1868, p. 22, pl. 12, f. 9 ; *Helix nupera*, Brazier, P.L.S., N.S.W., I., 1876, p. 18. King George's Sound.

Endodonta cygnaea, Benson.—*Helix cygnaea.*, Benson, Ann. Mag. Nat. Hist., XI., 1853, p. 30 ; Reeve, Conch. Icon. VII., 1853, pl. 174, f. 1182. Perth.

Endodonta millestriata, Smith.—*Helix millestriata*, Smith, Zool. Erebus, and Terror, 1874, p. 2, pl. 4, f. 5. Depuch Island.

Endodonta (?) sublesta, Benson.— *Helix sublesta*, Benson, Ann. Mag. Nat. Hist., XI., 1853, p. 30 ; Reeve, Conch. Icon., VII., 1853, pl. 174, f. 1177. Fremantle.

Paralaoma morti, Cox.—*Helix morti*, Cox, Ann. Mag. Nat. Hist., 3 (XIV.), 1864, p. 182 ; Monog. Austr. Land Shells, 1868, p. 21, pl. 11, f. 13. West Australia.

Family—Zonitidæ.

Microcystis lissa, Smith.—*Lamproeystis lissa*, Smith, Proc. Malac. Soc., I., 1894, p. 86, pl. 7, f. 22, 23. Queen's Islet, Parry Island and Barrier Range.

Helicarion thomsoni, Ancey.—Le Naturaliste, 1889, p. 260. Geographe Bay.

Sub-Order—Opisthobranchia.

Family—Actaeonidæ.

Pupa flammea, Gmelin.—*Voluta flammea*, Gmelin, Syst. Nat., XIII., 1791, p. 3435 ; *Tornatellina flammea*, Reeve, Conch. Icon., XV., 1865, pl. 1, f. 2 ; Brazier, P.L.S., N.S.W., IX., 1884, p. 798. Cossack.

Pupa suturalis, A. Adams.—*Solidula suturalis*, A. Adams, Proc. Zool. Soc., 1854 (1855), p. 61 ; *Tornatella s.*, Reeve, Conch, Icon,. XV., 1865, pl. 2, f. 9 c. ; Brazier, P.L.S., N.S.W., IX., 1884, p. 798. Cossack.

Family—Ringiculidæ.

Ringicula australis, Hinds.—Proc. Zool. Soc., 1844, p. 97 ; Crosse, Journ. de Conch., XIII., 1865, p. 4, pl. 2, f. 5 ; von Martens, Forsch. Gazelle, III., 1889, p. 191. Mermaid Strait.

Family—Scaphandridæ.

Cylichna arachis, Quoy and Gaimard.—*Bulla arachis*, Quoy and Gaimard, Zool. Astrolabe, II., 1833, p. 361, pl. 26, f. 28–30. King George's Sound.

Cylichna pygmaea, Adams.—*Bulla pygmaea*, A. Adams, Thes. Conch., II., 1850, p. 595, pl. 125, f. 150 ; Tate, Trans. Phil. Soc. Adelaide, II., 1879, p. 137. King George's Sound.

Retusa apicina, Gould.—*Tornatina apicina*, Gould, Proc. Bost. Soc. Nat. Hist., VII., 1859, p. 129 ; *Urticulus avenarius*, Watson, Zool. Chall. XV., 1886, p. 658, pl. 49, f. 5 ; *T. fusiformis*, Verco. Trans. Roy. Soc., S.A., XXXVI., 1912, p. 204. Geraldton.

Retusa apiculata, Tate. *Utriculus apiculata*, Tate, Trans. Phil. Soc., Adelaide, II., 1879, p. 138, pl. 5, f. 3. King George's Sound.

Family—Bullidæ.

Bullaria australis, Gray.—*Bulla australis*, Gray, Ann. Philos. IX., 1825, p. 408 ; Quoy and Gaim., Zool. Astrolabe, II., 1833, p. 357, pl. 26, f. 38, 39. King George's Sound ; Verco, Trans. Roy. Soc. S.A., XXXVI., 1912, p. 204. Geraldton.

Bullaria columellaris, Menke, Bulla, Malak. Blatt., 1854, p. 26. Iredale, Proc. Zool. Soc. 1914, p. 667. Monte Bello Island.

Bullaria quoyi, Gray.—*Bulla quoyi*, Gray, Dieffenbach's, New Zealand, II., 1843, p. 243 ; Smith, Zool. Erebus and Terror, 1874, p. 5, pl. 1, f. 11 ; *B. striata*, Menke, Moll, Nov. Holl., 1843, p. 5. Woodman's Point.

Bullaria tenuissima, Sowerby.—*Bulla tenuissima*, Sowerby, Conch. Icon., XVI., 1868, pl. 2, f. 4. Swan River.

Haminœa brevis, Quoy and Gaimard.—*Bulla brevis*, Quoy and Gaimard, Zool. Astrolabe II., 1833, p. 358, pl. 26, f. 36, 37, King George's Sound.; *B. ovoidea*, Menke, Moll. Nov. Holl., 1843, p. 6. Fremantle.

Haminœa ambigua, A. Adams.—*Bulla ambigua*, A. Adams, Thes. Conch., II., 1850, p. 582, pl. 124, f. 97. King George's Sound.

Akera bicincta, Quoy and Gaimard.—*Bulla bicincta*, Quoy and Gaimard, Zool. Astrolabe, II., 1833, p. 355, pl. 26, f. 31, 32. King George's Sound.

Family—Aplustridæ.

Hydatina physis, Linne.—*Bulla physis*, Linn, Syst. Nat. X., 1758, p. 727 ; Pilsbry, Man. Conch. XV., 1893, p. 387, pl. 45, f. 14–17 ; Verco, Trans. Roy. Soc., S.A., XXXVI., 1912, p. 204. Geraldton.

Family—Aplysiliidæ.

Tethys gigantea, Sowerby.—*Aplysia gigantca*, Sowerby. Conch. Icon., XVII., 1869, p. 1, f. 1. Swan River.

Group—Pteropoda.

Family—Cavoliniidæ.

Clio pyramidata, Linne.—Syst. Nat., XII., 1767, p. 1094; Souleyet, Zool. Bonite, II., 1852, p. 179, pl. 7, f. 17–25; Pfeiffer, Monats. Ak. Wiss. Berlin, 1879, p. 237, f. 7. N.W. Australia.

Cavolinia longirostris, Lesueur.—*Hyalaea longirostris,* Lesueur, Dict. Sci. Nat. XXII., 1821, p. 81; Boas, *Spolia Atlantica,* 1886, p. 102, pl. 1, f. 5; Pfeiffer, Monats. Ak. Wiss. Berlin, 1879, p. 235. N.W. Australia.

Group—Nudibranchiata.

Family—Scyllæidæ.

Scyllaea pelagica, Linne.—Syst. Nat., X., 1758, p. 644; Cuvier, Ann. d. Mus., VI., 1, 1804, p. 424, West Australia; Basedow and Hedley, Trans. Roy. Soc. S.A., XXIX., 1905, p. 148, pl. 9, f. 1, 2.

Family—Phylliroidæ.

Phyllirhoa lichtensteinii, Eschscholtz. *Eurydice lichtensteinii,* Eschscholtz, Isis, 1825, I., p. 737, pl. 5, f. 1; *Phylliroe punctulatum,* Quoy and Gaimard, Zool. Astrolabe, II., 1833, p. 407, pl. 28, f. 15–18. West Australia.

Family—Pleurophyllidiadæ.

Pleurophyllidia cygnea, Bergh.—Malak. Blatt., XXIII., 1876, p. 9, pl. 1, f. 1–7. Swan River; Basedow and Hedley, Trans. Roy. Soc. S.A., XXIX., 1905, p. 149, pl. 10–12.

Family—Dorididæ.

Hexabranchus imperialis, Kent.—*Doris imperialis,* Kent, Naturalist in Australia, 1897, p. 151, pl. 5. Rat Island, Abrolhos.

Kentrodoris maculosa, Cuvier.—*Doris maculosa,* Cuvier, Ann. du Museum, IV., 1804, p. 466; Quoy and Gaimard, Zool. Astrolabe, II., 1833, p. 249, pl. 16, f. 3–5. Sharks Bay.

Ceratosoma brevicaudatum, Abraham.—Ann. Mag. Nat. Hist., 4 (XVIII.), 1876, p. 142, pl. 7, f. 6. West Australia.

Family—Phylliadæ.

Phyllidia varicosa, Lamarck.—Syst. Anim. s. Vert., f. 1801, p. 66; Quoy and Gaimard, Zool. Astrolabe, II., 1832, p. 292, pl. 21, f. 25. Dampier Archipelago.

CLASS—SCAPHOPODA.

Dentalium eburneum. Sowerby.—Genera of Shells, I., 1823, pl. 138, f. 6; von Martens, Forsch. Gazelle. III., 1889, p. 194, 9 fath. Mermaid Straits.

Dentalium francisense, Verco.—Trans. Roy. Soc., S.A., XXXV., 1911, p. 207, pl. 26, f. 1, 15 fath. Geographe Bay, 6 f. Fremantle, Rottnest Island, Bunbury.

Dentalium gazellae, Plate.—Valdivia Exped., IX., 1908, p. 356, pl. 30, f. 40–41. 9 fath. North-West Australia.

Dentalium hyperhemileuron, Verco.—Trans. Roy. Soc., S.A., XXXV., 1911, p. 217, pl. 26, f. 3, 12–14 fath. King George's Sound, 15 f. Geographe Bay, 110–12 f. Fremantle.

Dentalium zelandicum, Sowerby.—Thes. Conch., III., 1860, p. 101, pl. 223, f. 13; von Martens, Forsch. Gazelle. III., 1889, p. 196, 50 fath. Mermaid Straits.

Cadulus angustior, Verco.—Trans. Roy. Soc., S.A., XXXVI., 1911, p. 211, 218, pl. 26, f. 5, 35 fath. Hopetoun, 12–14 f. King George's Sound, 15 f. Geographe Bay.

Cadulus occiduus, Verco.—Trans. Roy. Soc., S.A., XXXV., 1911, p. 202, 218, pl. 26, f. 7. 15 Geographe Bay, 10–12 f. Fremantle. Geraldton.

SUB-KINGDOM—BRACHIOPODA.

Order—Telotremata.

Family—Terebratellidæ.

Terebratulina cancellata, Kuster.—Conch. Cab., VII., 1843, p. 35, pl. 2*b*, f. 11–13. West Australia.

Magellania flavescens, Lamarck, *Terebratula flavescens* An. s. vert., IV., 1819, p. 246; Davidson, Trans. Linn. Soc. IV., 1886, p. 41. Pl. VII., figs. 6–19. Bunbury (Henn).

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PRESIDENTIAL ADDRESS, 1914-1915.

The Philosophy of Vitalism in Modern Biology.

By

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(Delivered June 8, 1915.)

The Session 1914-1915, which ends with this meeting, and which has been the first year of the Royal Society of W.A., will be for ever remembered in the history of the world. I feel, therefore, that I cannot pass to the main theme of my address without some reference to those events which have cast a cloud over all.

Just at the moment when we were congratulating ourselves that culture and the study of the Arts and Sciences were breaking down the barriers of distance and almost of nationality—just when we were receiving in our midst as our guests the delegates of the British Association for the Advancement of Science (the Australian meeting, 1914), and several prominent German, French, and other foreign scientists, hell seemed to break loose. Europe, since last August, has been torn to the heart by fighting such as the world has never before seen, and to the horror of civilised peoples war has appeared in a form which very few, indeed, ever expected. Our much-vaunted civilisation seems for a moment to be a thing of nought; science and art, except in so far as they may be useful in the service of butchery, seem to have been relegated to the background, and in some cases, even, education has been looked upon with suspicion. We may truly comfort ourselves with the heroism, the valour, and chivalrous conduct generally of the men and women of the British Empire in this time of trial. At least the spirit of courage and honour which built up our Empire lives to-day. Whilst recognising this, let us look at another aspect of the matter. I should fail in my duty as President of this society, whose aim is to advance the study of science in all its branches, if I did not emphasise the important part which has been played by science in the progress of our enemies. This is, however, a truth which has been hurled at the Britisher for many years now. Unfortunately the warnings have been practically unheeded. At the present time, commercial men are telling us that we must capture Germany's trade, and Chambers of Commerce are trying to suggest means. We should never have allowed Germany to gain much of this trade. We are told, for example, that the value of the colouring matters consumed in the United Kingdom per annum is £2,000,000, representing, at least, £200,000,000 of textile industries and employment for 1,500,000 workers. Nearly all these dyes come from Germany. The great dyeing industry has been lost to this country because we, as a nation, and our manufacturers in particular, have failed to recognise the value of science in their works. Great inconvenience has also been experienced owing to the absence of German glass. I need hardly give other examples, but I notice in last Saturday's paper a remark made by Lloyd George, in a great speech at Liverpool, which is worthy of notice. Speaking of the recent German successes, he stated "The battle had been won by the skilled industries of Germany and the superior organisation of the German workshops. The German triumph was due entirely to superior equipment and overwhelming superiority in munitions of war." What does this mean? Is the British Empire unable to match the Germans? Is the race that produced Priestly, Black, Boyle, Cavendish, Davy, Dalton, Faraday, Graham, Newton, Kelvin, Stokes, Maxwell, Rayleigh, Thomson, Darwin, Wallace, Huxley, amidst hosts of others famed in the world of science, unable to organise its industries which depend largely on the discoveries of the scientist? The public and the manufacturers suggest "Protection"—"Tariffs on German goods." What inability to grasp the position! Before we can satisfactorily shut out German goods we must make them ourselves, and if we *had* made such goods and kept up our position in the war of commerce, there would probably have been no German hammering away in Belgium and France to-day. The nation that succeeds in the struggle for existence to-day will be the one where valour, chivalry, and high morality are co-existent with knowledge. Knowledge is proving its power to-day on the battlefields of Europe and courage alone will not avail against the application of science and art.

We have failed in the past to recognise the value of science—I might almost say with truth, the value of the educated man. Important posts in the British Empire have been, and still are, filled often without considering the ability of the men appointed. The average man does not respect the teachers of the children of our Empire as much as he should. How can he do so when their wage, in many cases, is scarcely equal to that of the lumper? Good men with great ability will not devote themselves to science at the Universities when their remuneration, after years of study and practical research, is likely to be somewhere near £80 or £100 per annum.

A few words about the inaugural year of the Royal Society. I feel that I have not only been very highly honoured by selection as your first President, but that the council and members have shown a spirit in choosing newcomers to the State and the society to be President and Vice-President respectively, which is worthy of the greatest respect. It is indeed unfortunate for a President to be elected under such circumstances, for he cannot help but feel how great have been his shortcomings.

I must strongly urge the need of an increased membership. We want more of the professional scientific workers of the State to join those who are already members. We want also more of the keen amateurs, for it must not be forgotten that much of the advance in science has been due to hard-working amateurs.

One other point, we want much more suitable rooms. This is largely a question of funds, and it adds more force to the duty of every member to find additional support, and new members.

THE PHILOSOPHY OF VITALISM IN MODERN BIOLOGY.

I may be criticised for attempting, in the short time allotted for the reading of a paper, to add still more in the way of a discussion of Neovitalism. For excuse, I must plead that the investigation of life and the phenomena which distinguish living from lifeless matter is the fundamental problem of the biologist.

Looking around us, we recognise certain bodies as living; others we say are lifeless. Some of these lifeless bodies may once have been living, or at least may consist of substances which once formed part of living bodies—others never at any time have had any close relations whatever with living bodies. We speak of living bodies as organisms and classify them as animals and plants. There are, however, cases where we find it extremely difficult to draw a line between the state of living and that of non-living, and, as a matter of fact, it is only with difficulty that we can put into words our conception of life.

Leaving aside these problematic cases, we may study the substance of living organisms by—

(1.) A chemical examination, in order to determine the elements of which it is composed.

(2.) A microscopic examination, in order to discover its structure.

(3.) An investigation of its manifestations, which we recognise collectively as indicative of life.

We can then attempt to correlate composition, structure, and life phenomena.

The chemist has shown us that the elementary substances of which protoplasm is built exist and are quite common in non-living bodies around us. The microscope has its limits, but the wonderful advance in microscope technique during the last ten years has taken us far into the minute structure of living things. The phenomena of life have been observed under normal and also abnormal experimental conditions. The question that follows quite naturally may be put in the following words:—"Are the manifestations of life and the phenomena associated with living beings to be explained entirely by physico-chemical phenomena as now understood by us, or must we conclude that there is some non-material vital principle, or some new form of energy, or some other property of matter as yet unknown, which is peculiar to living substance and the living organism?" This is the ultimate problem of biology. The mysterious properties of living substance have appealed alike to the philosophers of ancient days and modern times. Yet, as Johnstone states in his Philosophy of Biology, the ordinary person unacquainted with the results of physiological analysis has probably no doubt in his mind that the human body is animated by a principle or agency which has no counterpart in the inorganic world, and the same might even be said of the anatomist, naturalist, and physicist unacquainted with details of physiological inquiry.

We biologists have, as our duty, to explain all that is possible of such explanation by those forms of energy and properties of matter that so far have been known to us. A general knowledge of the beautiful co-ordination met with in Nature might, and very often does, lead to the belief that something more than the physical forces is present to animate and sustain the dust of which we are made. Let us see then to what view the results of our combined knowledge lead us to-day.

The earliest attempts to explain the phenomena of life have been lost with the knowledge of the ancients. In the period 460-370 B.C., however, the followers of Hippocrates believed that an agent—the pneuma—controlled all vital phenomena in the organism. In the years that followed, two controlling powers were considered necessary—the vital spirits resident in the heart and the animal spirits which had their abode in the brain. Much more definite information can be gathered if we pass to the period A.D. 131-200, when Galen, the first physiologist, formulated a doctrine which, with his other works, remained untouched, unshaken and controlling, through the long slough of the middle ages. Galen was also a believer in the spirits as the cause of all phenomena in the living body. He added, however, another of these ruling powers—the Natural Spirits—to the two already mentioned. This third factor was supposed to reside in the liver!

The nature of the spirits is not exactly indicated, but it must not be assumed that this early physiologist regarded them as entirely metaphysical.

Through thirteen hundred years of stagnation and decay must we pass until the night once more gives way to the light of learning, and we reach the dawn of modern times. By a strange coincidence the particular branch of the new learning with which we are to-night concerned was heralded by the works of one Andreas Versalius, who was educated at Louvain. Louvain University was of great renown even in 1530. Who could have foretold that it would have been left for the German race, most arrogant concerning learning, to demolish that kind of culture they have not yet attained? I have not time to do more than mention the work of Versalius. We must pass to the researches of an Englishman—the immortal Harvey. With the discovery of the circulation of the blood by Harvey, the death blow was given to the doctrine of the spirits. Harvey's explanation of the blood flow was essentially mechanical, and this view of the famous physician of Charles I. opened up a path which was followed with brilliant success by succeeding physiologists.

Whilst Harvey was making his investigations on the living organism, the science of physics was progressing rapidly. Galileo had been made Professor of Physics at Padua just six years before Harvey had reached that place, and epoch-making discoveries had been made in a new school of exact science. About the same time, four years after Galileo reached Padua to be exact, and in the year 1596, there was born near Tours in France the man whom we may consider as the real father of the mechanistic conception of the organism. I refer to René Descartes. He was a great mathematician, but neither a physiologist nor anatomist. He studied both subjects, however, as an amateur and even wrote a popular treatise which might be called the first text book of physiology. The point to be emphasised here is that he wrote to show that the new views and laws of physics might be applied to the living organism, and that the human body might also be looked on as a machine. Nevertheless, Descartes found it necessary to add an additional factor to his machine which he called the "Rational Soul." The Soul was supposed to be concerned in all thought, intelligence, memory, sensation and imagination. It was apparently not at all necessary for the ordinary functions of the body.

We must pass very quickly over further historical details, but I must draw your attention to the growth of another school which introduced the knowledge of the chemists and combined the forces of physics and chemistry in an endeavour to explain the phenomena of life. At this period, however, the physicists and chemists were not able to do very much after all, and the unexplainable became the support of a theory of Vital Force which now for the first time burst forth in definite form. The theory of Vital Force was put forward by the followers of Haller (1708-1777). This force was supposed to control and be responsible for all physiological processes whilst chemical and physical forces were confined to the phenomena of non-living matter. The result was disastrous. The phrase Vital Force became sufficient, became in fact the actual explanation (a lazy and stifling explanation) of all difficult problems in physiology.

The last period to be referred to leads on to to-day. It coincides with the victories of physiological chemistry and may be said to have commenced with the synthesis of Urea, an organic compound formed only by organisms. This was achieved by Wohler in 1828, and the discovery greatly stimulated the chemical explanation of life phenomena. From this date physiologists have applied chemistry and physics with huge success to the study of living organisms, and one obstacle after another has been broken down until in the impetus of their success they have become almost all pronounced mechanists and have claimed the sufficiency of chemical and physical explanations for all the phenomena of life. The biologists, too, have been carried away and we see the mechanistic view put forward very strongly by Huxley, whilst more modern discoveries have led to the very extreme views held by Jacques Loeb. The modern work in experimental embryology has led in some cases to the belief that development of the organism is explainable by known physico-chemical laws, but many of the foremost exponents of this branch of biology are unable to agree with this and one of them, Driesch, is now, perhaps, the foremost advocate of a new vitalism. Bergson, whose philosophy has aroused fresh interest to-day wherever it has been studied, "rising into heights of metaphysics" proclaims that our conceptions of mechanism fail to explain life. There is a spirit of unrest abroad once more and we meet again a tendency here and there to consider the organism as something more than a machine. The old phrase Vital Force is, however, often disguised and appears in new form as Biotic Energy, Entelechy, Elan vitale, etc., although it must not be supposed from this that the terms mean exactly the same thing. It must be confessed that the exponents of new vitalistic theories are being subjected to a strong frontal attack, and the feeling of the other side is summed up pretty well in the following quotation from a work on embryology published very recently.[1] "Thus we are brought back to Pre-Darwinian days, to a position indeed more primitive than that of the early 19th century, for it is surely easier to conceive of an all embracing intelligence, whose myriad plans were realised in the different species, rather than of millions of uncaused and unrelated intelligences . . . . . Driesch offers no explanation whatever, and it seems to us that this final result is the *reductio ad absurdum* of his whole system." Verworn, the physiologist, writes[2]: "But so much is certain; an explanatory principle can never hold good in physiology with reference to the physical phenomena of life that is not also applicable in chemistry and physics to lifeless Nature. The assumption of a specific vital force is not only wholly superfluous but inadmissible." One other example and that comparatively recent. I have no doubt that many of you have Schafer's Presidential Address to the British Association at Dundee in 1912 still in your mind. In the course of his remarks on the sufficiency of physics and chemistry, he stated "Vitalism as a working hypothesis has not only had its foundations undermined, but most of its superstructure has toppled over, and if any difficulties still persist, we are *justified in assuming that the cause is to be found in our imperfect knowledge of the constitution and working of living material.*" I want to emphasise the

1. MacBride, Text-Book of E · bryology., Vol. I., Envertebrata. London, 1914.
2. Verworn, General Physiology (Eng. Trans.). London, 1899.

latter part of this statement. To my mind it sums up all that is vicious in the modern mechanistic attitude of physiologists and biologists. We are certainly *not justified in assuming anything* of the kind. We may say that, possibly, when we have more perfect knowledge, all can be explained by ordinary physico-chemical laws; but just so can the vitalists say that more perfect knowledge will indicate the impossibility of physico-chemical explanation.

Driesch, after a long and successful study by experiment, has formulated a theory of some importance in any discussion on vitalism. He expounded his theory in the Gifford lectures given at Aberdeen in the year 1907.[1] Yet not once in Schafer's address are those experiments or the conclusions of Driesch referred to. We are simply led to assume that from the success in explaining some vital processes by physics and chemistry we must take for granted that all vital phenomena will be some day similarly explained. This is not a scientific attitude.

One might well use Johnstone's words[2] in reply to the physiologists—"Did physiology, that is the physiology of the schools, ever really investigate the organism? A muscle nerve preparation, an excised kidney through which blood is perfused . . . . these things are not organisms." It seems very probable indeed that many of the changes taking place in the living body are purely chemical changes, and that many organs are operated by physico-chemical processes. We must, however, guard ourselves from confusing the cause and controlling factor or factors with the means by which they act.

The phenomena of the living organism which call for explanation may be classified as follows:—

Group (a.) The phenomena dealing with the growth of the organism in the widest sense of the word—that is to say inclusive both of development from the egg, and the regeneration of lost parts.

Group (b.) The phenomena dealing with the evolution of the species—transformism.

Group (c.) The phenomena of the actual functioning of the organism—the *modus operandi* of its organs—the methods by which energy is obtained for growth and upkeep.

The believers in the all-sufficiency of physico-chemical explanations have achieved their greatest successes in the study by experiment of the phenomena coming under Group (c.).

Their conception of life phenomena would compel us to regard the successive stages in the growth of the organism (Group (a.) above) as phases in a complex physico-chemical system. The same thing would apply to their explanation of the steps in the evolution of the species.

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[1] Driesch. Science and Philosophy of the Organism. London, 1908.
[2] Johnstone. The Philosophy of Biology. Cambridge, 1914.

Let us glance at Driesch's illustration from the phenomena of Group (a.); the example which he has developed as a proof of Neo-Vitalism—the development of the sea-urchin's egg. The usual cleavage of the fertilised egg cell results here in first two and then four equal cells. Further segmentation gives, by equal division again, an eight cell stage. Driesch was able to show by separating the blastomeres (by shaking) that even in the eight cell stage, each blastomere was capable of producing a complete sea-urchin larva. After separation of the blastomeres in the following sixteen-cell stage (separation by the use of sea-water free from calcium), some of the isolated cells might yet survive and give rise to perfect larvae. The blastomeres in this case are, therefore, totipotent, or at least so up to the sixteen-cell stage. If we assume that a mechanism is present in the developing egg, the mechanism must be capable of division without destruction of the character of the whole, and must be present in each blastomere of the eight-cell stage at least. Let us follow the argument of Driesch still further. If cleavage is allowed to continue until the blastula stage is reached, this must possess a three-dimensional mechanism if we assume that a "kind of real machine" exists in the system "which if once set going, would result in the differentiations that are to take place." For a machine whose acting is to be typical with regard to the three dimensions of space must be typically constructed in regard to these dimensions itself. We can, however, cut the blastula in pieces and the parts will give rise to complete embryos. Can you conceive of a machine which can remain itself, if you remove parts of it or if you rearrange the parts at will? And Driesch has come to the conclusion that if we are to explain the development of the sea-urchin egg (which is a harmonious-equipotential system) by the action of physical or chemical factors, there must be some such thing as a machine.

Driesch's experiment, however, proves perhaps no more than that no mechanism such as is understood above can be present in the developing egg and embryo. The fact alone that part of a sea-urchin blastula can give rise to a complete larva does not seem to my mind to indicate very much more than the fact that the germ cell can give rise to a larva, for in both cases it is almost impossible to conceive of a series of chemical changes due to a certain initial chemical constitution being alone responsible for the regulation of development. And if it were found possible to explain the development from the egg as due to a chemical mechanism alone, it would be just as probable that the development of isolated blastomeres of the sea-urchin's egg could be explained by the same process.

Bearing in mind, then, the possibility of some other chemical mechanism, let us follow the development of the egg of another organism, for it will be found that the sequence of events described above is not universal and we should hope that our theory of development would apply to all cases. The development of the egg of

Cynthia[1] will prove very suitable for our purpose. There is no yolk in the young egg of Cynthia—the ovarian egg—and the neucleus is situated in the centre. The deposition of yolk takes place round another body to be found in the cytoplasm (probably the attraction sphere). A peripheral layer of cytoplasm remains free from the yolk, but pigment granules of a yellow colour are deposited in this region. During the maturation changes, nuclear sap flows upward and forms a cap of cytoplasm at one pole of the egg, in which the chromosomes may be seen lying. Whilst maturation divisions proceed, the clear nuclear cytoplasm and the peripheral cytoplasm with yellow pigment both flow down to the opposite pole of the egg. The result is that the slate-coloured yolk is now at the upper pole whilst clear cytoplasm with more internally situated yellow pigment is to be found collected at the lower. Further changes take place in the distribution of these different substances as fertilisation takes place. It will be seen, therefore, at the outset, that the structure of the egg is not homogeneous and that different substances are actually visible.

The first cleavage divides the egg into two equal cells. The second cleavage results in four cells, but the yolk is separated so that it all passes into two cells only. The third cleavage gives eight cells and the coloured substances are still further segregated. Two cells now consist almost entirely of grey yolk, two cells almost entirely of yellow pigment, and four cells contain almost only clear substance. For our present purpose it is not necessary to follow the remaining divisions.

Now some authors regard the sequence of events in this development as indicating that the coloured substances in the cytoplasm are definite organ-forming substances which cause and control chemically the phenomena of development. It was found by Conklin that if one of the first two blastomeres was killed, the other one segmented as if its sister were still present, and hence only half a larva resulted. If three blastomeres were killed in the four-cell stage, the survivor, whichever it might be, gave rise only to an imperfect larva. In fact, what developed out of the surviving blastomere corresponded exactly to what would have developed had the three sister blastomeres remained alive. It appears demonstrated, therefore, in this case, that the organisation present in the egg—whatever it may be—cannot be divided into equal parts which are totipotent. The factors of development seem, at first sight, to be different from those of the sea-urchin's egg.

If development in this way were universal it might appear quite easy to demonstrate the probability of a three-dimensional machine. It is not, however, necessary, to my mind (even if physico-chemical factors are regarded as sufficient) to prove the existence of a three-

[1] Conklin. Orientation and Cell-lineage of the Ascidian Egg. Journ. Acad. Sc. Philadelphia, Series 2, vol 13, 1905.

dimensional "machine" which has the characters of our machines of everyday life. We must look then at other chemical explanations which have been put forward. The best known is the Roux-Weissman, which assumes that a complicated structure built up of determinants, representing the characters to appear in development, is present in the egg, and that disintregation of the structure during development and the segregation of the determinants is responsible for the growth of the adult form. It will be obvious that this explanation alone fails to explain the experiments made by Driesch on the sea-urchin embryo. Removal of a blastomere should result in the loss of certain determinants or chemical substances, and consequently certain structures should be missing from the embryo. Subsidiary explanations have therefore to be added to account for these results and also for the phenomena of regeneration. The development of Cynthia would lend support to this theory if it were universal—but it isn't. Moreover, the experiments on the egg of Cynthia do not prove conclusively that the blastomeres have lost the power of producing complete embryos. The method of experiment alone may have prevented the full expression of their growth taking place. Did not Roux' famous experiment in 1888—the destruction of one blastomere of the two-cell stage in the development of the frog's egg—appear to prove conclusively the segregation of determinants? Roux found that if one of the two first blastomeres was destroyed by means of a red hot needle, the other continued to segment and finally gave rise to a half embryo—either a right or a left half according to which blastomere had been destroyed. This result led naturally to the assumption that the first division of the frog's egg was qualitative and separated the materials of the right half of the embryo from those for the left. Later investigations showed, however, that under other circumstances the two first blastomeres might give rise each to an embryo whose *complete* development was only prevented by the impediment offered by the presence of the other, whether living or dead. In the Newt, where the two first blastomeres can be separated, two whole larvae result. It is quite evident, therefore, that the potentiality of the two blastomeres is a question of constitution *plus something else.* The experiments on Cynthia eggs seem to me to be something like those of Roux on the egg of the frog. It is not yet evident from them that loss of certain blastomeres causes incomplete development *because certain substances are lost.* It is noteworthy that the blastomeres cannot be actually separated; it is only possible to kill different ones by means of a hot needle and note the development of the survivors. It is wonderful that the mutilated embryo is able to survive at all.

Quite apart, however, from the above, if we allow the assumption of numerous determinants, we have to account for the manner in which they are ushered to their proper places, repressed, or impelled to develope. We have to explain how it is that every part of an Echinus egg contains all the determinants or formative substances for the complete adult, since its parts (if it be divided in any way) can give rise to a whole embryo. It is inconceivable that there could be present in the protoplasm of any part of a sea-urchin's egg an individual and distinct chemical substance for every different part of the complex adult. To meet this difficulty, however, it has been assumed by some recent writers that there is only one chemical substance or very few to begin with and that these determine the development of other organ-forming substances later. The development of the egg of Cynthia is supposed to give much support to this theory.

If we consider that by the chemical changes or disintegration of a complex chemical compound (or a few complex chemical compounds) a definite sequence of events follows, resulting in the development of organic form, then how are we to explain the regeneration of lost parts in adult or embryonic organisms? Whence comes the re-existence of the compound or the "chemical state" to repeat its sequence when this has been completed once already?

It is to my mind quite illogical to assume, as MacBride has done, that the development of Cynthia proves the coloured masses to be definite organ-forming substances[1]:—"In the egg of *Cynthia partita* Nature has provided us with an ocular demonstration of the existence of organ-forming substances." If Conklin's experimental work is considered final enough to prove that parts of the segmenting egg are unable to regenerate the other parts, it does *not* prove that the coloured substances are organ-forming substances, nor that organ-forming substances alone can explain the organised development of form in the embryo.

What we see in the embryology of Cynthia suggests that the phenomena of development are accompanied by chemical reactions. This does not, however, necessitate the assumption that these same chemical reactions are the actual organising and controlling factors of development. Three differently coloured substances are present in the egg of Cynthia which are separated in development, and which appear to be associated with the production of certain parts of the embryo. It is possible that these substances are used in the construction of certain parts of the body without being in any sense factors of causation. Thus, as a matter of fact, the term "organ-forming substances" may be strongly criticised, for substances probably do occur which are used in the formation of organs without being the *cause* of formation of those organs. The metal of which church organ pipes are composed is an organ-forming substance, but we may put down in a heap, metal, wood, ivory, and reeds, and we shall never see them arrange themselves into a church organ.

I have devoted some little time to this discussion of the development of the organism. To what has it led? According to Driesch we are to conclude that something is present in the egg to co-ordinate,

[1] MacBride. Text Book of Embryology. Vol. I. pp. 631, 632.

to organise, and to harmonise the phenomena of development which is not material and which is not a form of energy. It is a conception for which Driesch has used the term Entelechy. For my part I consider the more correct attitude can be expressed by the statement of T. H. Morgan[1]:—"We cannot see how any known principle of chemistry or physics can explain the development of a definite form by the organism or a piece of the organism." We may consider this a fair result of the discussion of the events of animal embryology, but it must be emphasised that it is not a proof of the existence of any non-material factor. It does not mean that we may *never* explain development by material agency; it is merely the expression of our present ignorance of a factor or factors which are responsible for organising and co-ordinating, and which are characteristic of living protoplasm.

I shall pass over the phenomena of regeneration in the adult organism, but I may call your attention to the regeneration of the lens in the eye of the salamander after removal of this structure. The new lens arises from the already differentiated layers of the iris, whereas in normal original development it takes its origin from the ectoderm. That is to say, a highly specialised structure, the lens, arises out of a tissue which is highly specialised in another direction. Time will not allow of a discussion of this and other problems of regeneration here. Let us pass to the second group of phenomena that were mentioned at the outset:—The phenomena of Evolution or Transformism. During the past few years several writers on biological subjects, whilst accepting the general conception of Evolution, have hinted that they considered the explanations put forward as insufficient to account for the phenomena. For example, Bateson, in his Presidential Address to the British Association for the Advancement of Science last year at Sydney, used these words, "And the chief conclusion I drew was the negative one, that, though we must hold to our faith in the Evolution of species, there is little evidence as to how it has come about, and no clear proof that the process is continuing in any degree at the present time." This statement came, I am afraid, as a great shock to the general public and even to many scientists, especially to those non-biologists who have regarded Darwin's suggestions as all sufficient. It even resulted in newspaper correspondence suggesting that all evolution was a myth! I need scarcely point out that this was due to the very prevalent idea that Darwinism and Evolution are one and the same thing. It is only natural that with our modern technique and our accumulated knowledge of the phenomena of Nature we should endeavour to explain more fully the causes and methods of Evolution and to seek for explanations of the difficulties that Darwin himself felt in the acceptance of his theory. Let us leave on one side to-night the modifications to Darwin's theories now considered necessary owing to the

[1] T. H. Morgan. Regeneration.

work of Mendel, Bateson, De Vries, and other experimentalists, and look at the difficulties which Driesch, and more lately Bergson, have found in the acceptance of the usual theories of descent. Driesch emphasises the fact (well known to biologists) that Natural Selection is not a creative factor. It does not explain the existence of certain animal and vegetable forms except by stating that all forms which *do not* exist are absent because they *cannot* exist or have never been produced. In the words of Driesch:—"Do we understand in the least why there are white bears in the Polar regions if we are told that bears of other colours could not survive." There is nothing in these statements, of course, which is contrary to the writings of Darwin. The point is merely emphasised that the Variations on which Darwin assumed Natural Selection to act are taken for granted. In other words no satisfactory explanation is forthcoming for the first appearance of Variations—the really fundamental phenomena of Evolution.

In addition, Driesch makes the criticisms that Darwinism cannot explain "the mutual adaptions between plants and insects; that it can never account for the origin of those properties that are indifferent to the life of their bearer; that it fails in the face of all portions of organisms which are composed of many different parts —like the eye—and nevertheless are functional units in any passive or active way; and that, last not least, it has been found to be quite inadequate to explain the first origin of all newly formed constituents of organisms even if they are not indifferent: for how could any rudiment of an organ which is not functioning at all, not only be useful to its bearer, but be useful in such a degree as to decide about life or death"?

The assumption that acquired characters could be inherited would, it is true, simplify, indeed it might explain, many of the above problems, and I see no reason yet for believing that acquired characters are not inherited. It would not explain all.

What does Driesch suggest as a solution of the problem? He considers that the non-material factor to which we have already been introduced, viz., Entelechy, is at the root of all transformism of species.

Bergson has evidently felt the same difficulties as Driesch and in his inimitable manner has devoted some time to an expression of the obstacles in the way of an acceptance of an accidental occurrence of co-ordinated variations. As one of the chief examples dealt with by Bergson is a structure on which I have spent some little time in research,[1] I feel no apology is needed for discussing the case here. The example comes from the well-known mollusc Pecten (the common Scallop), species of which exist all over the world. This animal, although in many details of organisation not very highly developed,

[1] Dakin. The Eye of Pecten. Q.J.M.S. Vol. 55. 1910.

possesses a large number of remarkable eyes on the mantle edge. They are remarkable not only for their complexity, which is probably only approached by the Cephalopoda amongst the Mollusca, but for the large number present. The Eye consists of a vesicle, the wall of which is formed of the connective tissue of the thickened mantle edge. This tissue is reduced in thickness and is more transparent in front of the lens. Covering it at this place is the ectoderm of the mantle which is free from pigment and forms a cornea. Below the cornea and the underlying connective tissue is a cellular lens composed of rather peculiar cells. Across the optic vesicle is a septum which acts as the distal boundary of the retina and lies in contact with it.

Now the retina is highly characteristic. It comprises two separate and distinct layers of sense cells, and the optic nerve bifurcates before reaching the optic vesicle in order to innervate these two sensory strata. One series of cells—the distal of the two—is not unlike a layer of ciliated epithelial cells with the cilia-like processes directed towards the lens. The other stratum is thicker and consists of rod cells or retinophorae, bearing rods. These cells are inverted so that the rods are turned *away from* the lens. The nerve fibres reach the retinophorae by the periphery of the retina. The nerve fibres reach the distal layer of sense cells by perforating the septum.

By no stretch of the imagination can the structure or the development of this eye be said to resemble the human eye, except that both eyes have an inversion of sensory elements in the retina. Bergson, however, assumes (probably from an ancient loose biological description) that the eye of Pecten and the human eye are closely alike in structure.[1] Taking the view that the vertebrates and the molluscs separated long before the appearance of a visual organ so complex he asks "Whence, then, the structural analogy?"

The same author points out that an explanation of the evolution of *either* of these eyes by the selection of small variations, or large mutations involving many simultaneous small changes, is surrounded with difficulties. The organ will be of no use and will not give selection any hold unless it functions. It will, moreover, be of no use if the retina develop without the other parts of the eye. If then small variations are responsible how could they have arisen in every part of the organ at the same time and in such a way that the eye would, from the beginning, be able to perform its work? If large mutations have resulted in the evolution of the eye, then what factor has governed the development so that all parts of the sense organ, having changed, yet remain so co-ordinated that the function of sight is still observed? Let us grant the possibility, suggests Bergson, of such a state of affairs taking place in one or other of the cases referred to, out of myriads of failures—is it conceivable that such a process could have occurred twice in unrelated organisms if no special organising factor were present?

[1] Bergson. Creative Evolution. (Eng. Trans.). London, 1913.

Now let us see how this may be answered. To my mind, in the first place there is nothing new in the case brought forward by Bergson except the difficulty of a similar evolution occurring twice and in unrelated organisms. The eyes, however, are *not* alike in structure. They certainly agree in being inverted, but even this inversion is different in type. Inversion occurs in other odd groups in the animal series and its isolated occurrence would suggest perhaps chance rather than design. A statement like the following:—"This inversion of the retinal layers occurs in all vertebrate animals but it is exceptional in the invertebrates" is very misleading at the outset, for it suggests to the reader that the two groups—Vertebrata and Invertebrata—are of equal rank and their subdivisions too.

We may regard similarity of structure in two invertebrate groups as surprising, but it would be much more extraordinary if we did not find similarity of structure in the different groups of the vertebrates, for they are much more closely related. In other details beyond inversion there are no resemblances between the two eyes, and consequently any special deductions drawn from the supposed occurrence of two similar complicated structures are quite worthless. Johnstone grants the failure of Bergson's argument in the case of the eye of Pecten, but suggests that a better case would be found in the convergent evolution of the teeth of "marsupials and some rodents." This cannot possibly be accepted, for on almost any theory of evolution it is to be *expected*, as suggested above, that similar modifications in structure will be found in different Vertebrate groups owing to their close relationship. As a matter of fact the teeth of marsupials and rodents are homologous structures and any resemblance is a case of parallelism. Convergent evolution is a different thing altogether.

We are thus left with Bergson's general objection that Natural Selection could not have resulted in the evolution of such a complex structure as an eye. This very example was brought forward by Darwin himself and answered in the "Origin of Species." Darwin writes:—"To suppose that the eye, with all its inimitable contrivances for adjusting the focus to different distances, for admitting different amounts of light, and for the correction of spherical and chromatic aberration, could have been formed by Natural Selection, seems, I freely confess, absurd in the highest possible degree. Yet reason tells me that if numerous gradations from a perfect and complex eye to one very imperfect and simple, each grade being useful to its possessor, can be shown to exist; if, further, the eye does vary ever so slightly, and the variations be inherited, which is certainly the case, then the difficulty of believing that a perfect and complex eye could be formed by Natural Selection, though insuperable by our imagination, can hardly be considered real. He who will go thus far, if he find on finishing the treatise that large bodies of facts, otherwise inexplicable, can be explained by the theory of descent, ought not to hesitate to go further, and to admit that a structure even as perfect as the eye of an eagle might be formed by natural selection—his reason ought to conquer his imagination." In this argument, or rather statement, Darwin takes his variations for granted, and it is in the production of these variations that both Driesch and Bergson believe their special factors manifest themselves. The whole thing is in reality only another form of the problem that we discussed first, *i.e.*, the development of form after the fertilisation of the ovum. The conclusions to be drawn from the discussions on the evolution of such a complicated organ as the eye are in a way disappointing. We can find no exceptional support, however, for Bergson or Driesch in the comparison, made so keenly by Bergson, of the eye of Pecten with the human eye. So far as the evolution of either of these eyes is concerned many biologists will follow Darwin and take chance variations as sufficient, if natural selection eliminates the useless, to account for the final evolution of such complex structures. Others would probably assert that nothing but large variations or mutations had been at work without attempting to inquire further into the co-ordination present in such mutations. The problem in either case is one of variation, and we have no evidence yet explaining the phenomena of variation. We are most certainly not in a position to say that some non-material factor such as Driesch's "Entelechy" or Bergson's "Vital Impetus" is present or even necessary, although no satisfactory mechanical explanation of variation is forthcoming.

Before leaving the subject which has introduced the eye of the mollusc Pecten into this discourse let me call your attention to one or two other points of interest in connection with the evolution of these structures. As a lamellibranch sense-organ the complexity of the eye of the scallop requires some explanation. I am afraid the theory of evolution by natural selection often encourages us to look with an anthropocentric attitude at the phenomena of adaptation. If so, we can find no solace in this case. There is no evidence of the need of such a battery of highly complicated visual organs. Other bivalves with similar habits are not provided with them. Lima swims as well as Pecten and has extremely simple eyes. Spondylus has eyes like Pecten and does not swim at all. Experiment, too (although personally I think in this particular example it is almost worthless unless the conditions are more natural than is usually the case) fails to show any reason for the presence of such eyes. How then are they to be explained on the assumption of a survival of the fittest, or on being the result of an active stimulus of the environment?

Subsidiary theories have been brought forward[1] to explain the evolution of monstrous reptiles, which were, by very reason of their specialised evolution unable to survive and are now merely indicated by those battered pages of history—the fossiliferous rocks. What

[1] Dendy. Momentum in Evolution. Report British Assoc. Adv. of Sc. 1911.

was the driving force in the evolution of all these forms and structures?

In conclusion let us look at the third category of phenomena suggested at the beginning of my address—the phenomena of the actual functioning of the organism—of physiology. Here we meet with evidence indicating the use of chemical reactions. In many cases, however, the phenomena observed appear at first sight to be highly peculiar. Take for example certain phenomena of osmosis. Several cases of diffusion in the animal body have been considered as beyond physico-chemical explanation because they appear to be contrary to what one observes in the laboratory or in the inorganic world. As Driesch states, the fact has been quoted often that the migration of ions or compounds in the organism can happen quite contrary to all the laws of osmosis, from the less concentrated to the more concentrated side of a so-called membrane, Driesch continues[1]:—"There is no simple membrane in the organism, but a complicated organisation of an almost unknown character takes its place and nothing, indeed, is against the assumption that this organisation may include factors which actually drive ions or compounds to the side of higher concentration which indeed drive them by "doing work," if we like to speak in terms of energy; and these factors included in the organisation may very well be of a true physical or chemical nature."

It is quite evident from this that Driesch looks upon physics and chemistry as explaining many processes that take place in the living organism, whilst at the same time considering them unable to account for all the phenomena of life. In the last few years physical chemistry has made progress in the elucidation of certain phenomena of osmosis, and it is interesting, perhaps, to note how an attempt has been made on physico-chemical lines to explain some of the phenomena met with in fishes.[2] In these animals the body fluids may possess a saline concentration which is normally higher than that of the surrounding water in which the fish are living (fresh water teleosts) or may be much lower than that of the external medium (marine teleosts). This appears at first sight very extraordinary for there seems nothing present to prevent simple osmosis taking place as it would if we separated a strong solution of salts from a weaker by a semi-permeable membrane. Experiments tend to show that the separating living membrane does not allow chlorine ions to pass through, although other experiments would indicate that it is to a certain extent permeable for them. The explanation of the problem is probably highly complicated. Donnan[3] has shown, however, that a membrane permeable to, say, Chlorine ions may actually separate two solutions with very different Chlorine concentrations. This

[1] Driesch. ibid p. 187.

[2] Dakin. Aquatic Animals and their environment. Intern. Revue d. ges. Hydrotrologie, 1912,

[3] Donnan. Theor. der Membrangleichgewichte. Leit. †. Elektrochemie. Bd. xvii.

would occur if an anion R′, and the undissociated salt NaR, were present on one side of a membrane impermeable to both, but permeable to NaCl which is present in solution on the other side. Owing to the presence of the non-dialysing substance NaR with the common ion Na the diffusion of the NaCl is hindered and in fact may be almost entirely prevented. Such mechanisms may be present in the living organism. There is no doubt, however, that the action of the membrane is different in aquatic animals immediately it is killed. But this could be put down to an alteration in its physical or chemical condition. This is only one example of the application of physico-chemical methods to the study of the phenomena of life, and it must be granted that these methods have elucidated much that once remained a mystery. We must not let ourselves be blinded by this success, nor must we fly to the opposite extreme and claim that the failure of our present knowledge to explain life phenomena means the presence of non-material factors.

To sum up, our conclusions are largely negative in character. The general result appears to be that "We don't know." Yet I think this result is not without value. The tacit acceptance of some explanation has often kept back discovery for years. One could use no better illustration of this than Stahl's famous theory of phlogiston which ruled natural science with a rod of iron for practically a hundred years. Curiously enough Stahl's hypothesis was vitalistic. The time is not yet ripe for a tacit acceptance of Entelechy nor of any other similar non-material factor in the phenomena of life. It is just as certain that it is too soon to take as proved or even as probable the view that ordinary chemico-physical phenomena are responsible for all that we know as life. In fact, our discussion has lent support to the presence of some unknown factor which is as yet hidden from our ken.

In the last few years a greater spirit of caution has been abroad —we are learning what complex phenomena we have to deal with in biological studies. The struggle to find simple theories has been carried too far. I might have said the struggle to find *a* theory, for scientists are often very intolerant, and it is sad to think of the wordy warfare that has raged on such problems as evolution, acquired characters, Mendelism, biometrics, and coral reefs and their origin.

Biology has had a remarkable effect upon human thought and action since the time of Darwin—let us then tread carefully, by experiment and observation collecting our facts, until the time comes when we feel our results allow of certain deductions being made. Then let us make them with a spirit of humility, being always prepared for newer knowledge to prove or disprove our contentions. I could not do better than conclude with the words used once by Professor D'Arcy Thompson: they meet our case so well:—

"The reasons and the reasoning that contented a past generation call for re-inquiry, and out of the old solutions new questions emerge; and the ultimate problems are as inscrutable as of old. In wonderment, says Aristotle, does philosophy begin, and more than once he rings the changes on the theme. Now, as in the beginning, wonderment and admiration are the portion of the biologist, as of all those who contemplate the heavens and the earth, the sea, and all that in them is."

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INDEX—*continued.*

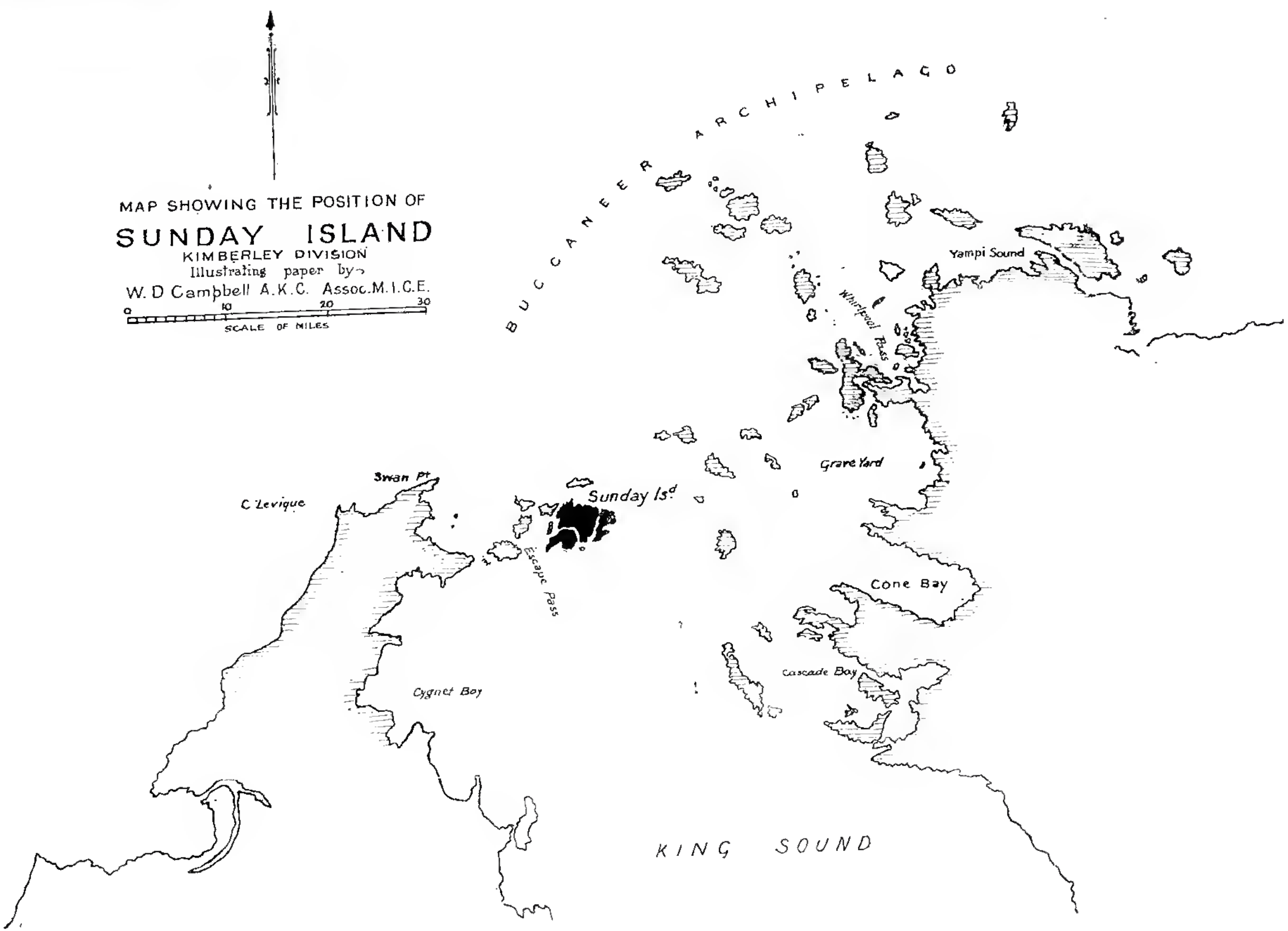
INDEX—*continued.*

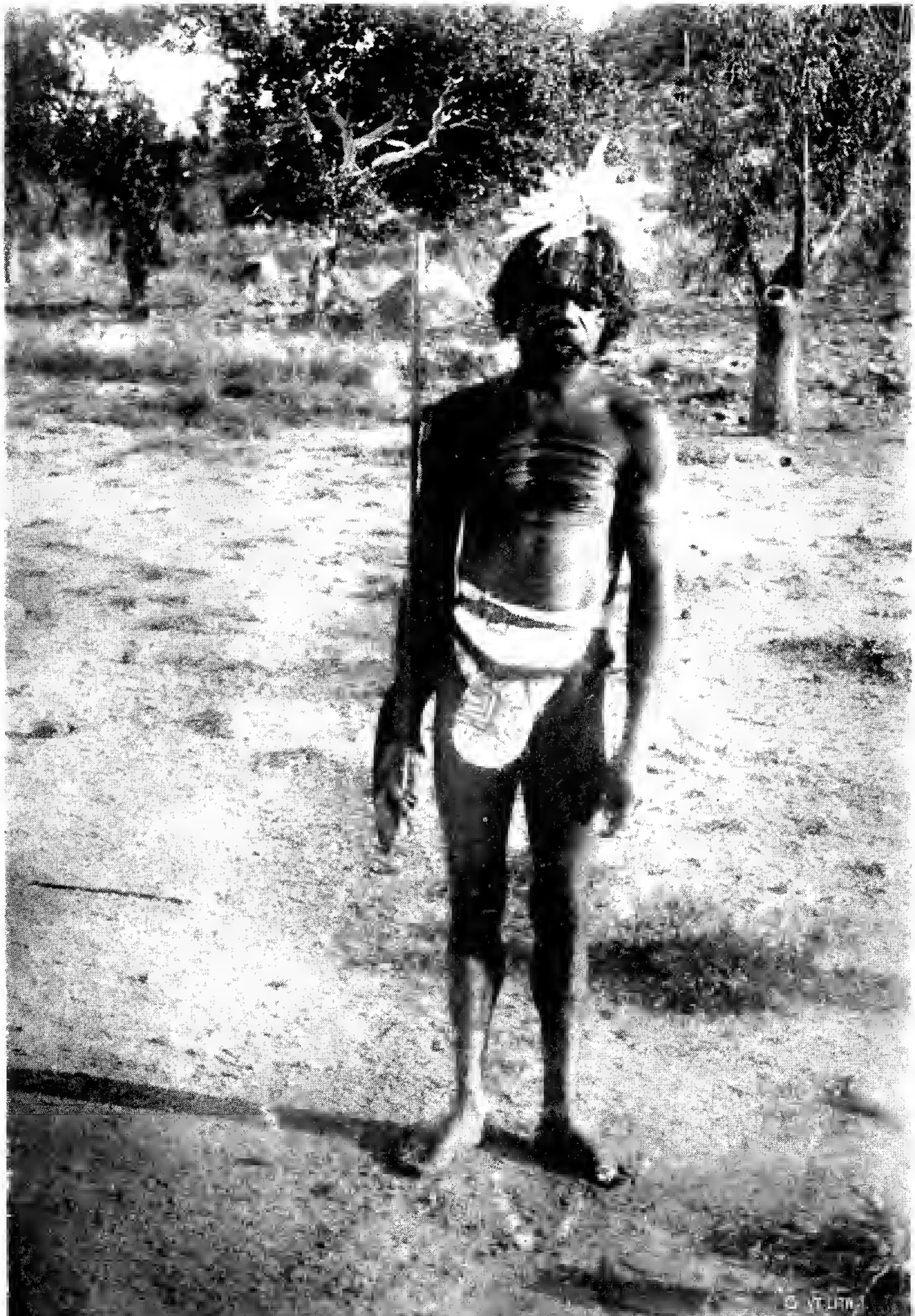
INDEX—*continued.*

INDEX—*continued.*

By Authority: FRED. WM. SIMPSON, Government Printer, Perth.

Plate I.


MAP SHOWING THE POSITION OF
SUNDAY ISLAND
KIMBERLEY DIVISION
Illustrating paper by
W. D Campbell A.K.C. Assoc.M.I.C.E.
0 10 20 30
SCALE OF MILES
BUCCANEER ARCHIPELAGO
Yampi Sound
Whirlpool Pass
Grave Yard
Sunday Isd
Swan Pt
C Levique
Escape Pass
Cone Bay
Cascade Bay
Cygnet Bay
KING SOUND



Sunday Islander, "Cockroach."

Photo., W.D.C. Front view.

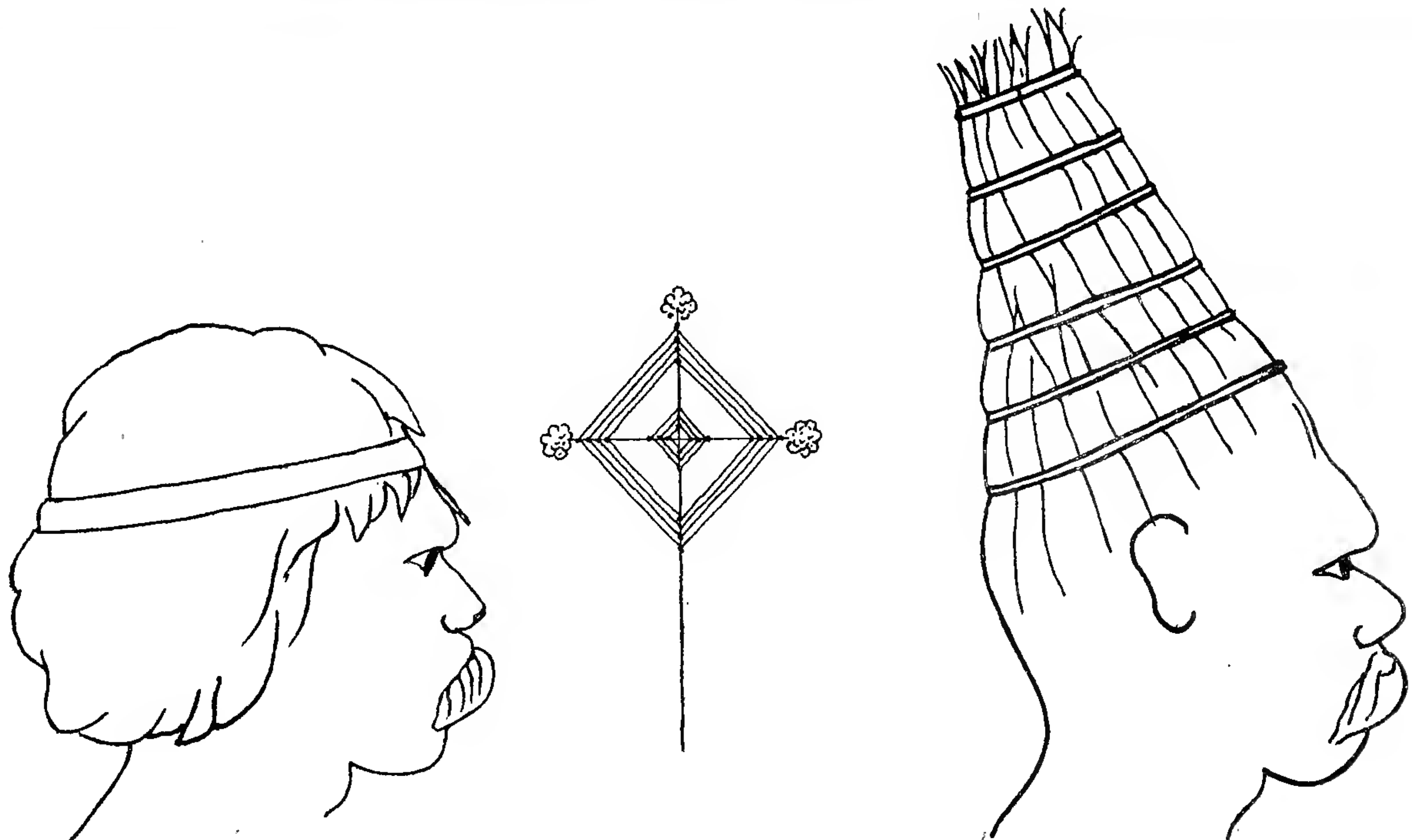
Sunday Islander, "Cockroach."

Photo., W.D.C. Back view.

Sunday Islander, "Cockroach."

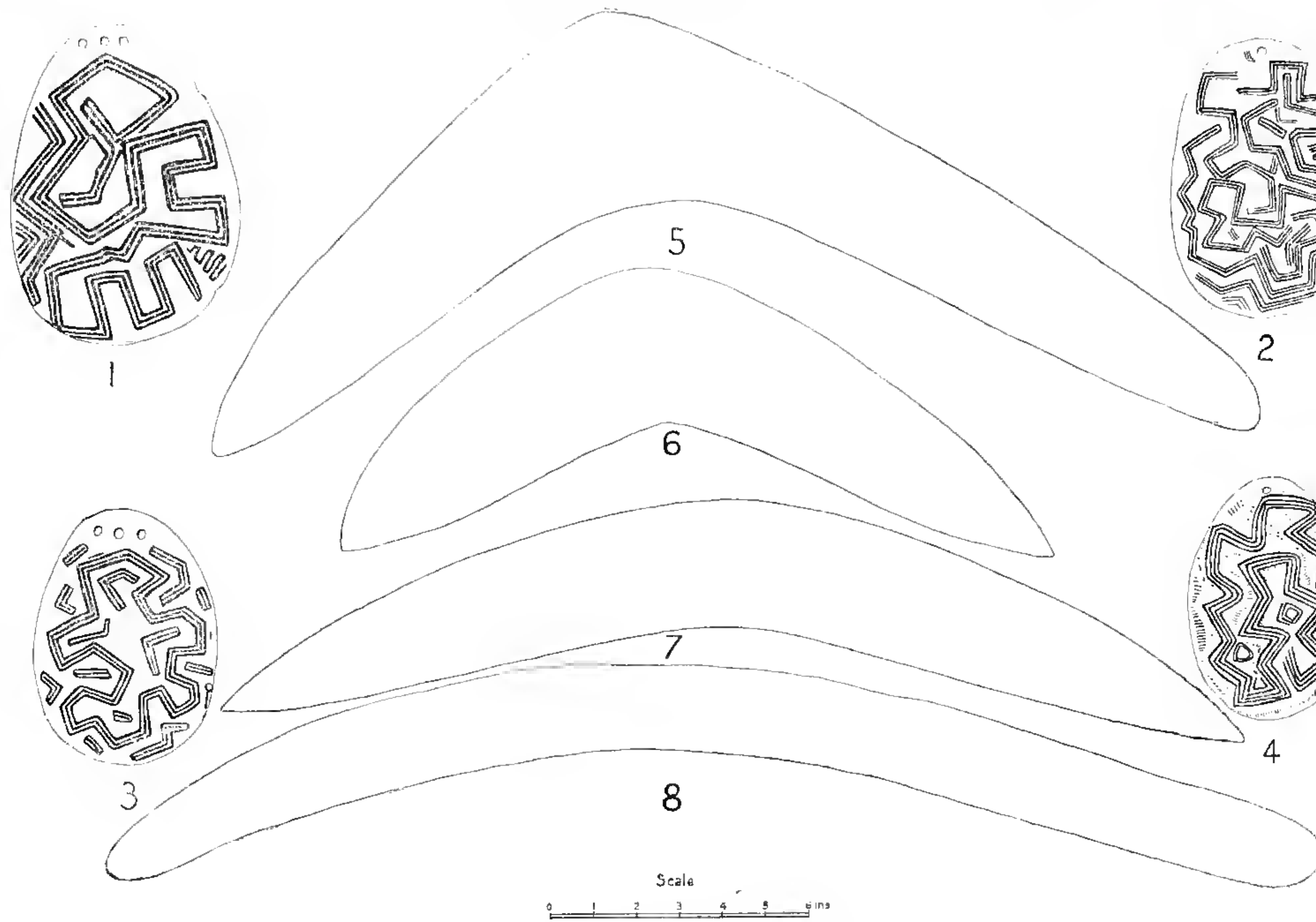
Photo., W.D.C. Side Face.

Plate V.



B. C. A.

HEADDRESSES AND ORNAMENT.



Figs. 1-4.—Ornamented Pearl Shells.
Figs. 5-8.—Fish, War and Ordinary Kylies.

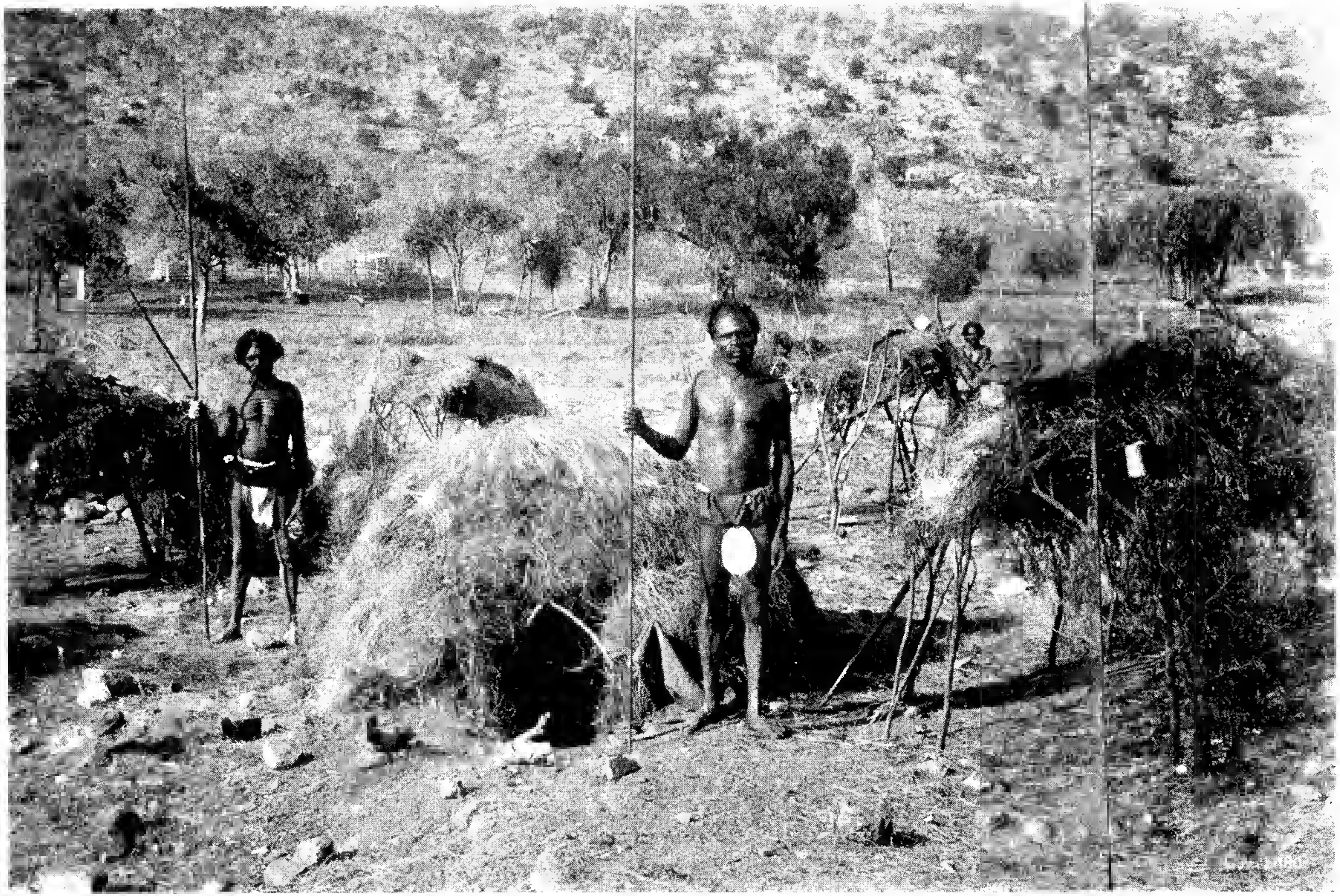


Photo., W.D.C. Aboriginal Camp, Sunday Island.

Fig. 1.

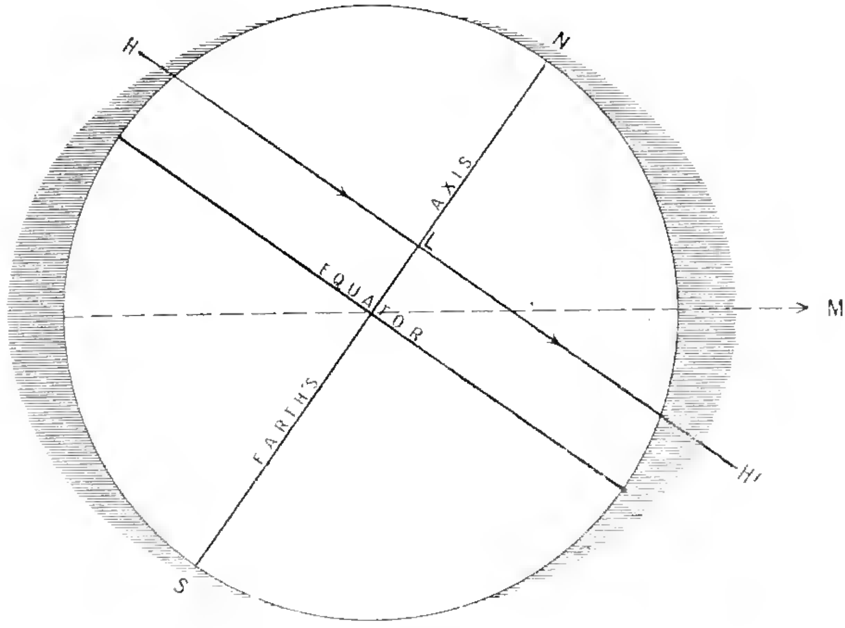


Diagram explaining Diurnal Irregularity (p. 29).

Fig. 2.

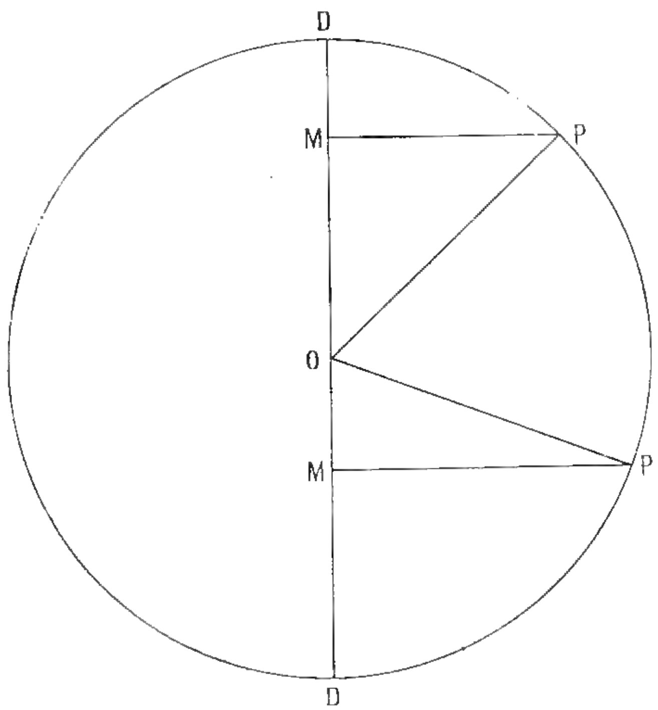
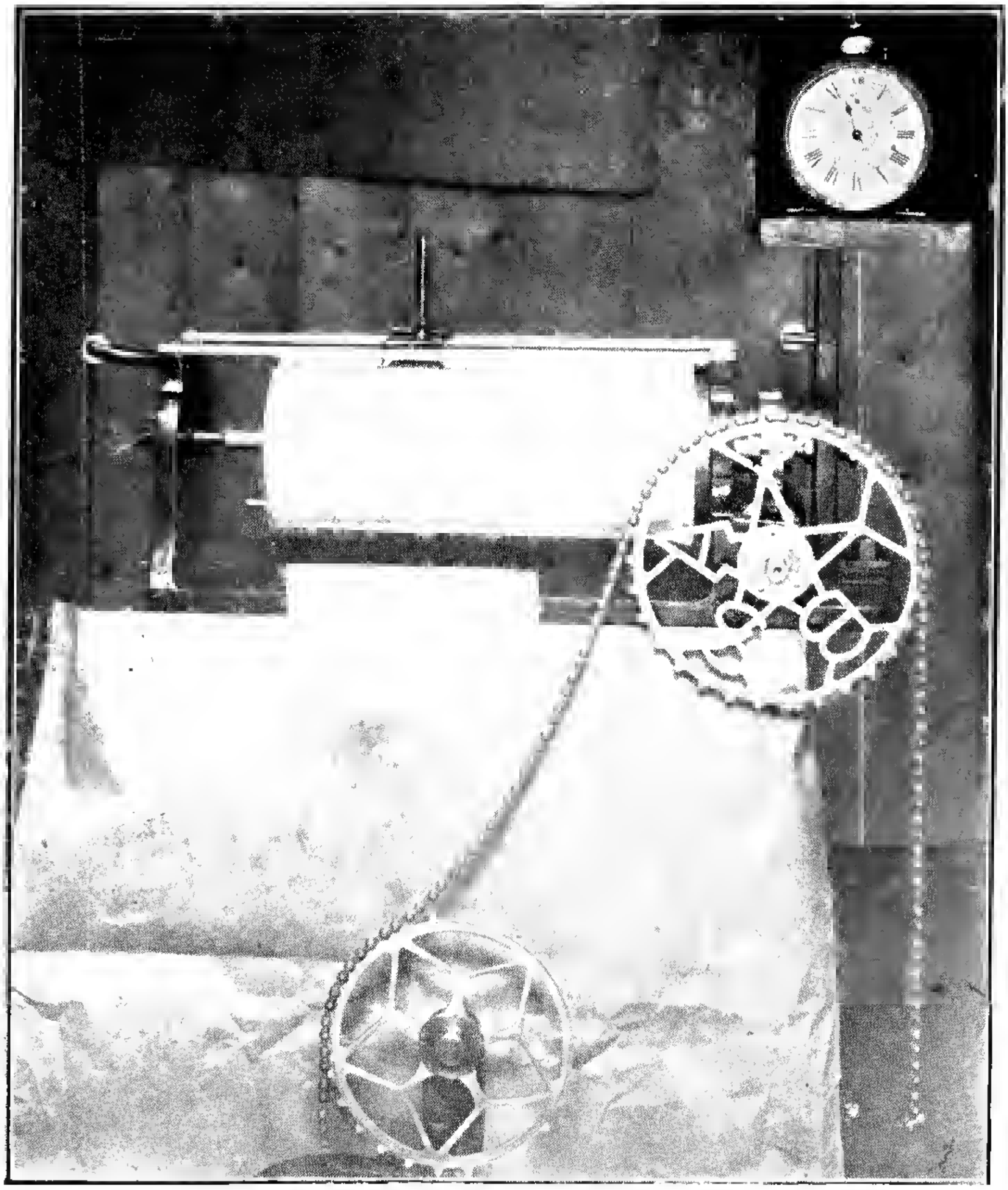
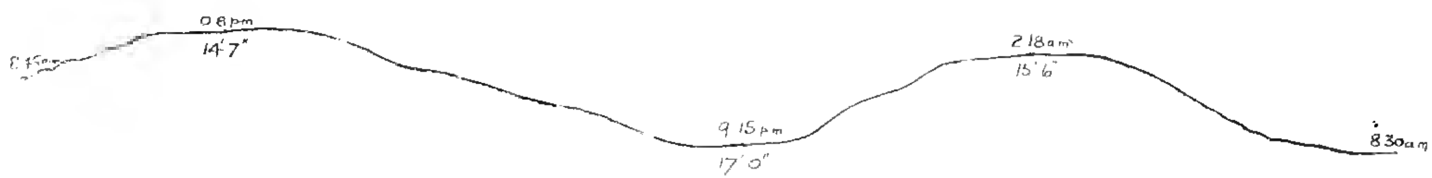


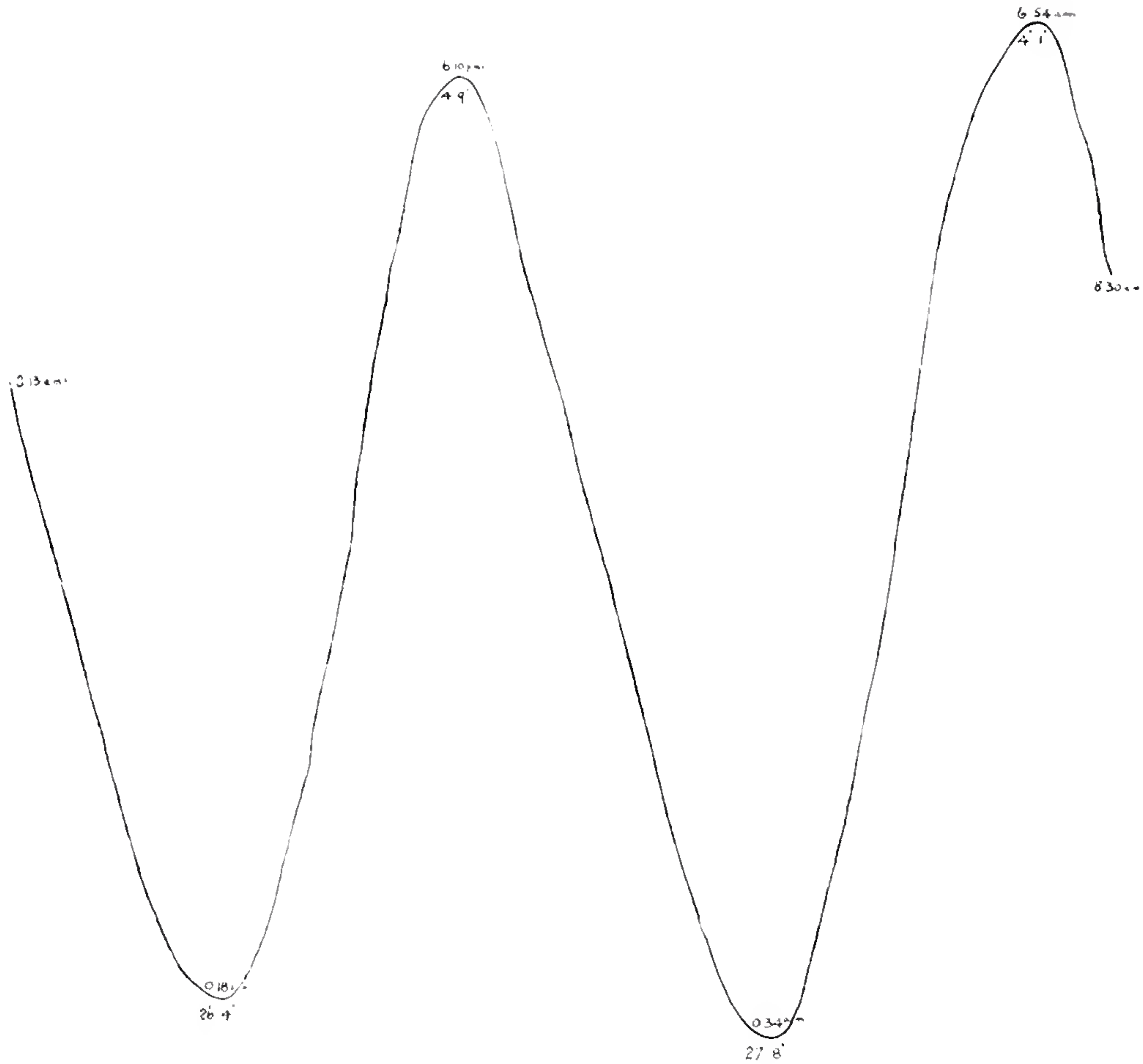
Diagram explaining simple harmonic motion (p. 40).



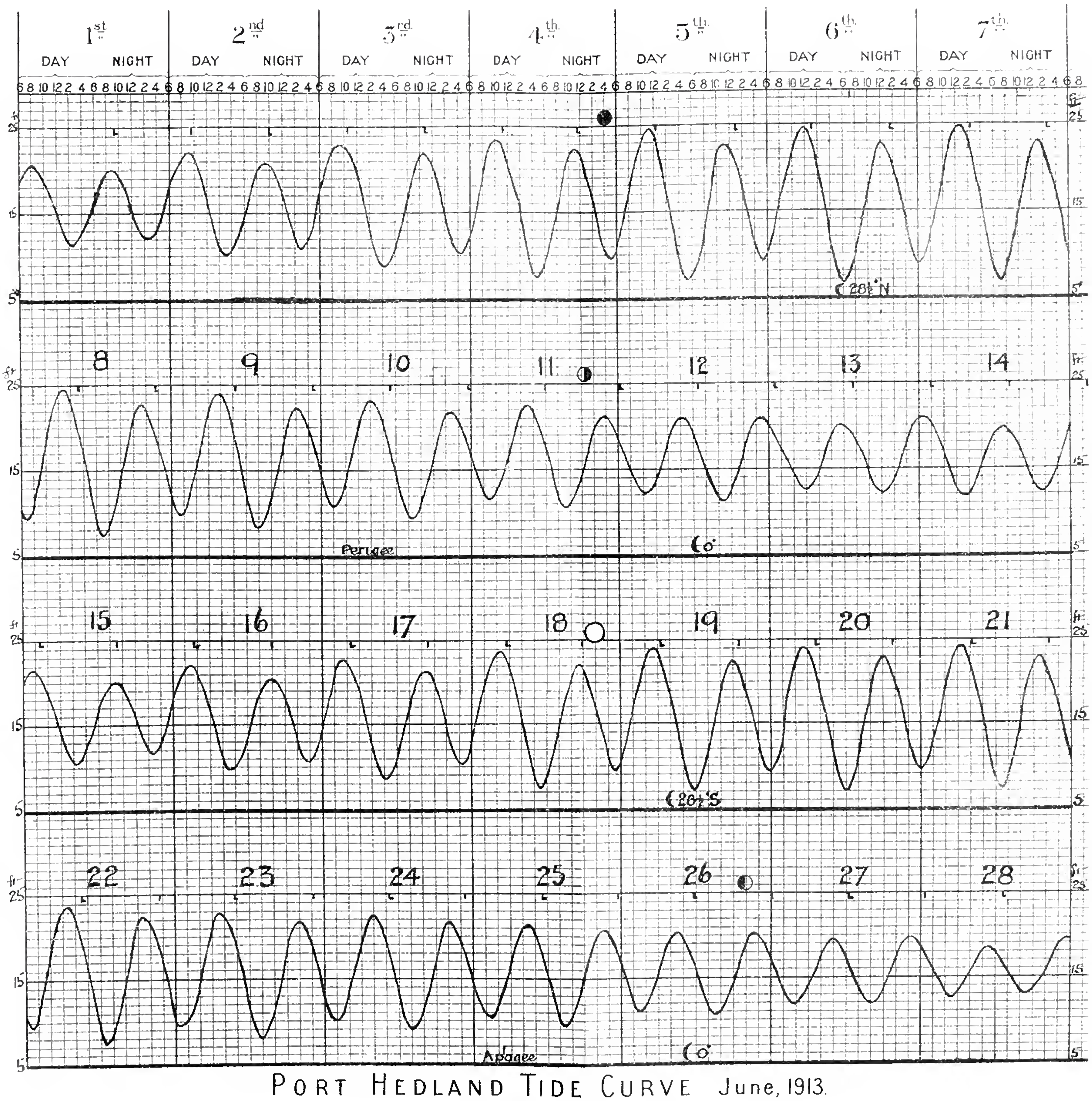
The New Tidal Gauge at Port Hedland (*see* letterpress, p. 30).



Curve of Neap Tide at Port Hedland, 1913, Oct. 9. *See* pp. 31 and 35.



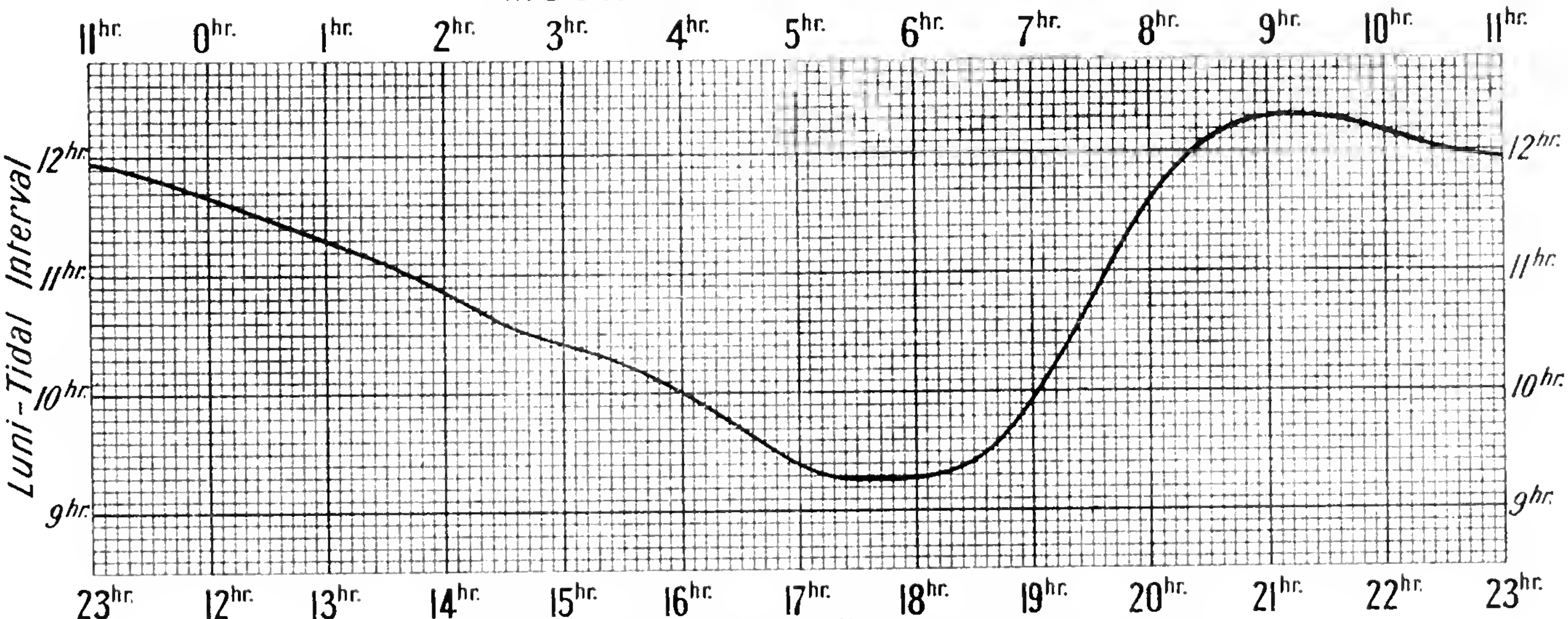
Curve of Spring Tide at Port Hedland 1913, Oct. 2. (*See* pp. 31 and 35.)



PORT HEDLAND TIDE CURVE June, 1913.

H J Pether, Government Lithographer, Perth, W.A.

MOON'S MERIDIAN PASSAGE.

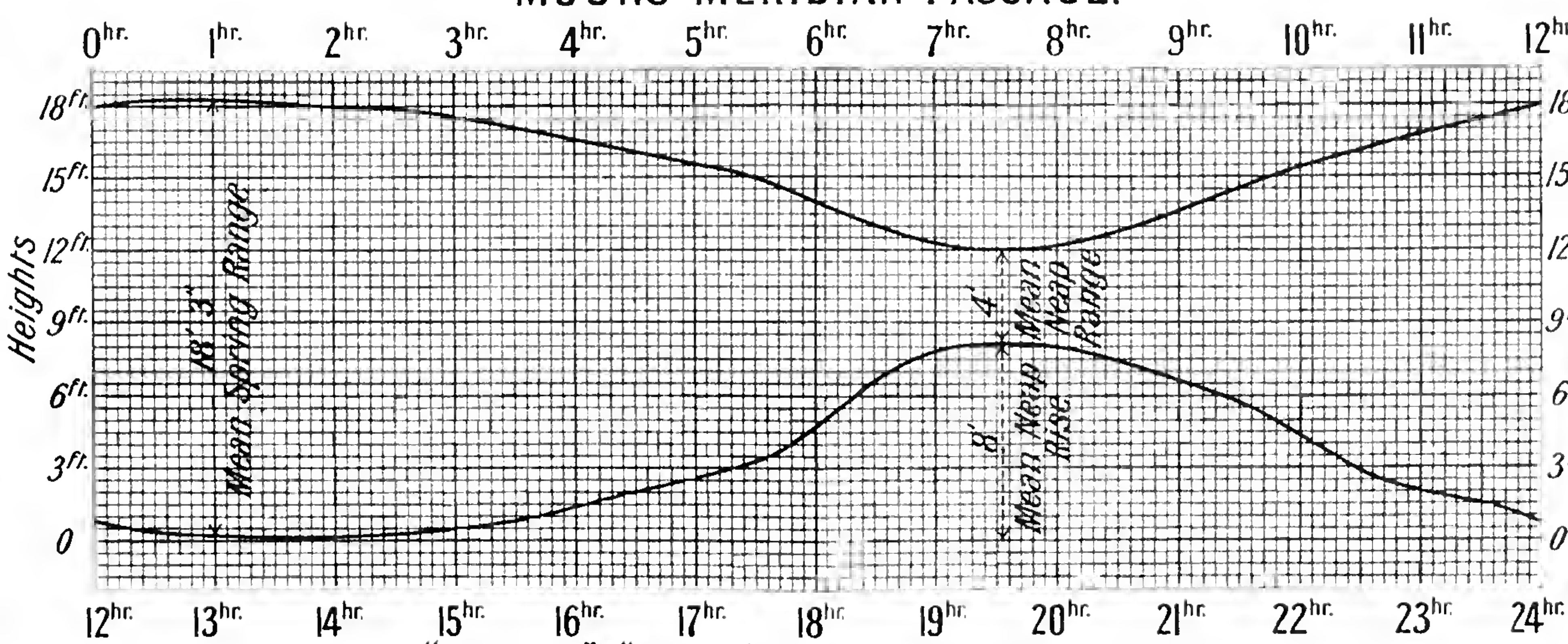


"THE ESTABLISHMENT" OF PORT HEDLAND.

Fig. I.

Each Division of Horizontal Lines equals 6 minutes.
" " " Vertical " " 6 "

MOON'S MERIDIAN PASSAGE.

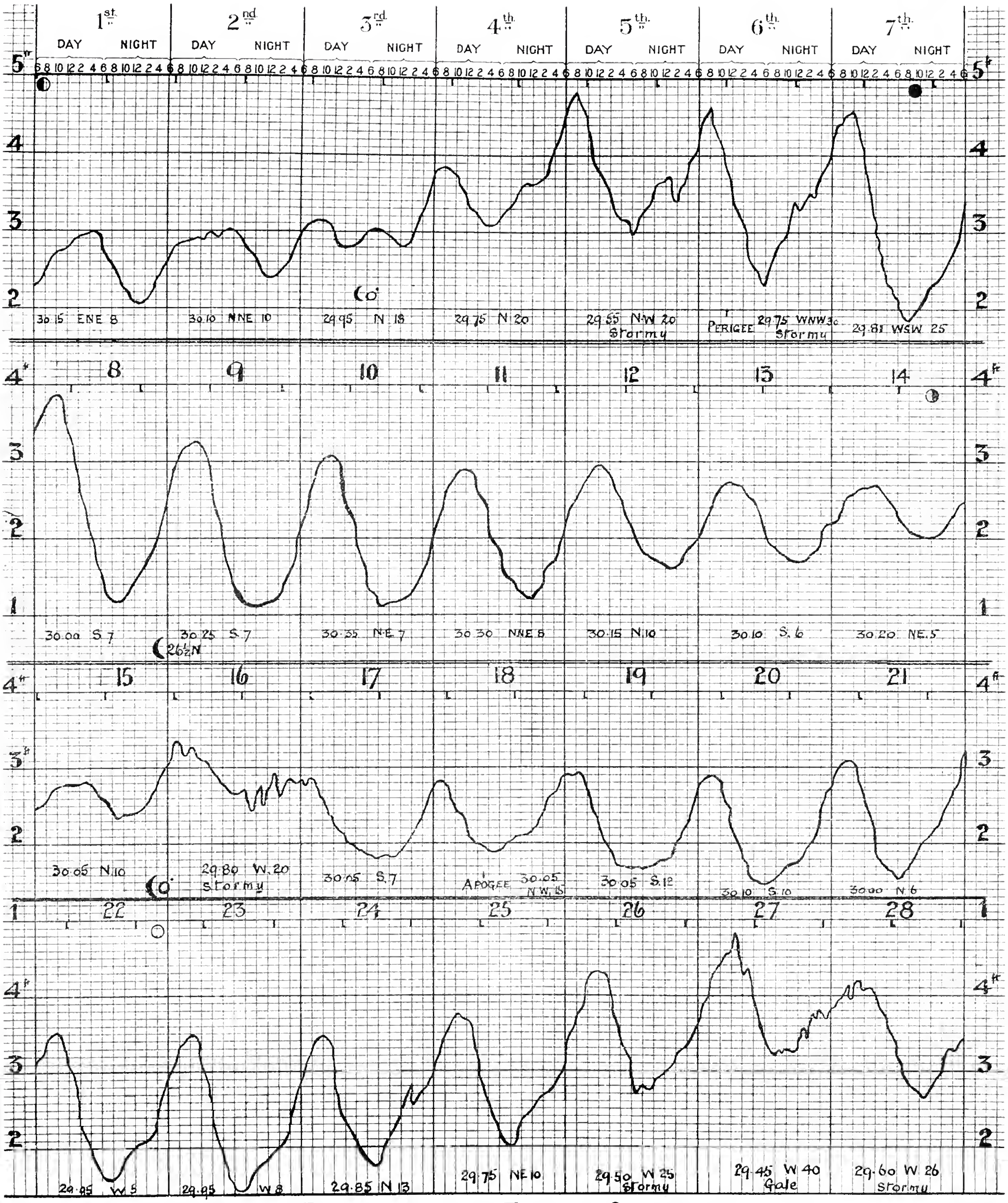


"SPRING" & "NEAP" RANGE - PORT HEDLAND.

Fig. 2.

Each Division of Horizontal Lines equals 6 minutes.
" " " Vertical " " 6 inches.

H. J. Pether, Government Lithographer, Perth, W.A.



FREMANTLE TIDE CURVE

June, 1910.

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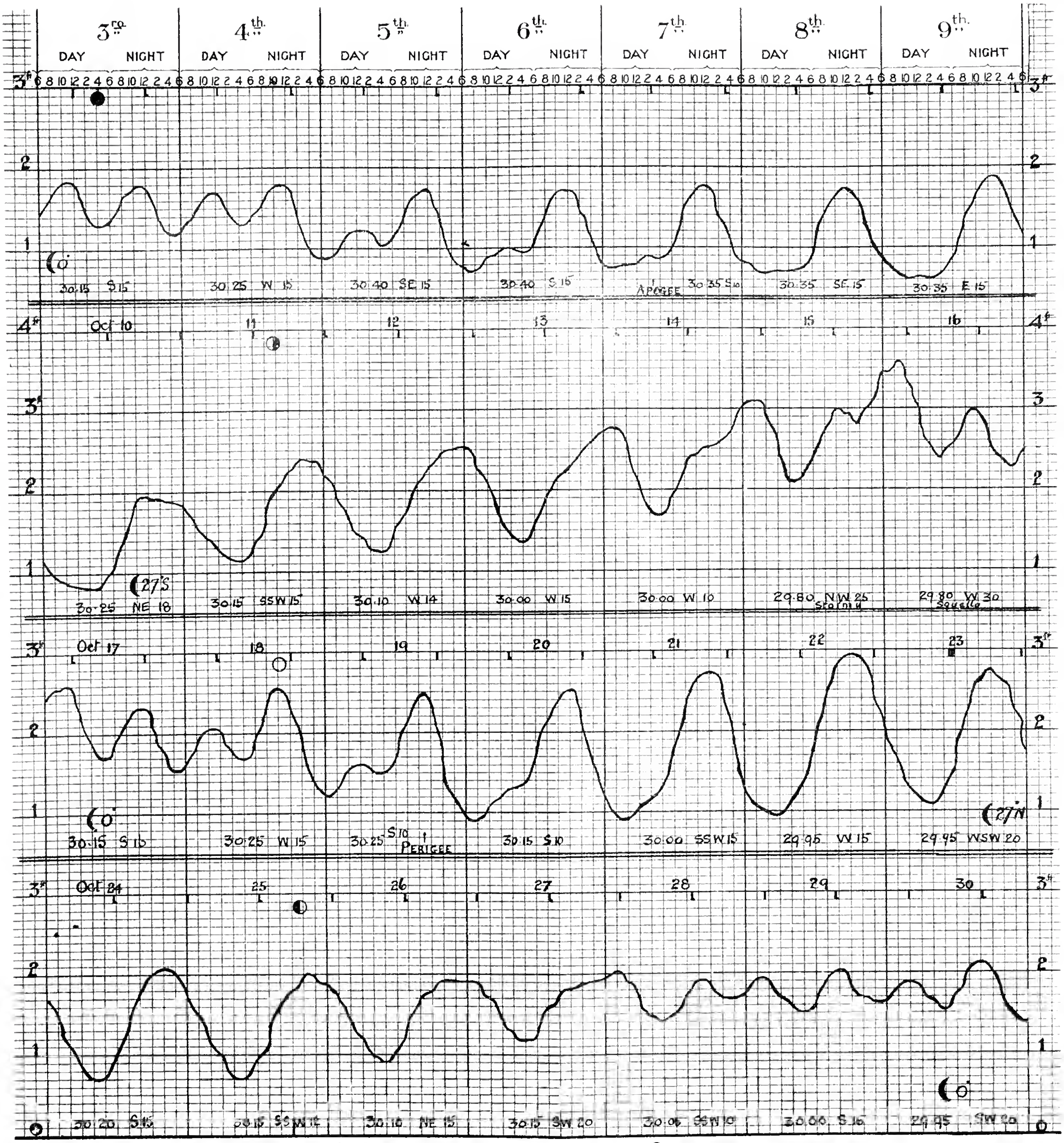
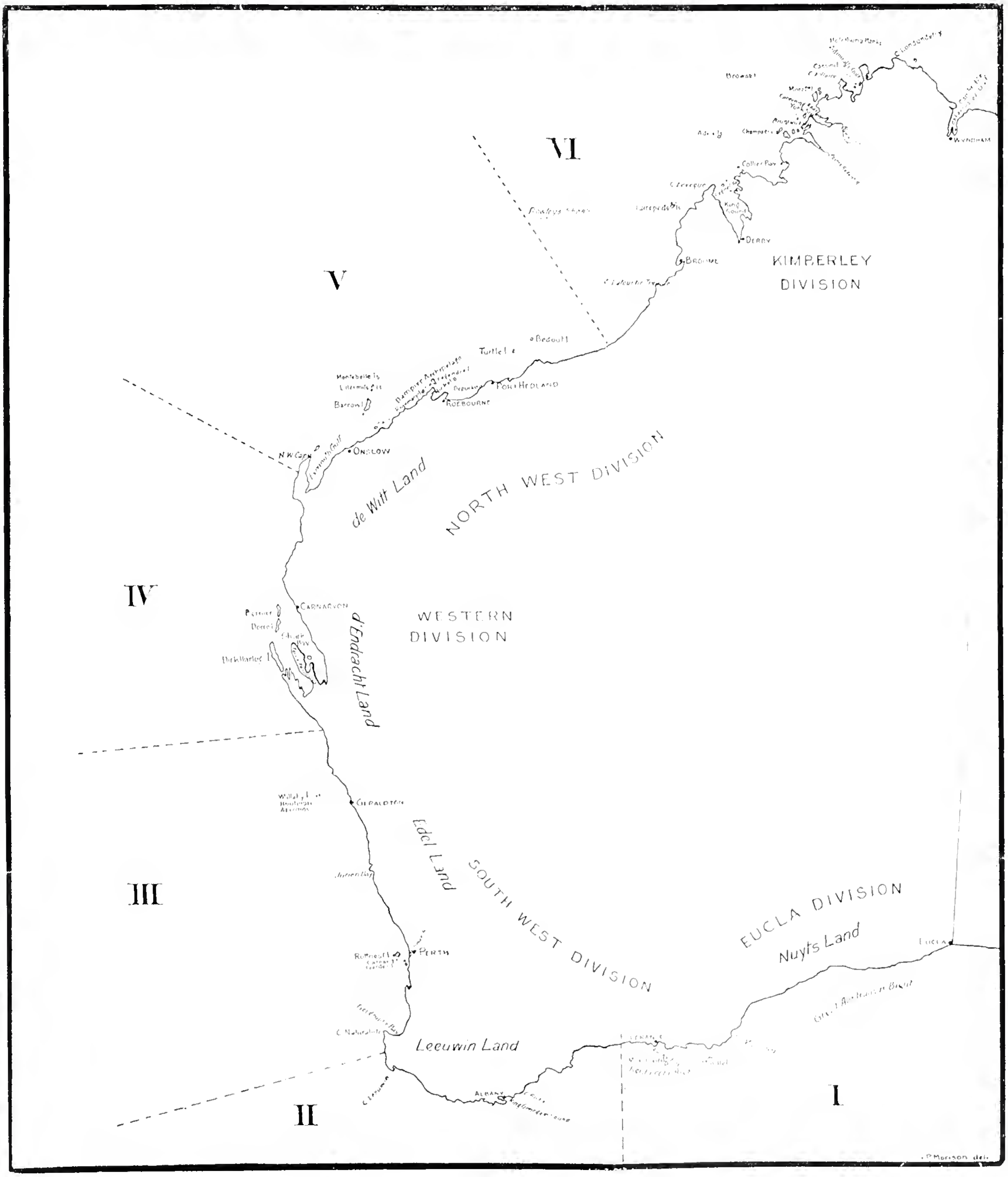
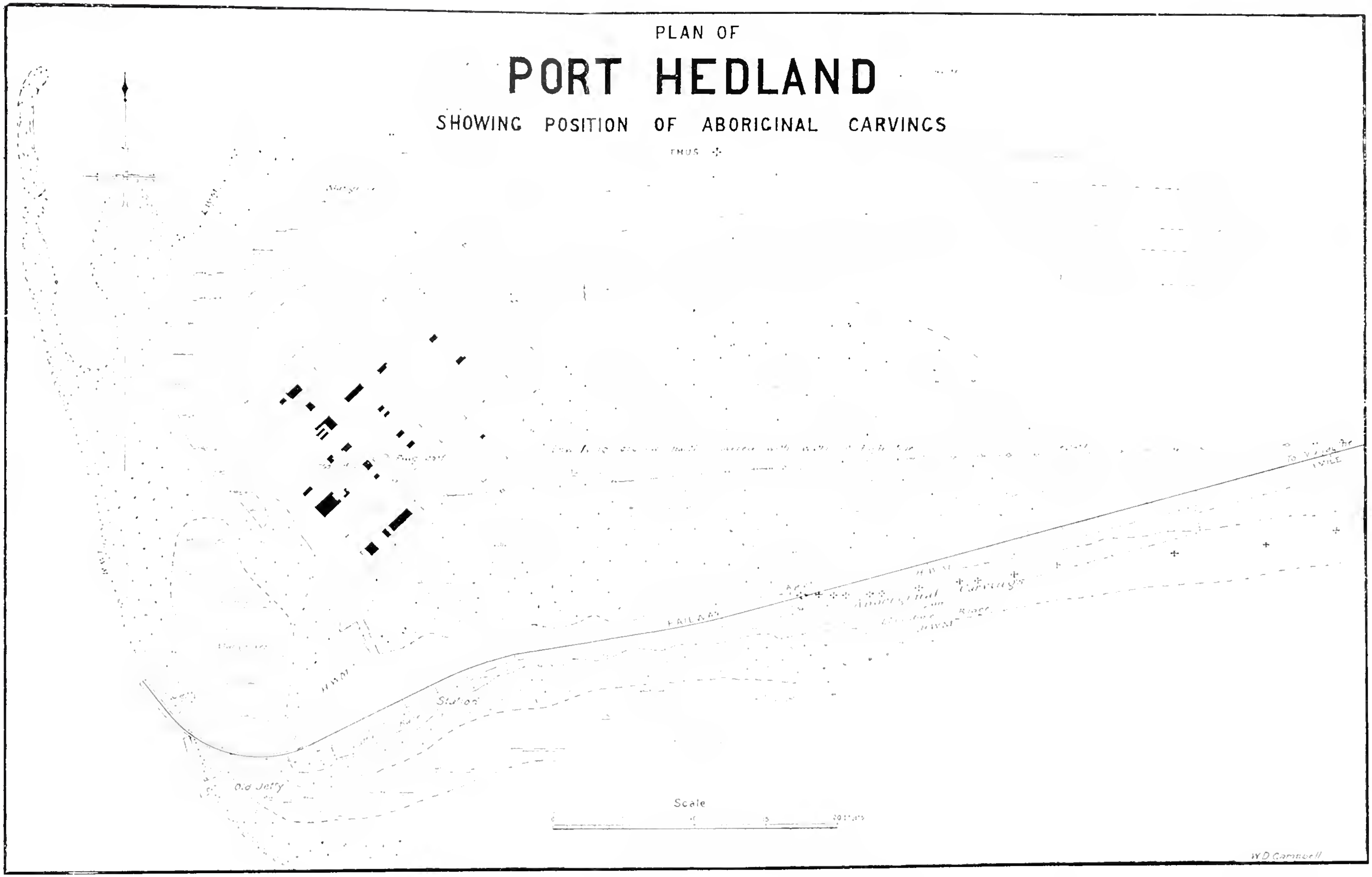


FREMANTLE TIDE CURVE
October, 1910.

R. J. Pether, Government Lithographer, Perth, W.A.

Map illustrating the History of Zoology in Western Australia.





Referred to in Vol. III., Nat. Hist. and Sci. Soc., W.A.