PAPERS AND PROCEEDINGS

OF THE

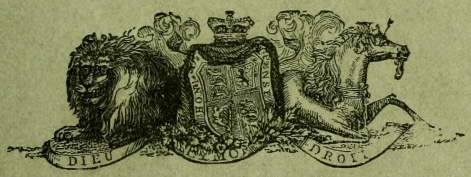
ROYAL SOCIETY

OF

TASMANIA,

FOR

1882.



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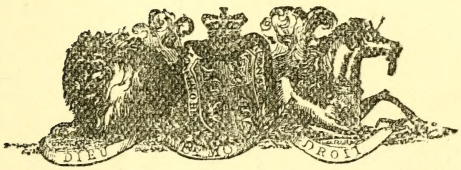

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THE responsibility of the statements and opinions given in the following papers and discussions rests with the individual authors ; the Society as a body merely places them on record.

Contents.

PROCEEDINGS.

APRIL, 1882.

A monthly meeting of the Society, the first of the preseut session, was held at the Museum, on Monday, April 17. Mr. Justin McC. Browne in the chair.

Mr. W. F. Ward, Government Analyst, who had previously been nominated by the Council, was balloted for, and declared unanimously elected as a Fellow of the Society.

The Hon. Secretary (Mr. BARNARD) brought forward the usual returns, viz. :—

1. Number of visitors to Museum, January—On Sundays, 634; on week days, 1,400; total, 2,034. Do. February—On Sundays, 613; on week days, 1,022; total, 1,835. Do. March—On Sundays, 499; on week days, 969; total, 1,468.
2. Do. Gardens, January, total, 7,577.
   Do. do. February, total, 6,383.
   Do. do. March, total, 5,536.
3. Plants, etc., sent from and received at Gardens :—
   January—Received from De Smet Freres, Ghent, Belgium, 2 cases Rhododendrons, Clematis, and Peony. From Chamber of Agriculture, Washington, United States, 55 papers of seeds. From Baron von Müeller, Melbourne, bulbs of *Crinum uniflorum*. Sent to De Smet, Ghent, 7 Tree Ferns.
   February—Received from Mr. Kayser, Mount Bischoff, seeds of *Acacia rhombifolia*. Sent Mons. J. Linden, Ghent, 6 Tree Ferns. Received from Vilmorin, Andrieux, et Cie., Paris, 11 packets seeds.
   March — Received from Vilmorin, Andrieux, et Cie., Paris, 10 packets seeds. From Chamber of Agriculture, Washington, U.S.A., 16 packets seeds. Sent to Messrs. Law, Somner, and Co., Melbourne, seeds of Clianthus. To Mons. August von Geert, Ghent, 6 Tree Ferns. To De Smet Freres, Ghent, 6 do.
4. Books and Periodicals received, January, February, and March.
5. Presentations to Museum.

Meteorology.

1. From the Marine Board, Hobart. Tables from Mount Nelson for January, February, and March; South Bruny for January and February; Goose Island, do.; Swan Island, King's Island, and Kent's Group, for January.
2. From Mr. Roblin. Tables of results of Meteorological Observations taken at the lighthouses and Mount Nelson during the year 1881.
3. From Mr. F. Abbott, jun. Monthly tables of Rainfall at Society's Gardens. During January, 1·06in.; February, 1·01in.; and March, 0·65in.
4. From Mr. Kayser. Do. at Mount Bischoff during March, 3·34in.
5. From Mr. D. C. Purdy. Do. at Macquarie Harbour, do., 2·09in.
6. Rainfall at Mount Nelson, January, 1·64in.; February, 1·51in.; and March, 0·49.

Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during January, February, and March :—

January 8. Veronica angustifolia in full flower.
,, 10. Apricots commenced to ripen (Roman).
,, 16. Grevillea robusta in full flower.
,, 18. Jargonelle Pear ripe.

January 24. Black Mulberry commenced to ripen.
February 10. Kerry Pippin Apple do.
" 15. Windsor Pear do.
" 20. Bon Chretien Pear do.
" 22. Green Gage do.
" 25. Ash commencing to shed seed.
" 27. Sycamore do.
March 14. Seckle Pear commencing to ripen.
" 16. Tips of Hornbeam commencing to turn.
" 18. Coe's Golden Drop Plum ripe.
" 28. Horsechestnut leaves turning brown.
" 28. Ash leaves turning yellow.
" 30. Oak leaves commencing to fall.
" 31. Tips of Elm turning yellow.

The presentations to the Museum were as follow :—

1. From Mr. J. A. Clark, Franklin. Stalactite, from a recently discovered natural tunnel, running through a hill on the Craycroft River, Huon district.
2. From Mr. V. Johnston. A specimen of the "Ribbon Fish" (Trachypterus ativelis), caught off Darlington, Maria Island, East Coast Tasmania.
3. From Mr. S. P. H. Wright. Specimens of the various strata passed through in boring for water at The Grove, Glenorchy.
4. From Mr. A. P. Canaway. Specimens of the paper money (Assignats) of the First French Republic (1793-1805).
5. From Mr. John Page. Nine Snake Skins, from the Eastern Marshes.
6. From Mr. D. M. Barnard. Skin of Black Snake (Hoplocephalus curtus), from Beaconsfield. In a note which accompanied this specimen, the donor states that "The snake was originally 6ft. in length, the skin is now 5ft. 10in., without head, and allowing for shrinking."
7. From Mr. J. Barnard. 89 Copper Coins and Tokens, and 4 Silver Coins. [Among the latter is a Specimen, in excellent preservation, of the "dump" struck from the centre of the Dollar, and formerly in circulation in the colony. It bears the date 1813, and its value, 15 pence, is stamped on the reverse side.]
8. From Master Stephens. Two specimens of Unio Moretonicus, from the Lake River.
9. From Miss Lodder. 73 Species of Marine Shells, from North Coast, Tasmania.
10. From the Trustees, Australian Museum, Sydney. 108 Specimens of Foreign, and 121 of Australian Birds, mounted; three Heads of Egyptian Mummies.

Presentations to Library :—

1 From Captain W. V. Legge, R.A. Two Photographs of the Chaldæan Account of the Deluge, taken from Terra Cotta tablets found at Nineveh, and now in the British Museum, with translation and text by George Smith, of the Oriental Department, British Museum.
2. From Trustees British Museum, Catalogue of Birds, Vol. 6.
3. From the Government of Victoria. A descriptive Atlas of the Eucalypts of Australia (Eucalyptographia), 5th Decade, by Baron von Mueller, K.C.M.G.

The SECRETARY called special attention to the extent and value of the donation (No. 10) from the Trustees of the Australian Museum, as an act of great liberality, especially coupled with the promise of a future gift of skins of New Guinea Birds, whenever mounted specimens are available for the purpose. "In exchange, the Trustees would be

glad to receive skins or skeletons of Thylacines (Native Tigers), and skulls or skeletons of small Whales; also, fresh water Fishes and Crustaceans."

The SECRETARY read a letter from Baron F. von Müeller, K.C.M.G., with a short paper entitled, "Remarks on the Vegetation of King's Island."

Mr. R. M. JOHNSTON, F.L.S., followed with a "Note and Description of the first discovered representative of the Genus *Pupa* in Tasmania," with a drawing of the Shell.

The meeting closed with a vote of thanks to the writers of the papers and to the donors to the Museum, making especial mention of the presentation of Birds from the Australian Museum, and of Shells from Miss Lodder.

At 8 o'clock the members adjourned to the upper rooms of the Museum, when an exhibition of the telephone took place, at which a number of ladies were present by invitation. Mr. R. Henry, the superintendent of telegraphs, conducted the proceedings, and commenced by giving a lucid and interesting description of the construction and uses of the instrument. Communication was made with Pearson's Point, Mount Nelson, and Battery Point; the extreme distance traversed being about 20 miles. The experiments were very successful, and afforded much gratification to those who witnessed them. Twelve telephones were employed on the occasion, by which means the various messages and replies were made audible to a number of persons simultaneously. In addition to conversation held between the several stations, music and singing were introduced, the airs being distinctly heard in the room.

In conclusion, Mr. Henry gave explanations of the working of the phonograph and microphone, which were attentively listened to.

MAY, 1882.

The monthly evening meeting of the Society was held on Tuesday, 9th May, His Honor Mr. Justice Dobson, V.P., in the chair.

Mr. Fleetwood Wilson was balloted for, and declared duly elected as a Fellow of the Society.

The Hon. Secretary (Mr. BARNARD) brought under notice the following Returns for the month of April, viz.:—

1. Number of Visitors to Museum—On Sundays 959, on week days 777; total 1,736.
2. Ditto to Gardens, total 4,880.
3. Plants and seeds received at and sent from Gardens.
4. Presentations to Museum.
5. Books and periodicals received.

Meteorology.

1. From Hobart Marine Board. Tables from Swan Island for March, South Bruny for do., and Mount Nelson for April.
2. From Captain Shortt, Meteorological Observer. Mean of Observations taken at Hobart during April, 1882. Result of Rainfall at Southport during do.
3. From Mr. H. W. F. Kayser. Register of Rainfall at Mount Bischoff do.
4. From Mr. F. Abbott, jun. Do. at Botanic Gardens do.

The following are the results of the observations above referred to :—

Hobart, April, 1882.

Barometer—Mean, 29·695.

Thermometer—Means, Max., 61·1deg.; Min., 45·2deg.; Dry, 54·4; Wet, 51·5.

Humidity of Air—Means, Dew Point, 48·54deg.; Humidity, ·814 ; Elastic Force of Vapour, ·346.

Condensation—Number of days on which rain fell, 13 ; amount collected, ·90in.

Cloud—Mean daily amount 5 (scale 0-10).

Wind—Mean force 1·3 (scale 0-12), principally from westward ; light airs and calms prevailing during the month.

Remarks—"In the above the rain was taken for the month, the other observations for the last 24 days only. The greatest temperature in shade was 74·8deg. on the 10th, the lowest 37·0deg., on night of the 6th. On the evening of the 17th, the Aurora Australis was very brilliant, commencing a little before 8 o'clock, and lasting nearly all night, streamers of light ascending to the zenith from between the S.E. and S.W., illuminating the heavens and making it as light as if the moon was up. It was said to be the grandest Aurora seen in Tasmania. A smaller Aurora appeared on the evening of the 20th, but with no streamers. Calms and light winds prevailed through the month, though heavy gales have been experienced on the coasts of Tasmania and other Colonies."

J. SHORTT, Meteorological Observer.

Southport Rainfall, April, 1882.—Number of days on which rain fell, 14 ; amount collected, 2·55in.

Waratah, Mount Bischoff, April.—Number of days on which rain fell, 18 ; amount collected 5·27in.

Botanic Gardens, Hobart.—Number of days on which rain fell, 9 ; amount collected, 0·58in.

Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during April, 1882 :—

10th. Chinese Chrysanthemums commencing to flower.

12th. Elm leaves commencing to fall.

12th. Coe's late red Plum commencing to ripen.

20th. Pyrus aucuparia leaves commencing to fall.

24th. Black mulberry ditto ditto.

26th. Seeds of Hornbeam ripe.

The presentations to the Museum were as follow :—

1. From Mr. F. Bednall, Adelaide, per Mr. C. E. Beddome, two Specimens of *Voluta flavicans*, and one of *Cypræa thirsites*.
2. From Mr. E. D. Swan, a Specimen of *Nautilus pompilius*, and one of *Nautilus umbilicatus*.
3. From Mr. H. White, two Specimens of Copper Pyrites, from Saxon's Creek, near Beaconsfield, Tasmania.
4. From Mr. W. K. Dixon, Ouse, a Specimen of a Petrel *(Prion turtur)*.

[No particulars furnished with this specimen, which had probably been driven inland by the severe weather lately prevailing on the coast.]

5. From Mrs. Percy, Rokeby, Clarence Plains, a Basket and Eggs from a petrifying spring at Matlock, Derbyshire, England.
6. From Mr. Justice Dobson, a specimen of the Fern *Schizea bifida*, found near the Cascade Brewery.

[The donor of this specimen remarks—"This fern has hitherto, so far as is recorded, been found only at Southport in this colony. The Schizea found at George Town and on the North Coast, which is commonly known as '*Schizea bifida*' on Hooker's authority, is, according to Bentham, p. 693, not '*Schizea bifida*,' but '*Schizea fistulosa*.'"]

To Library—

1. Annals of the Entomological Society of Belgium, Vol. 25, 1881. From the Society.
2. Catalogue of the Australian Stalk and Sessile-eyed Crustacea, by William

A. Haswell, M.A., B.Sc. From the Trustees of the Australian Museum, Sydney. (Two copies.)

3. Smithsonian Miscellaneous Collections, Vols. 6 and 7. Report, 1865. From the Smithsonian Institute, Washington, U.S.A.

Mr. BARNARD read a paper, entitled "Notes on the economic value of the aquatic plant *Typha latifolia*."

Some conversation followed the reading of this paper, after which Mr. J. B. WALKER read a communication from Mr. G. McIntyre, of Christchurch, New Zealand, "On the State of the Surveys in Tasmania."

Mr. STEPHENS said that as the discussion and correspondence on this subject had been started by the quotation of some remarks of his by His Excellency Sir J. H. Lefroy, in a paper read before the Royal Society, he might be allowed to say a few words. The late Mr. J. E. Calder was one of the earliest pioneers in the exploration of the Western country, and from his long experience in the Survey department was entitled to speak with some authority upon the question of land surveying. The author of the admirable paper which had just been read clearly points out the defects of a magnetic survey, and shows that a proper system can be carried out even in the wildest parts of New Zealand. It was almost unnecessary to say that his criticism upon Mr. Calder's letter was conceived and written in no unfriendly spirit, and that at no time had there been any intention to find fault with the surveyors of Tasmania, but only with the system under which they had to work. With reference to some unfavourable remarks which had been made respecting the conduct of the trigonometrical survey, which was unfortunately discontinued before it could be made much use of, he (Mr. Stephens) would read a short extract from the report of Major Cotton, then Deputy Surveyor-General, upon the subject, which was read before the Royal Society on May 10, 1854 :—From the Papers and Proceedings of the Royal Society, Tasmania, Vol. 3, p. 87.—"The observations have been entirely in the hands of one individual, Mr. J. Sprent, whose scientific knowledge, together with untiring perseverance and patient endurance, has enabled him, single-handed, to effect what would in other countries have been shared by many equally qualified for the work. But the result is such as he will, I am sure, from the interest he takes in this work of science, feel no small recompense for his efforts."

A long and interesting discussion then ensued, in which Captain STANLEY, Mr. J. M. CLARKE, and the CHAIRMAN took part.

Mr. C. H. GRANT considered the thanks of Tasmanians generally, no less than of the Royal Society, were due to the author of the paper for again calling attention to what was undoubtedly a matter of great regret in the present system of conducting the surveys of the colony. A previous speaker had alluded to the discrepancy between the due North and South lines shown in the survey of the property held by the Van Diemen's Land Co., and what purported to be similar lines in more recent surveys. This was shown in even a more striking manner on the land plan of the township of Somerset, where the lines of the true and magnetic meridian were shown at a considerable angle to each other, leaving a triangular space between them of a "no man's land." He presumed that by the Lands Titles Act the Government guaranteed the owner of each property registered thereunder the correctness of his boundary lines, but this they were practically unable to do under the conflicting systems of survey, which, in his own experience, had been productive of very great embarrassment, expense, and delay. The increasing resources and importance of this colony, and therefore improvement of its landed estate, appeared to make it desirable that a scientific department of the Government should be created, and placed under the charge of a highly competent scientist, who should be specially charged with the superintendence of the Land Surveys and of the Meteorological and

Astronomical observations. There would then, he thought, be no difficulty in having the surveyors' field notes sent direct to the central office, and there plotted, with the check lines and angles also furnished, and a well-established conection with a trigonometrical station or some accurately learned point or line. It would doubtless, under existing circumstances, involve too much time, and therefore cost, to connect all surveys with the trigonometrical standard, but the great importance of doing so should always be kept in mind, and every effort made at the central office to correctly plot each new survey on the land plan of the colony; and, as far as practicable, correct any errors discovered, rather than allow them to indefinitely accumulate. The matter of the paper now read being of such great importance, and the necessity of a change in the present system being urgent, he desired to suggest that the Secretary be requested to forward copies of Mr. McIntyre's valuable communication to each of the town and district surveyors of this colony, and that they be asked to favour the society with their views thereon, in order that the subject may be more fully discussed here, and some practical suggestions arrived at for the improvement of the present anomalous system of the land surveys.

A vote of thanks having been accorded to the authors of the papers read, and to the donors of presentations, the proceedings terminated.

JUNE, 1882.

The usual monthly evening meeting of the Society was held on Tuesday, 13th June, Mr. T. Stephens, M.A., Vice-President, in the chair.

The following gentlemen, who had previously been nominated by the Council, were balloted for and declared duly elected :—As Fellows of the Society, Mr. William Knight. M.A., and Mr. Patrick Mackay ; as a corresponding member, Mr. George McIntyre, of Christchurch, New Zealand.

The Hon. Secretary (Mr. BARNARD) brought forward the following returns for the past month, viz.:—

1. Number of visitors to Museum, May—On Sundays 747, on week days 601; total 1,348.
2. Do. to Gardens, 3,319.
3. Plants and seeds received at Gardens :—From Baron von Müeller, Government Botanist, Victoria, a collection of miscellaneous seeds, comprising 402 varities. From Messrs. Shepherd and Co., Sydney, 20 varities of Eucalypti. From the hon. the Colonial Secretary, a packet of seeds of Typha Latifolia, received from the Italian Consul, Melbourne. From Mr. J. Latham, Hobart, a collection of imported seeds.
4. Seeds, etc., sent from Gardens :—To Mr. C. F. Creswell, Melbourne, 20 varieties of seeds and bulbs.
5. Periodicals received.
6. Presentations to Museum and Library.

Meteorology.

1. From Captain Shortt, Government Meteorologist. Monthly means of observations taken at Hobart during May.
2. From Mr. F. Abbott, jun., register of rainfall at Botanic Gardens for May.
3. From Mr. H. W. F. Kayser. Do. at Waratah, Mount Bischoff, do.
4. From Mr. D. C. Purdy. Do. at Strahan, Macquarie Harbour for April and May.
5. From the Marine Board, Hobart. Tables from Mount Nelson for May Swan Island for April, South Bruny, for April and May.
6. From Dr. Hector. Printed abstracts of observations taken in New

Zealand, from October, 1881, to March, 1882, inclusive; and monthly tables from Wellington for February, March, and April, 1882.

The following are the results of observations above referred to :—

Hobart, May, 1882.

Barometer.—Mean, 29·656,

Thermometer.—Means, Max., 55·4deg.; Min., 43deg.; Dry bulb, 50·2deg.; Wet bulb, 47·5deg.

Humidity.—Dew Point, Mean, 43·9deg.; Humidity, do., ·816; Elastic Force of Vapour, do., ·297.

Condensation.—Number of days on which Rain fell, 16; amount collected, 5·91in.

Cloud.—Mean daily amount, 5·9 (scale 0-10).

Wind.—Mean force, 1·8 (scale 0-12); prevailing directions, South and West, and calms.

Remarks.—Rain fell on 16 days. The heaviest fall, registered at 9 a.m. on the 8th, was 1·18in. The greatest temperature in shade, 62deg. 5in. on the 2nd, 11th, and 16th. The lowest on the night of the 19th, 34·8deg. Heavy gales passed over Hobart from the westward on the 7th, 16th, and 17th. Snow fell on Mount Wellington on the nights of the 2nd, 6th, and 31st. The Aurora Australis appeared about 10hrs. 30min. on the night of the 14th, but not very brilliant, and with no streamers. Foggy on the morning of the 27th. A few cold and frosty nights. Wet month throughout. The fall of rain for month, 5·91in.

J. SHORTT, Meteorological Observer.

Rainfall Botanic Gardens, Hobart, May.—Number of days on which rain fell, 14; amount collected, 4·49in.

Do. Waratah, Mount Bischoff, do.—Number of-days, 27; amount collected, 14·55in.

Do. Strahan, Macquarie Harbour, April.—Number of days, 14; amount collected, 4·73in. Do. May.—Number of days, 21; amount, 7in.

Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during May :—

8th. Dutch Medlar, commencing to ripen.

16th. Photinia serrulata, commencing to flower.

20th. Diosma alba, do.

25th. Ailanthus, leaves all shed.

The presentations were as follow :—

To Museum—

1. From Captain Langworthy. Specimen of a rare Fish (*Gastrochisma melampus.* Rich.), caught off the mouth of the Derwent. [Mr. R. M. Johnston remarks :—"This is the second specimen only of the fish known. It should be preserved if possible."]
2. From Mr. J. H. Grant. A Stockwhip Handle, made from a Queensland wood known as "Ringed Giddia." In a note which accompanied this presentation, the donor refers to the wood of which it is formed as one of the handsomest in Queensland, and adds :—"It was made by a half-caste stockman on the Paroo River, who merely used a knife, glass, and sand-paper for the purpose."
3. From Mr. George Fry, per the hon. Minister of Lands and Works. A fine specimen of Tin Ore, from Upper Ringarooma.
4. From Mr. James Grant. Specimen resembling fossil wood, from a boring at Tullochgorum, at a depth of from 66ft. to 76ft.
5. From Mr. A. J. Taylor. Model of a Gold Nugget found at Long Plain, West Coast, Tasmania. [In reference to this presentation, the donor has furnished the following note. "The nugget was discovered by a man named Buckner at Long Plain, W. Coast, and weighed a little under 9oz., (avoir.). I have named it the 'Little Welcome,' as it resembles in shape, somewhat, the large 'Welcome' nugget found at Ballarat, Victoria, some years back."]

6. From Mr. R. M. Johnston. Specimen of a Cone, probably of a species of Lepidostrobus, from the auriferous sandstones of Campania. [In reference to this presentation, Mr. Johnston read a short descriptive paper.]

To Library—

1. From the Author, Baron von Müeller. "Fragmenta Phytographiæ Australiæ." Vol. II.
2. From Dr. Schomburgk. Report of Progress and Condition of the Botanic Garden and Government Plantations, Adelaide, 1881.
3. From Mr. C. Todd, C.M.G., Government Astronomer, Adelaide. Meteorological Observations made during 1881 at Adelaide.

The CHAIRMAN read an elaborate and interesting paper on the remains of Trilobites from the Mersey River district, and on other fossils from the boulders in the conglomerate beds near Table Cape, with figures and descriptions, communicated to the Society by Robert Etheridge, jun., F.G.S., etc., of the Museum of Natural History, London, and a corresponding Member of this Society.

Mr. STEPHENS said that the specimens which formed the subject of the paper consisted of a collection of Trilobites and other fossils sent to England by himself several years ago, and comprising representatives of all the forms which have yet been discovered in the Silurian rocks of the Mersey district. Mr. Etheridge having very kindly consented to examine and describe them, a large collection of similar specimens was contributed by Mr. Hainsworth, who also furnished several specimens from the boulders near Table Cape. The result is that two entirely new Trilobites belonging to the genera *Conocephalites* and *Dikelocephalus* are described and named by Mr. Etheridge, and six others noticed, which are too imperfect to be described, together with an *Ophileta*, and the internal cast of a bivalve; the fossils identified from the Table Cape conglomerate being a new *Pentamerus*, a *Tentaculites*, an *Orthis*, three species of *Spirifer*, and some doubtful forms. The Trilobite beds might now, in Mr. Etheridge's opinion, be confidently classed as Lower Silurian, and some at least of the Table Cape boulders as Upper Silurian. The arduous nature of the task which Mr. Etheridge had so kindly undertaken might be imagined by anyone who had seen the refractory matrix in which the fossils were found, and he (Mr. Stephens) was sure that a cordial vote of thanks would be unanimously accorded for his valuable paper.

Mr. R. M. JOHNSTON stated that the paper read was one of very great importance, as the determination of the horizon of the Caroline Creek beds at Latrobe, with their included Trilobites, and the fossiliferous conglomerate at Table Cape, will materially help Tasmanian geologists in relating the undetermined ancient rocks which are found largely distributed all along the western part of the island from North to South. Mr. Johnston further pointed out that the Crassatella bed of the Table Cape Tertiary series, which was formerly described by him, rested immediately upon the conglomerates referred to. Much credit was due to Mr. Stephens for the careful selection of fossils made by him in order to have the positions of these important geological horizons truly determined. The members of the Society were under deep obligation to Mr. Stephens, as well as to the able palæontologist, Mr. Etheridge, for this very valuable contribution to the Society's papers

A communication was received from Mr. Aug. Simson, of Launceston, announcing his discovery at "Brady's Look-out," Swansea, of a plant *(Helipterum exiguum)*, new to the flora of Tasmania, and its identification by Baron von Müeller.

A special vote of thanks having been unanimously accorded to Mr. Etheridge for his admirable paper, the proceedings closed with the usual acknowledgment to the donors of presentations.

JULY, 1882.

The monthly evening meeting of the Society was held on Tuesday, 12th July, Mr. C. H. Grant in the chair.

The following gentlemen, who had previously been nominated by the Council, were balloted for and declared duly elected as Fellows of the Society, viz. :—Mr. William Lees, of the Union Bank ; and Mr. C. W. Chapman, of Cascades.

The Hon. Secretary (Mr. BARNARD) submitted the following returns for the past month, viz. :—

1. Number of Visitors to Museum—On Sundays 719, on week days 802 ; total 1,521.
2. Ditto to Gardens—Total 3,722.
3. Plants and seeds received at Botanic Gardens:—From Mr. Barnard, seeds of *Wistaria megasperma.* From the Hon. J. Maclanachan, seeds of a variety of *Cedrus Libani.* From Mr. C. F. Creswell, Melbourne, 14 packets of seeds. From the Botanic Gardens, Melbourne, 30 plants. From Messrs. Heyne and Co., Adelaide, 24 packets of seeds.
4. Plants and seeds sent from Gardens :—To Mr. C. F. Creswell, Melbourne, collection of seeds. To Mr. J. Smith, Riddell's Creek, Victoria a collection of seeds and plants. To Mr. R. J. Lynch, Botanic Gardens, Cambridge, collection of seeds. To Botanic Gardens, Brisbane, Queensland, seeds of Eucalyptus Globulus. To Messrs. Vilmorin, Andrieux, et Cie., France, collection of seeds. To the Chamber of Agriculture, Washington, U.S.A., collection of seeds. To the Royal Gardens, Kew, collection of seeds. To Mr. W. Bull, London, ditto. To Baron von Müeller, Melbourne, ditto. To Messrs. Shepherd and Co., Sydney, collection of seeds and plants. To Mr. J. Latham, collection of seeds. To Dr. James Hector, Wellington, New Zealand, ditto.
5. Books and periodicals received.
6. Presentations to Museum.

Meteorological Returns :—

1. Hobart, from Captain Shortt, Government Observer, table for June.
2. Table of Rainfall at various stations in Tasmania, from ditto.
3. Mount Nelson, from the Marine Board, table for June.

The following are the results of observations above referred to :—

Hobart, June, 1882 :—

Barometer —Mean, 29·776in.

Thermometer. — Means. Max., 58·2deg. ; Min., 33deg. ; Dry bulb, 45·6deg. ; Wet bulb, 43·2deg.

Humidity.—Dew Point Mean, 40·4deg. ; Humidity, 823 ; Elastic force of vapour, 251.

Condensation.—No of days on which rain fell, 13 ; Amount collected, 2·41in.

Clouds.—Mean daily amount 6 (scale 0·10).

Wind.—Prevailing direction, Westerly ; Mean force, 1·5lb. (scale, 0·12).

Remarks.—Rain on 13 days ; the heaviest registered was 1·38in., at 9 a.m. on the 20th. Highest temperature in the shade, 58·2deg., on the 28th. The lowest, 33deg., on the nights of the 9th and 15th. On the morning of the 16th, a very heavy fall of snow, from two to three inches deep. Light snow falling at intervals for 30 hours. Before the snowstorm the barometer had been falling slowly and steadily day by day, from the 5th ; at 9 a.m. the barometer, then 30·387in., rose a little for 30 hours on the 8th and 9th, then fell slowly to 28·923in., its lowest, on the 15th ; with heavy squalls and rain from the westward, lulling early in the morning, when the snow commenced falling heavily. The Comet has been observed a few nights only at Hobart (though seen

frequently in the northern part of Tasmania), on account of the cloudy evenings. It showed a well-defined nucleus, and a tail of about 3deg. in length, nearly vertical; visible about N.W. by W., between 5 and 6 p.m. A few days of strong westerly winds, but light winds and calms prevailed during the remainder of the month.

J. SHORTT, Government Meteorologist.

Rainfall in Tasmania, June, 1882 :—

Circular Head, rain fell on 9 days, amount 1·17in.
Oatlands, rain fell on 9 days, amount 1·27in.
On 16th, 7in. of snow.
Falmouth, rain fell on 4 days, amount ·76in.
Mount Bischoff, rain fell on 17 days, amount 5·59in.
On 16th, heavy fall of snow.
Southport, rain fell on 13 days, amount 3·89in.
Low Heads, rain fell on 8 days, amount 1·55in.
Macquarie Harbour, rain fell on 13 days, amount 4·34in.
Botanic Gardens, Hobart, rain fell on 12 days, amount 1·88in.
Hobart City, rain fell on 13 days, amount 2·41in.
Mount Nelson, rain fell on 6 days, amount 1·84in.

Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during June, 1882 :—

15th. Maclaura aurantiaca leaves commencing to fall.
18th. Common Privet ditto.
20th. Calycanthus præcox commencing to flower.
24th. Crocus vernus ditto.
30th. Pyrus japonica commencing to flower.

The presentations to the Museum were as follow :—

1. From Mr. R. C. Weeding, Mount Seymour. A specimen of the Grey Flying Opossum (*Belideus sciureus*), from that locality.
2. From Mr. Thomas Ransom, Fingal. A specimen of the Owlet Nightjar (*Ægotheles Novæ Hollandiæ*).
3. From Mr. A. Dowling, Melton Mowbray. A living specimen of the Chestnut-faced Owl of the colony (*Strix castanops*).
4. From the Hon. the Colonial Secretary. A specimen of the buoyant mattress used in the Italian Navy, with letter from the Italian Consul, Melbourne, on the subject.
5. From Mr. J. E. Baynton. A specimen of the Fan-tailed Cuckoo (*Cacomantis flabelliformis*), shot near Mount Nelson, on July 6. [In reference to the Fan-tailed Cuckoo, Gould states that it "is a migratory species, arriving in Tasmania in September, and, after spending the summer months therein, departing northward in January and February." Its occurrence in the colony in the depth of winter is therefore remarkable.]
6. From Mr. G. Innes. Specimen of Huon Pine (*Dacrydium Franklinii*), and Red Pine (*Athrotaxis selaginoides*), from Macquarie Harbour, in which locality an extensive bed of the latter timber has been discovered.

Mr. BARNARD read "Some further Notes on the economic value of the aquatic plant, *Tipha latifolia*," illustrating its utility as a material for stuffing buoyant and life-saving mattresses in the case of shipwrecks and disasters at sea.

Some conversation ensued, and an examination was made of the sample mattress, with a general expression in favour of its introduction into the marine service, its value being recognised from the fact that it was in use in the Italian Navy.

A vote of thanks having been accorded to Mr. Barnard for his paper, and to the donors of presentations, the meeting terminated.

AUGUST, 1882.

The monthly evening meeting of the Society was held on Monday, August 7, Mr. C. H. Grant in the chair.

The Hon. Secretary (Mr. BARNARD) brought under notice the following returns, viz.:—

1. Number of visitors to Museum during July. On Sundays, 957 ; on week days, 960 ; total 1,917.
2. Do. to Gardens, do.; total 3,899.
3. Plants and seeds received at Gardens :—From Baron von Müeller, Melbourne, 18 packets seeds. From Mr. C. F. Creswell, Melbourne, 68 packets of seeds indigenous to Australia. From the Horticultural Society's Gardens, Victoria, 44 varieties of fruit scions. From Mr. J. Smith, Riddell's Creek, Victoria, 39 trees. From Messrs. Law, Somner, and Co., Melbourne, 38 varieties of Gladioli.
4. Seeds sent from Gardens. To Botanic Gardens, Calcutta, 36 packets. To do., Saharunpore, 36 do.
5. Books and periodicals received.
6. Presentations to Museum.

Meteorological Returns :—

1. Hobart, from Captain Shortt, Government Observer. Table for July.
2. Table of Rainfall at various stations in Tasmania, from do.
3. From the Marine Board. Tables from Goose Island for March, April, and May ; Kent's Group for do.; Bruny Island and Mount Nelson for July.

Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during July, 1882 :—

14th. Cytysus leucanthus commencing to flower.
18th. Arbutus unedo in flower.
20th. Eranthis hyemalis commencing to flower.
22nd. Garrya elliptica do.
28th. Almond do.
28th. Yellow Crocus do.
30th. White Hyacinth do.
31st. Snowdrop do.

Results of the Hobart observations :—

Barometer.—Mean for month, 29·664in.

Thermometer.—Mean, Max., 50·9deg.; Min., 38·9deg.; Dry Bulb, 44·5deg.; Wet Bulb, 41·7deg.

Humidity.—Dew Point, 38·1deg.; Humidity, 230 ; Elastic Force of Vapour, ·785.

Condensation.—No. of days on which rain fell, 13 ; amount collected, 2·14in.

Clouds.—Mean daily amount, 5·25 (scale, 0·10).

Wind.—Prevailing direction, N.W. and S.W. Mean force, 2·3 (scale, 0·12).

Remarks.—Rain fell on 13 days ; the heaviest fall (5·25in.) was registered at 9 a.m. on the 4th. The highest temperature in the shade was 59deg. on the 2nd ; the lowest, 31deg., on the night of the 29th. There were nine days of strong winds and squally weather from the westward. Snow fell in Hobart on the night of the 13th, the ground and houses being covered in the morning. At 7 a.m. of the 26th another storm of snow, intermingled with rain, passed over the city, continuing all day and through the following night. Very cold weather, with heavy frosts at night continued until the 31st ; the minimum thermometer registering for the nights of Friday the 28th, and Saturday the 29th, at 9 a.m., 32·5 and 31deg. respectively. At Southport, under the thermometer shed the minimum temperature registered was 30deg. on the 28th, and 28deg. on the 29th. The lowest reading of the barometer was 28·964 at 9

a.m. on the 25th, and the highest 30·288in., at 9 a.m. on the 20th. This has been the coldest month experienced for many years, although the mean minimum temperature was higher than that for June. The falls of snow during June and July covered the city to a greater extent than has been previously observed. Mr. W. E. Shoobridge, of Bushy Park, New Norfolk, has kindly furnished the following record of the minimum temperature, at that place, for July, the instrument being under a thermometer shed, viz.—On the 29th, 29deg. ; on the 30th 26deg., the latter being the lowest register for the year.

Rainfall in Tasmania, July, 1882 :—

Low Heads, rain fell on 15 days, amount 3·99in.
Southport, rain fell on 23 days, amount 4·12in.
Falmouth, rain fell on 9 days, amount 1·21in.
Oatlands, rain fell on 10 days, amount 1·10in.
Mount Bischoff, rain fell on 27 days, amount 11·53in.
Mount Nelson, rain fell on 10 days, amount 1·70in.
Botanical Gardens, Hobart, rain fell on 13 days, amount 1·52in.
Hobart, City, rain fell on 13 days, amount 2·14in.
Circular Head, rain fell on 19 days, amount 5·82in.

J. SHORTT, Government Observer.

The presentations to the Museum were as follow :—

1. From Mr. G. Innes. A large specimen of Lignite, from Macquarie Harbour.
2. From Mr. D. Carsons. A Cardinal Finch, from Brazil.
3. From M. Murachi, of the Japanese warship Tsukuba. Three specimens of Japanese money, viz., 10 cents, paper ; 2 ditto, copper ; and 10 ditto, silver.

The Hon. W. A. B. Gellibrand exhibited samples of a Seedling Apple, originally grown at Cleveland, and subsequently worked on stocks at South Arm, which were greatly admired.

Mr. STEPHENS read the following "Notes on Minimum Temperature at Hobart during the month of July" :—

A question having arisen as to apparent discrepancies in the records of minimum temperature during the month of July in various parts of Hobart, a few remarks on the subject may not be without interest. On the nights of the 28th and 29th July two unusually severe frosts were experienced. Mr. Leventhorpe Hall reports to *The Mercury* that at 7·45 a.m. on the 29th his thermometer registered 23deg. (Fahr.), and on the following day at 7·30 a.m. 21deg. Comparing notes with the Rev. J. C. Whall, who had also been recording the temperature, he ascertained that the two observations for the night of the 29th July exactly tallied. About the same time it was stated that the minimum results registered by the instruments under the charge of Commander Shortt, R.N., the Government Observer, were 32·5deg. and 31deg. respectively for the two nights in question. A considerable variation may occur at any time in the readings of different instruments, which are not periodically tested by the same standard. Commander Shortt informs me that of two minimum thermometers which have been in use elsewhere in the colony, and which he has compared with the standard, one is 3deg. 5min., and the other 5deg. out. This possible discrepancy must always be taken into account in comparing observations ; but in the present instance the difference is mainly caused by registrations of temperature under widely different conditions of exposure. Mr. Hall's instrument is an ordinary mercurial thermometer, placed outside his house, and unprotected above, but sheltered from the sun. It reads nearly 3deg. lower than the Museum thermometer, and if corrected to that extent, and placed "on grass," the result for the night in question would probably have been much the same as was actually recorded. Mr. Whall's is a self-registering instrument, of the type known as Six's Thermometer. It

is placed about 18in. from the ground, without protection above or around it, and the general conditions of exposure are nearly equal to those under which the temperature "on grass" is usually ascertained. On the other hand, there is no thermometer in use at the Barracks at present for recording the temperature "on grass," nor is there any place available for the purpose. The maximum and minimum thermometers are intended to record the temperature of the air under definite conditions of protection, and are kept, as nearly as present circumstances allow, under the conditions prescribed for all the meteorological stations in the intercolonial system. They are new instruments by Negretti and Zambra, and as they were obtained from Mr. Ellery, it is superfluous to say that they supply a better standard than is obtainable elsewhere in the colony. Their position, pending the completion of the instrument shed, is of course not satisfactory, and they will probably register both a higher and lower temperature when placed under it than they do now; but it must be remembered that the temperature of the air, as taken at a meteorological station, is a very different thing from the temperature "on grass." My own observations have necessarily been so irregular that they are of little value; but I believe that the lowest temperature yet noted in the colony was registered by a thermometer which I placed on the top of Mount Wellington several years ago, and which gave 16deg. as the minimum temperature for two consecutive winters. The minimum "on grass" in Hobart during the same period was 24deg.; but, for the present exceptional season, a record of 21deg., as the minimum temperature, is probably not far from the mark. But no meteorological statistics can be satisfactorily registered at Hobart until the station is properly equipped, and favourable conditions of observation permanently and effectually secured. Since writing the above I find that Mr. Shoobridge records as the minimum temperature of the air at New Norfolk, on the night of the 28th July, 29deg.; and on the following night 26deg.; a result which, if I may judge from experience of the winter temperature at the two places, agrees pretty closely with that obtained at the temporary station in the Barracks.

On the conclusion of the reading of the paper, Mr. GRANT observed that Commander Shortt must have chosen an unfortunate position for his thermometer, the day temperature throughout the whole of the 30th July having certainly been below the freezing point, as proved by the frozen condition of the ground, and the forming of ice on tubs placed 4ft. above it, where sheltered from the direct solar rays. Such temperature, therefore, would probably have been much lower during the preceding night, and was proved to be so by the observations of Messrs. Hall and Whall. He understood that Captain Shortt's thermometer was placed under a deep verandah, and a worse place than an ordinary verandah could scarcely be selected for observing the air temperature. The usual position for this instrument is at the back of a light screen of trellis work or louvre painted white, and with a top covering which protects it from the direct sunlight, but allows the free circulation of the air around, and it should be at such a distance from every other object as not to receive heat therefrom. Under a verandah the temperature of the partially stagnant air, increased by the heat radiation of all surrounding objects, especially of the house, would alone be obtained, and doubtless differ many degrees from the true air temperature correctly taken. In a long course of practical experiments and observations he had not found much difference in the minimum readings were the thermometer placed only 9in., or several feet above the ground, whether covered or uncovered, if the roof were simply a shade; but there was a considerable difference on a clear night between the readings of an instrument placed on the grass, or not more than 3in. above it, of a wet bulb, and of a dry bulb thermometer; the wet bulb reading showing an intermediate temperature between the other two. He did not think that in Hobart the extreme difference would

much exceed 4½deg., because there is rarely an entire absence of cloud, which checks the radiation and evaporation, but in some of the high table lands of India, the Deccan especially, where the air is of less density and the skies perfectly clear, the difference between an air and grass thermometer sometimes exceeds 10deg. The readings from a Six's Thermometer could not be so fully relied upon as the simple form, as, although very convenient for reference, their liability to derangement made them almost a toy. There was little trouble with spirit thermometers, if attention were paid them to see that the spirit was all connected with that in the bulb, but it must not be expected that any two thermometers will read exactly together throughout the scale, even though all were divided on the glass, from very carefully ascertained points, and from comparison with undoubted standards, as were the best instruments. Still, the registered maxima and minima of all good thermometers, placed in similar positions, should coincide.

Mr. Stephens thought that Mr. Grant had somewhat misunderstood his remarks, and described the conditions under which the temperature of the air would be registered, when the arrangements are completed, by thermometers placed close under a double roof, and 4ft. or 5ft. from the ground. Of course the temperature registered by thermometers freely exposed would depend on whether they were placed close to the ground or at a considerable distance above it. The thermometers at the Barracks appeared to have been put in the verandah because there was no other covered place available for them.

Mr. R. M. Johnston said he agreed with the remarks made by Mr Stephens. He was aware that arrangements for reading the temperature were not yet made, and it was therefore not fair to say that Commander Shortt's readings were incorrect, for he was necessarily more conversant with meteorology than the gentlemen who had published the records of their thermometers. Commander Shortt had, moreover, followed the system laid down for taking such records, whereas the other records mentioned had all been taken at different times and under different conditions. He considered that Commander Shortt, as far as his present arrangements would allow, had taken his records under precisely the same conditions as were adopted in every part of the world, and that the other gentlemen were necessarily incorrect, having conformed to no rules whatever in placing their instruments. He hoped that in a short time Commander Shortt would be able to take records under all conditions, and then his readings would compare with the thermometers of others.

Mr. H. J. Buckland understood that Commander Shortt's thermometer was placed against the wall of his house, and thought that would to some extent affect the reading; it would draw heat from the interior of the house and surrounding objects. He doubted if readings in other parts of the world were taken under such conditions, as if so, it would be impossible to arrive at the true climate of a country. If by this means the temperature of what was admitted to be a bitterly cold night was only shown as 32deg., and by other instruments without cover it was said to be 20deg., it was surely impossible to arrive at a correct temperature of the locality.

Mr. Johnston explained that the reason for using a cover was to exclude the direct influence of sunlight, and everything was eliminated that could, in the least degree, influence the temperature, and therefore scientific men have advised that there should be some standard of eliminating all disturbing influences, and Commander Shortt, as far as he could, had adopted these principles, and if all these conditions were taken into consideration, there would not be such a great discrepancy in the readings as now appeared.

Mr. Riddoch thought Commander Shortt's readings deceptive in stating the temperature of the atmosphere. He had seen where

Commander Shortt's instruments were placed, and did not think they could ever give the normal state of the air. The verandah had a roof, and was enclosed on both sides. The instruments were against a weatherboard wall, and sheltered from the west and south-west; and altogether a more sheltered place could hardly be found, and the lowest temperature could not possibly be obtained.

Mr. JOHNSTON then read an elaborate and valuable paper, entitled 'General and Critical Observations on the Fishes of Tasmania, with a Classified Catalogue of all the known species." The time was too limited to admit of more than the first two divisions of the subject being read, and the remainder, including the classified catalogue, was deferred until the next monthly meeting. Discussion on the portion read was also deferred until a future occasion, in order to admit of its being printed and circulated.

The usual vote of thanks was accorded to the contributors to the Museum, and also to the authors of the papers read.

SEPTEMBER, 1882.

The monthly meeting of the Society was held on Monday, the 11th September; Mr. T. Stephens, V.P., in the chair.

The following gentlemen, who had previously been nominated by the Council, were balloted for, and declared duly elected as honorary Members of the Society, viz.:—Baron Ferd. von Müeller, K.C M.G., M.D., F.R.S., Government Botanist of Victoria; and the Rev. J. E. Tenison-Woods, F.L.S., F.G.S., F.R.G.S., etc., etc.

The Hon. Secretary (Mr. BARNARD) laid before the meeting the following returns for the month of August :—

1. Number of visitors to Museum—On Sundays, 1,012; on week days, 666; total, 1,678.
2. Do. to Gardens—Total, 4,192.
3. Plants received at Gardens : —From Messrs. Shepherd and Co., Sydney, 16 plants. From Messrs. Vilmorin and Co., Paris, a general collection of flower and shrub seeds. From Mr. W. R. Guilfoyle, Director of Botanic Gardens, Melbourne, seeds of Pinus Australis (the Georgia Pitch pine). From Professor McOwen, Cape Town Botanic Gardens, sods of Disa grandiflora, a magnificent Orchid from the Table Mountain, in good condition.
4. Books and periodicals received.
5. Presentations to Museum.

Meteorological Returns.

1. Hobart, from Captain Shortt. Table of observations for August. Registers of rainfall at various stations through the colony.
2. From the Marine Board. Monthly tables from Mount Nelson for August; Swan Island for May; Goose Island for June and July; and King's Island from February to July inclusive.

Time of leafing, flowering, etc., of a few standard plants in the Botanic Gardens during August :—

20th. Sambucus niger commencing to break.
24th. Horsechestnuts do.
28th. Gooseberries do.
28th. Elm commencing to flower.
29th. Poplar commencing to break.
30th. Apricots commencing to flower.

Results of the Hobart observations :—

Barometer.—Mean for month, 29·836in.

Thermometer.—Mean, Max., 52·2 deg.; Min., 40·7deg.; Dry Bulb, 48·1deg Wet Bulb, 45·6deg.

Humidity.—Dew Point, 42·9deg.; Elastic Force of Vapour, ·276; Humidity, ·821.

Condensation.—Number of days on which rain fell, 12; amount collected, 4·82in.

Clouds.—Mean daily amount, 6 (scale 0-10).

Wind.—Prevailing direction, South and N.W. Mean force, 1·4 (scale, 0-12).

Remarks.—Rain on 12 days. The heaviest fall, registered at 9 a.m. on the 9th, was 1·48in. Highest temperature in the shade, 60·8deg. on the 25th; the lowest, 33·6deg., on the night of the 10th. Light and variable winds prevailed during the month, with a few squally days. Thick fogs at beginning of month. Heavy rain during the first eight days, 4½in. having fallen in that time. Cloudy and damp throughout the month. The lowest reading of the Barometer, 29·233in., was at 3 p.m. of the 31st; and the highest, 30·209in., at 9 a.m. of the 27th.

A very large and brilliant meteor was observed at 7h. 10m. p.m. on the 5th.

Rainfall in Tasmania, August, 1882 :—

Hobart, rain fell on 12 days, amount 4·82in.
Southport, rain fell on 14 days, amount 3·23in.
Oatlands, rain fell on 15 days, amount 2·47in.
Falmouth, rain fell on 17 days, amount 4·91in.
Low Heads, rain fell on 18 days, amount 4·13in.
Circular Head, rain fell on 23 days, amount 4·12in.
Mount Bischoff, rain fell on 23 days, amount 4·52in.
Botanical Gardens, Hobart, rain fell on 14 days, amount 3·09in.
Strahan, Macquarie Harbour, rain fell on 26 days in July; amount collected, 6·62in.

Presentations to Museum :—

1. From Mr. A. Winter. Specimens of an albino variety of the Brush Kangaroo (*Halmaturus Bennettii*), mounted.
2. From Mr. W. Ritchie. Specimen of Asbestos, from Anderson's Creek.
3. From Mr. J. Simmons. Specimen of Lode Tin from the claim of the Lottah T.M. Co., Gould's Country.
4. From Mr. Lester. Specimen of Ruby Tin from the vicinity of the Heemskirk River.

In reference to the specimens of asbestos from the West Tamar, which were exhibited at the meeting, the CHAIRMAN remarked that it was to be regretted that this mineral had hitherto received little attention, though it had long been known to exist in the colony; indeed, the Asbestos Ranges derived their name from it in very early days, though, as Mr. Gould had pointed out, they were quite unconnected with the serpentine of the neighbourhood of Anderson's Creek, in which rock it occurs. There was one point in connection with this substance which was involved in some obscurity. The mineral known to manufacturers in the United States and elsewhere, and now largely used for sheathing boilers and steam pipes, for packing piston rods, and for general felting purposes, is the true asbestos classed by Von Cotta, Dana, and other mineralogists, among the anhydrous silicates of lime and magnesia, and is a fibrous variety of tremolite, or actinolite. The proper title of the West Tamar mineral is probably chrysotile, better known as picrolite, or Schiller asbestos, a fibrous variety of serpentine, which belongs to the hydrous silicates of magnesia. As far as one could judge from superficial examination, the fibre seemed to be of excellent quality, and it would be interesting to ascertain whether it is inferior in any essential point to the other asbestos, so far as regards the special purpose for which it is manufactured.

Mr. C. H. GRANT observed that there were many reasons why the article had not yet been exported in large quantities for manufacturing purposes. Asbestos was found in considerable abundance in many parts of the world, especially in Cornwall, Corsica, and the Austrian Alps; but the largest deposits he knew were situated near the banks of the St. Lawrence, and in the United States: there the fibres were of great length. He had not heard of two qualities, differing in chemical composition, being used in manufacture, but there were many varieties from the desiccated fibre of amianthus to the massive rock, and these necessarily differed to some extent in their chemical composition. The specimen on the table appeared similar to other deposits that he had seen, but not so white and silky as that from Cornwall and Hungary. Some very fine samples had been procured in Virginia, U.S. He understood that the mineral was found in large quantities on the West Tamar in veins 2ft. thick and upwards, of considerable length. That so obtained appeared to be a good merchantable article, as far as he could judge, comparing it with what he had previously seen. The bulk of the asbestos that had come under his notice was of much shorter fibre than in the samples on the table, it being arranged vertically in slabs of from half an inch to one inch in thickness, but he had been informed that fibres of only half an inch in length could now be worked into many useful products. It should be remembered that Tasmania is a long distance from the centres of manufacture, as compared with other localities where this mineral is found, and whence it could be obtained at a low price. It had only recently become in important demand, but now that it is coming into such general use there is a probability that a large market will be found for the Tasmanian article.

Mr. R. M. JOHNSTON said that he had found a variety of fibre and colour in asbestos according to its exposure to atmospheric influences. It was only possible to get the fibre, in its true state, in the solid rock. Mr. Davies, an authority on the subject, states that asbestos is only just coming into general use, and is found very useful for packing engine piston rods, etc., but dependent upon the length of fibre to be of value. All the Tasmanian asbestos that he had seen had very short fibre.

Mr. R. M. JOHNSTON read the second part of his paper on the Fishes of Tasmania, which will be concluded at the next evening meeting of the Society.

The CHAIRMAN said that at the last meeting of the Society mention was inadvertently omitted of a new addition to the *fauna* of Tasmania in the shape of two native rats—one constituting a new genus—which are described by Mr. Oldfield Thomas, F.Z.S., of the British Museum, in the "Annals of Natural History" for June, 1882. One was described from a specimen sent to the British Museum by the late Mr. Ronald Gunn, the other from specimens contributed by Mr. Augustus Simson. A paper on this branch of the Tasmanian *fauna* had been communicated by Mr. Petterd, and would probably have been read that evening, had time allowed.

Mr. JOHN SWAN remarked that about two years ago he obtained a specimen of a black rat, generally considered as a Tasmanian species, but, on reference to Gould's work, he found it to agree with the description of one previously known to exist in Western Australia, and not mentioned as occurring in Tasmania. He did not agree with the idea that rats of different colours could not belong to the same species, for he had observed two of these animals, which had their nest near his residence, one of them being similar to the one above referred to, and the other of a much lighter colour. When at Deloraine a short time since, he saw a black rat killed, the colour of which induced no remark, being evidently regarded as nothing unusual.

A short discussion ensued, after which the usual vote of thanks was passed to the several donors to the Museum, and also to Mr. Johnston for his interesting paper.

OCTOBER, 1882.

The usual monthly evening meeting of the Society was held on Monday, 9th October ; Mr. Justin McC. Browne in the chair.

Mr. H. W. D. Archer, M.H.A., of Brickendon, who had previously been nominated by the Council, was balloted for and declared duly elected as a Fellow of the Society.

The Hon. Secretary (Mr. BARNARD) brought under notice the following returns for the month of September, viz.:—

1. Number of visitors to Museum—on Sundays, 742 ; on week days, 1,000 ; total 1,742.
2. Do. to Gardens—Total 4,603.
3. Books and periodicals received.
4. Presentations to Museum.

Meteorological Returns :—

1. Hobart, from Captain Shortt, Government Observer. Table of observations for September. Registers of rainfall at the various stations in the colony.
2. From the Marine Board. Tables from Mount Nelson and South Bruny Lighthouse for September.
3. From the Government Observer, Wellington, New Zealand. Printed tables for May, June, and July, 1882.

Results of the Hobart observations for September :—

Barometer.—Mean for month, 29·428in.

Thermometer.—Means : Max., 67·2 ; Min., 37·2 ; Dry Bulb, 52·4 ; Wet Bulb, 48·5.

Humidity.—Dew Point, 44·8 ; Elastic Force of Vapour, 29·7 ; Humidity, 75·4.

Condensation.—Number of days on which rain fell, 18 ; amount collected 2·93in.

Clouds.—Mean daily amount, 6·6 (scale 0·10).

Wind.—Prevailing direction, N.W.; mean force, 3·4 (scale 0·12).

Remarks.—Rain fell on 18 days ; the heaviest fall, 0·51in., was registered at 9 a.m. on the 30th ; showery weather throughout the month. The highest temperature in the shade was 67·2, on the 21st ; the lowest 37·2, on the night of the 14th. Gales and strong squally winds from N.W. prevailed through the month. On the morning of the 13th snow was well down on the hills, and in the forenoon large flakes fell in the town. Snow fell heavily at Oatlands. The Comet has been frequently observed in the morning ; it now rises earlier, and to the Southward of East, travelling to the Northward. The tail is extended to a greater degree than when first seen, and the nucleus is more brilliant.

Rainfall in Tasmania, September, 1882 :—

Hobart, rain fell on 18 days, amount 2·93in.
Do. Botanic Gardens, rain fell on 18 days, amount 2·45in.
Southport, rain fell on 21 days, amount 5·37in.
Oatlands, rain fell on 17 days, amount 1·69in.
Falmouth, rain fell on 9 days, amount 1·26in.
Low Heads, rain fell on 18 days, amount 3·04in.
Circular Head, rain fell on 23 days, amount 4·54in.
Mount Bischoff, rain fell on 29 days, amount 14·30in.
New Norfolk, amount 3·82in.
Fingal, rain fell on 8 days, amount 1·83in.
Mount Nelson, rain fell on 11 days, amount 1·75in.
Macquarie Harbour, rain fell on 5 days, amount 1·81in.

Time of leafing, flowering, etc., of a few standard plants in the Botanic Gardens during September, 1882 :—

20th. Horsechestnut commencing to flower.
22nd. Mountain Peony do.

28th. Ash commencing to break.
29th. Grape vines do.
29th. Sycamore do.
30th. Robinia pseudo Acacia do.

The presentations to the Museum were as follow :—

1. From Mr. S. H. Wintle. A collection of Fossils from the Rock House estate, St. Paul's River.
2. From Mr. A. J. Taylor. Specimens of Garnet from Mount Heemskirk.
3. From Mr. Schofield. An Egg, probably of a species of Petrel, embedded in Guano, from Bird Island.
4. From Mr. Moore. Specimen of Aragonite from a cutting through greenstone at Elboden-place, Hobart.
5. From Mr. J. R. McClymont. 18 silver and 32 copper coins.
6. From Mr. James E. Salier. Jaws of a large Shark.
7. From Mr. D. Carson. A "Bleeding Heart" Dove (*Phlogœnas cruenta*).

The following papers were read :—

1. "Description of some New Marine Shells of Tasmania." By Lieut. C. E. Beddome, I.N.
2. "Notes on two species of rather rare Fish recently captured in the Derwent ; viz., *Clinus despicillatus* a species of the Blenny family, and *Bovichthys variegatus*." By R. M. Johnston, F.L.S.
3. "Descriptions of hitherto undescribed Antechini and Muridæ inhabiting Tasmania." By Mr. E. T Higgins, M.R.C.S. Eng.; and Mr. W. F. Petterd, C.M.Z.S.

The proceedings closed with a vote of thanks to the authors of the papers read, and to the donors of presentations.

NOVEMBER, 1882.

The usual monthly evening meeting of the Society was held on Tuesday, 14th November ; Mr. T. Stephens, V.P., in the chair.

Mr. Wyatt Hickling, who had previously been nominated by the Council, was balloted for and declared duly elected as a Fellow of the Society.

The Hon. Secretary (Mr. BARNARD) brought under notice the following returns for the past month ; viz.:—

1. Number of visitors to Museum—On Sundays, 1,217 ; on week days, 794 ; total, 2,011.
2. Number of visitors to Botanic Gardens—Total, 5,600.
3. Seeds received at Gardens.
4. Books and periodicals received.
5. Presentations to Museum.

Meteorology :—

1. From Captain Shortt, Government Observer. Abstract table of observations taken at Hobart for October. Table of rainfall at various stations in the colony during October.
2. From the Marine Board. Tables from King's Island for August, September, and October ; Swan Island for June, July, and August ; Goose Island for August, September, and October ; Kent's Group for July, August, and September ; Mount Nelson and South Bruny for October.

The following are the results of the Hobart observations for October :—

Barometer.—Mean, 29·718 inches.

Thermometer.—Means : Max., 72 ; Min., 37·5 ; Dry Bulb, 55·5 ; Wet Bulb, 51·1.

Humidity.—Dew Point: Mean, 47 ; Elastic Force of Vapour, ·323 ; Humidity, ·922.

Condensation.—Number of days on which rain fell, 13 ; amount collected, 3·79 inches.

Clouds.—Mean daily amount, 6 (scale 0-10).

Wind.—Mean force, 2·5 (scale 0-12); prevailing direction, N.W. and S.E.

Remarks.—Rain fell on 13 days; the heaviest fall, 1·45in., was registered at 9 a.m. on the 20th. The highest temperature in the shade was 72 on the 18th ; the lowest 37·5, on the nights of the 21st and 27th. The lowest reading of the barometer was 29·207in., at 3 p.m. on the 1st ; the highest 30·139in., at 9 p.m. on the 27th. Strong winds from W. and N.W. on the 6th and 10th. The Comet is becoming much fainter. The planet Venus has been frequently visible to the naked eye, in daylight, during the month. A very heavy fall of snow occurred at Oatlands on Thursday, the 17th, covering the ground, in some places, to a depth of seven inches.

Rainfall in Tasmania during October, 1882:—

Hobart, rain fell on 13 days, amount 3·79in.

Southport, rain fell on 12 days, amount 3·50in.

Low Heads rain fell on 12 days, amount 1·31in.

Botanic Gardens, Hobart, rain fell on 12 days, amount 3·16in.

Oatlands, rain fell on 15 days, amount 1·95in.

Falmouth, rain fell on 7 days, amount 1·68in.

Circular Head, rain fell on 12 days, amount 2·56in.

Mount Bischoff, rain fell on 21 days, amount 6·27in.

Fingal, rain fell on 7 days, amount 1·39in.

Waratah and Macquarie Harbour for September, rain fell on 24 days, amount 8·63in.

Time of leafing, flowering, and fruiting of a few standard plants in the Botanic Gardens during October, 1882 :—

5th. Carpinus betulus commencing to break.

14th. Ailanthus glandulosus ditto.

15th. Morus niger ditto.

16th. Common Lime ditto.

18th. Elm ditto.

20th. Melia azederach ditto.

Presentations to Museum :—

1. From Mr. William Knight, M.A. 12 coins, viz.: 1 franc piece (silver), French Republic, 1851 ; three half, and three quarter annas (copper), India, 1835 ; one ditto, 1858 ; three ditto, 1862 ; one 5-cents, Ceylon, 1870.
2. From Mr. G. Dinham. Portion of cloth unrolled from the mummy of an Egyptian priest.
3. From Mr. A. S. Raiker, Campbell Town. A copy of the *Mercurius Caledonicus*, the first newspaper printed in Scotland, dated 1661. A silver egg-cup and spoon, a silver teaspoon, and pair of sugar tongs, formerly the property of an officer on board Captain Cook's ship when on the voyage round the world.
4. From Mr. E. D. Swan. 140 specimens of shells, 5 ditto of birds, mounted, and a collection of insects, from Fiji ; 25 specimens of shells and a lizard (*Pygopus lepidopus*) from New South Wales ; and 8 Tasmanian birds, mounted.

[The SECRETARY drew special attention to this valuable collection of objects of natural history from Fiji and New South Wales, presented by Mr. E. D. Swan, and observed that that gentleman set an admirable example to Fellows of the Royal Society, when visiting foreign countries, not to forget the Society when opportunities offered, for adding to the contents of the Museum, and thus helping to make it more and more

attractive, to the youth of the colony especially, in an educational point of view.]

The attention of the meeting was directed to a magnificent specimen of topaz, discovered by Mr. S. H. Wintle on the claim of the North Mount Cameron Tin-mining Company, and kindly forwarded by him to the Museum for exhibition. This specimen weighs 4lb., is of a pale blue colour, very transparent, apparently without flaw, and shows the form of crystallisation very perfectly.

The CHAIRMAN read a letter which he had received from Mr. Ward, Government Analyst, who, he said, had kindly undertaken to examine the West Tamar Asbestos, and to compare it with the manufactured product which had been exhibited in the shape of a specimen of packing for steam joints. The results of analysis are as follow :—

(A)

	West Tamar Asbestos.	"Packing."
Silica	41·80 ...	... 38·88
Magnesia	36·22 ...	... 31·68
Iron Protoxide	8·28 ...	... 6·84
Water lost at 212 F. ...	1·00 ...	... —
Do. lost at red heat ...	12·70 ...	... 22·60
Lime	none ...	... traces
	100·00	100·00

(B)

Results calculated minus loss on ignition :—

	West Tamar Asbestos.	"Packing."
Silica	48·43 ..	... 50·23
Magnesia	41·97 ...	. . 40·93
Iron Protoxide	9·60 ...	... 8·84

In reference to (B), Mr. Ward says :—"I have also calculated them out minus the total loss on ignition, thus getting a much fairer comparison, as the 'packing' contained oil as well as water. The results show that, so far as chemical composition goes, there is nothing against the use of the Tasmanian mineral for similar purposes. The composition in each case closely resembles that of some varieties of serpentine, and not that of hornblende.

Mr. R. M. JOHNSTON, F.L.S., read a description of a new species of Fish (*Lophotes Guntheri*), caught near Emu Bay, Tasmania.

Mr. JOHNSTON then read the concluding portion of his paper on the Fishes of Tasmania, which had been held over from a former meeting.

The SECRETARY referred to the elaborate and exhaustive paper on the Fishes of Tasmania which had just been concluded by Mr. Johnston, and regretted the absence of several members who had been present at the previous meetings when the two former parts had been read, and who, it was anticipated, would have joined in the discussion upon the whole subject when completed. It had been hoped also that the paper might have been printed in the interim, to facilitate the discussion. Mr. Barnard added, that the Society, as well as the colony, are highly indebted to Mr. Johnston for his valuable contribution to this important division of natural history, as, to his own personal knowledge, the publication in the "Tasmanian Journal of Science," some forty years back, of an article by Dr. Richardson, on the Fishes of Port Arthur, was followed up by an earnest application from the writer to the then Lieut.-Governor, Sir John Franklin, to procure and send home specimens of all new varieties of fish that could be procured from our waters ; and ever since a more comprehensive account of our Fishes has been deemed a *desideratum*. This has now been accomplished by Mr. Johnston, who enumerates 190 species of Fish as known to Tasmania. Mr. Barnard

then referred to the economic uses of the fish which abound on our coasts, and that this catalogue, in pointing out the best species for the purpose of being cured and exported, will prove a most useful guide in promoting trade and foreign commerce; and he concluded by moving the thanks of the Society to Mr. R. M. Johnston for his valuable papers, to Mr. W. F. Ward for his analyses of the specimens of Asbestos, and also to the various donors of contributions to the Museum during the past month.

Mr. NAPIER remarked that many years ago a large trade was done by some Chinese in the treatment of fish for exportation.

The vote of thanks, moved by Mr. BARNARD and seconded by Dr. E. J. CROUCH, was then put to the meeting and carried unanimously.

Mr. JOHNSTON, in acknowledging the vote of thanks, spoke of the labours of those who had preceded him in the same path, and especially mentioned the late lamented Mr. Morton Allport as having contributed largely to the Ichthyology of Tasmania; and he then drew the attention of the meeting to some exquisite drawings of certain Fishes, by Mr. H. J. Graham, which he had brought down for exhibition.

The meeting, which is the last for the session of 1882, then closed.

GENERAL AND CRITICAL OBSERVATIONS

ON

THE FISHES OF TASMANIA;

WITH A

Classified Catalogue of all the known Species.

BY ROBERT M. JOHNSTON, F.L.S.,

Fellow of the Royal Society of Tasmania and of the Linnean Society of New South Wales, &c.

[*Read 7th August*, 1882.]

GENERAL AND CRITICAL OBSERVATIONS ON THE FISHES OF TASMANIA.

In submitting to the Fellows of this Society my observations upon the Fishes of Tasmania, I am especially reminded of the valuable labours of the late Mr. Morton Allport in this direction, and of the loss which Ichthyology has sustained by his untimely death. Not only had he laboured zealously and successfully in all matters relating to the acclimatisation of the European *Salmonidæ* and other fishes, but, in addition, he had at much pains during a number of years collected many of our indigenous fishes and forwarded them to Dr. Günther, of the British Museum, with his observations. A few of those forwarded by him were afterwards described by Dr. Günther as new to science, and a still larger number, although already known and described, were reported for the first time to include Tasmania in their distribution. In this way he materially extended our knowledge of the indigenous fishes, and so increased the known list from about 100 to 142 species. These were recorded by him in a MS. Catalogue, which the Council of this Society kindly placed at my disposal when they learned that I was independently engaged on a similar work. Unfortunately with respect to this Catalogue, there are no notes or observations of any kind regarding the fishes themselves; and if no other records exist, the greater part of the knowledge which he gained by his many years of patient study has been lost to science.

It is right that I should here also mention how much we are indebted to Mr. T. J. Lempriere, who was the first Tasmanian naturalist who formed an extensive collection of fishes. His collection was described by Dr. Richardson, and afterwards published in the Journal of the Zoological Society in the year 1839, and reprinted in the Tasmanian Journal, vol. I, p. 59-65; 99–108.

My own labours in connection with the fishes of Tasmania only extend over the last six years, but during that period I have devoted much of my time to their investigation. The branch of study which especially occupied my mind has been one that had already engaged my attention in respect of the land and fresh-water shells of this Island,—viz., habits and variability. Like some species of our land

shells, many of our fishes have been described from single specimens, or from individuals sent to Europe at various times more or less imperfectly preserved. The difficulties of dealing with the classification of certain species are great enough when the specimens available are abundant and perfect, but they are increased tenfold when the only specimens available for examination are both imperfect and few in number. The limits of variability must first be accurately determined before a satisfactory classification can be established in respect of closely allied species. It is not expected that the vexed subject of "what is a species" and "what is a variety" can be settled by the references made in this paper in respect of some of our fishes about which there is some doubt; but it is hoped that the observations carefully recorded by me may be helpful at least in basing the classification of some of our local species upon a wider and more secure foundation. As such, these observations are respectfully submitted for the consideration of those eminent in the science.

Of the 188 species known to exist in Tasmanian waters I have personally examined the general characters of about 145 species. Indeed, I have been in the habit of making drawings and recording particulars of all individual fishes which came into my possession, whether rare or common. Of the more common fishes I have recorded characteristic particulars of several hundred distinct individuals. I mention this for the purpose of showing that the opinions herein advanced by me in respect of matters related to classification are based upon the observations of many individuals of the same species taken in different seasons and in various stages of development. It is in this place also desirable to state that as a Member of the Royal Fisheries Commission, which has now almost completed its enquiries into all matters relating to Tasmanian Fish and Fisheries, I have been enabled to verify many observations of which I was formerly doubtful, and to extend my information with respect to the habits of the more common market fishes, and to matters relating to the fishing industry of this Island generally.

The great portion of our fishes were described from specimens collected by various naturalists who accompanied expeditions from Europe between the years 1834 and 1842.

The following are the names of authors who have determined the greater number of species known to exist in Tasmanian waters :—

Dr. Richardson	41	species.
Dr. Günther.....	32	ditto.
Cuvier & Val.	21	ditto.
Linnæus	17	ditto.
Castelnau	10	ditto.
Johnston	10	ditto.
Various authors (25)	57	ditto.
TOTAL	188	

In the Catalogue which follows the General Observations I have given reference specially to three distinct sources as regards fuller specific description or as an authority for the existence of the particular species in Tasmanian waters. These are—

1. Dr. Günther's Catalogue of Fishes, 8 vols., London, 1859-70.
2. Mr. Macleay's Descriptive Catalogue of the Fishes of Australia. Pros. Linn. Soc. New South Wales, vols. 5 and 6, 1881.
3. Mr. Morton Allport's MS. List of Tasmanian Fishes.

With respect to the last reference, I have to explain that although it consists of a mere list of names, it is a guarantee of the existence of the species in Tasmania, and it affords me the extreme gratification of having Mr. Allport's name associated with my own in the first attempt to give a systematic review of our Tasmanian Fishes.

That there are many imperfections may be expected, but I have endeavoured to make the list as complete as possible. Mr. Macleay's very useful Catalogue, to which I have referred, is very complete, and those who wish to study the Fishes of Australia will find it to be indispensable.

The following Chapters contain—

1st. A brief description of our Market Fish and Fisheries.

2nd. Observations upon the Freshwater Fishes, including a chapter on the Introduced Species.

3rd. Observations upon the Marine Fishes, in the order of the Families as arranged by Dr. Günther.

4th. A Classified Catalogue of all the known Species, with references to the sources where they are more fully described, and, in some cases, with critical notes and observations.

Market Fish and Fisheries.

With a population of only 120,000 persons, it cannot be expected that the fishing industry in Tasmania can be very extensive; nevertheless it is estimated that there are about 1050 persons directly dependent upon the capture and sale of Fishes.

Hobart is the chief centre of the industry, its position being particularly favourable in this respect from its nearness to the principal fishing-grounds. Fully 63 per cent. of the men and boats belong to Hobart; and the men carry on their business either in the upper or lower waters of the Derwent, or in the open sea Trumpeter reefs, 40 to 80 fathoms, lying between Seymour on the East Coast and Port Davey on the South-West. The marine fishing-grounds may generally be divided into three classes:—

I. The "Home Grounds," near shore or in the upper shallows of estuaries, where the seine-net is largely used in the capture of—

The Sole	*Amnotretis rostratus.*
The Flounder ..	*Rhombsolea monopus.*
Garfish	*Hemirhamphus intermedius.*
Mullet	*Agonostoma Forsteri.*

In the Derwent, Tamar, Port Sorell, and George's Bay especially, there are many fishing-grounds where these fish are to be found in considerable numbers. Unfortunately, the flat fishes of Tasmania, and the Garfish, can only be captured by means of the seine-net, which in its operations destroys in myriads the young of all the fishes which tend to seek such shallow ground for food and shelter. Many unprotected localities, such as Ralph's Bay, in the Derwent, where such fish were once so abundant, have now been rendered almost barren from the indiscriminate and continuous operation of the destructive seine-net. The effect of the seine-net is clearly shown in the Derwent. The upper portion of the river, prior to being closed for the protection of the Salmonidæ, was so much thinned out by continuous and destructive seining, that the rod fishermen interested in the capture of mullet, native salmon, perch, &c. could no longer find it profitable to fish in this locality. Since this portion was so protected, all kinds of estuary fish have become so abundant, that it is stated that more mullet are caught now in these waters by amateur rod fishermen than were taken formerly by the seine-net.

The problem of devising some means whereby the Flounder, Garfish, and other useful marketable fish, might

be secured without involving the destruction of countless numbers of the ova and young of these and other fish, has yet to be solved. Certainly, limiting the size of the mesh of the seine might do some good, but it has been shown that the mesh which would allow the escape of the young Mullet, Perch, and Bastard Trumpeter, would still destroy the young of the Flounder. It is also shown that, owing to the mode in which the seine is used, the scraping of the lead-rope, and the enclosed weed render it almost impossible for the young fish to escape when the net is drawn upon the beach, even though the mesh of the seine were considerably enlarged. It seems, therefore, that the only way to remedy the evil is to reserve certain suitable areas in our estuaries as nursery grounds, wherein the use of the seine-net should be absolutely prohibited. The New South Wales Government have been obliged to adopt this course in respect of certain lakes and estuaries, in the interest of the deep-sea market fish, whose wholesale destruction was threatened by the operation of the seine-net.

II. The "MiddleGround" Fisheries are generally situated towards the mouth of estuaries, or in certain sheltered bays where the depth of water is from 5 to 6 fathoms. In such localities the graball net and ordinary hook and line are employed principally, in the capture of the following market fish :—

The Native Salmon	*Arripis salar.*
The Bastard Trumpeter....	*Latris Forsteri.*
The Black and Silver Perch	*Chilodactylus macropterus.*
The Magpie Perch	*Chilodactylus gibbosus.*
The Carp	*Chilodactylus Allporti.*
The Flathead	*Platycephalus bassensis.*
The Silver Trevally	*Caranx Georgianus.*
The Snotgall Trevally	*Neptonemus brama.*
The Rock Cod	*Pseudophycis barbatus.*
The Ling.....	*Genypterus blacodes.*
The Sand Mullet	*Mugil dobula.*
The Conger Eel	*Conger vulgaris.*

III. The "Outer," or "Open Sea" fishing-grounds, lie principally in the Southern waters of Tasmania, from one to sixteen miles off the coast, in depth of water ranging from 20 to 80 fathoms.

The fishing-boats employed in these grounds are necessarily the best of their description, although the most of them are open whale-boats, fitted, as nearly all of our Hobart fishing-boats are, with wells for keeping the fish alive after capture.

The fish, bottom fish, caught by hook and line in such places are

The School and Old-man Trumpeter ..... *Latris hecateia.*
The Rock Gurnet ..... *Sebastes percoides.*
The Black and Silver Perch *Chilodactylus macropterus.*
The Real Bastard Trumpeter *Mendosoma Allporti.*

Towards the surface of these open waters, the Maori "jig" and the swivelled barbless hook are employed in the capture of the rapacious though important market fishes—

The Barracouta ..... *Thyrsites atun.*
The Kingfish .... *Thyrsites solandri.*

Altogether, it is estimated that out of the 188 known species of fish, there are about 63, or a third, good edible fish,—but only about 21 of these are sufficiently abundant to be considered as of any importance, so far as a regular market supply is concerned.

Large schools of sprats and anchovies are known to appear upon our coasts regularly, but there are neither establishments* amongst us for the preservation of such fishes, nor have we the suitable equipment, in the shape of nets, for their capture. In time this source of wealth may be opened to us. At present, want of knowledge, and possibly want of enterprise, operates against this valuable source of supply.

Trawl-nets have been tried on our coasts, but without good result. Either the class of bottom fish are absent in our waters, or the proper grounds have yet to be discovered suited for this mode of capture.

Freshwater Fishes.

Our Freshwater fishes,—and among these I include migratory species which necessarily live a portion of their existence in fresh water,—may with convenience be dealt with specially, and they naturally fall into two distinct groups; viz.—

1. The Indigenous Fishes.
2. The Introduced Fishes from Europe.

Among the former there are 15 species, belonging to eight distinct families and 11 genera; viz.—

* Mr. Peacock, of Hobart, had tried to establish a preserving industry, but gave it up because he had not the skilled labour nor the proper facilities for carrying on the business successfully.

	Family.	*Genus.*	*Species.*	*Common to Australia.*	*Common to N. Zealand.*
1	Percidæ	Lates	colonorum	*	
2	,,	Microperca	Tasmaniæ		
3	Triglidæ	Aphritis	Urvillii		
4	Gadopsidæ	Gadopsis	marmoratus	*	
5	Haplochitonidæ	Haplochiton	Sealii		
6	,,	Prototroctes	maræna	*	
7	Salmonidæ	Retropinna	Richardsoni	*	*
8	Galaxidæ	Galaxias	truttaceus		
9	,,	,,	attenuatus		*
10	,,	,,	auratus		
11	,,	,,	Weedoni		
12	,,	,,	Atkinsoni		
13	Murænidæ	Anguilla	australis	*	
14	Petromyzontidæ	Mordacia	mordax	*	
15	,,	Geotria	Allporti		

The most important among these, so far as the market is concerned, are—

1. *Lates colonorum* ..... Brackish-water Perch.
2. *Gadopsis marmoratus* .. Blackfish.
3. *Anguilla Australis* .... The Common Eel.
4. *Prototroctes maræna* .. The Freshwater Herring.
5. *Retropinna Richardsoni*. The Smelt or Whitebait.
6. The various species of *Galaxias*. { Jolly-tails and Native Trout.

The first three are the only fish attaining any size; the remainder are small, valued for their quality as food, and in most cases for their wonderful abundance throughout nearly all the rivers and streamlets of Tasmania.

Lates colonorum.—Is a well known fish in Australian waters, but its distribution in Tasmania is confined, so far as is yet known, to one small river discharging into Anson's Lagoon, in the north-east part of Tasmania. It has more the appearance of a saltwater fish, and indeed, although it is not a sea-going fish, it is most frequently captured in brackish water at the mouth of small streams whose connection with the sea is frequently closed with shifting sand-bars. It is probably in this way that this genus had originally become acclimatized to the fresh water. The existence of this fish in Tasmania was only recently made known to the Society through the instrumentality of Mr. John Swan, who states in respect of it, that he had seen, about the end of June, 30 or 40 specimens in the course of two days, weighing from 1½ to 3 lbs. each, which were netted by Chinamen. Their stomachs were filled with small fish, which he stated resembled anchovies. The Chinamen cut a slit down the back of the fish, and put

them into a composition which they keep secret; they then hang and dry them, without removing the intestines. A specimen preserved in this way, now in my possession for more than a year, is still in an excellent state of preservation.

The market for the fish captured by the Chinamen is chiefly among the tin-miners of Thomas's Plains.

It is most singular that this species, with the Blackfish *(Gadopsis marmoratus)*, should be identical with species found abundantly in Victorian Rivers, and wholly absent in all the southern waters of Tasmania. The Unio *(U. moretonicus)*, and the Freshwater Lobster *(Astacopsis Franklinii)*, are also restricted to the rivers which discharge their waters into Bass's Straits. The peculiar inhabitants of northern rivers, therefore, are more Victorian than South Tasmanian in character, which is remarkable when we consider the present insular character of Tasmania. Mr. Wallace's theory of the original distribution of 'Island Life' receives ample confirmation from these and other facts known to me in connection with the Flora and Fauna of Tasmania.

The Blackfish *(Gadopsis marmoratus)*, whose singular distribution has been commented upon, is found in nearly all the rivers of Tasmania which flow into Bass's Straits. Their original absence in some northern streams, such as the South Esk,—which has recently been successfully stocked by Mr. Harrison and other pisciculturists,—is somewhat puzzling; but the total absence from all the other rivers and streams of Tasmania where the conditions are identical, can only be explained on the principles of geographical distribution as illustrated by Darwin and Wallace. I believe if the Fauna of Tasmania were specially studied by Mr. Wallace, that many of the opinions advanced by him in his last great work would receive ample and striking confirmation.

The Blackfish somewhat resembles a small Ling in markings and general appearance. It is much esteemed as food, and is a welcome fare to bushmen and settlers who are far removed from the centres of population. The fish usually are taken in considerable numbers by rod and line all the year round, the hook baited often with the large white grub (a species of moth obtained from the 'wattle' or 'honeysuckle,' (i.e., *Acacia dealbata: Banksia marginata*). A good take can always be relied upon in most of the northern streams, especially in the Ringarooma, where, it is stated by Mr. John Brown, they have been known to reach a

weight of 10 lbs. The average weight, however, runs from 3 to 4 lbs., except in the North Esk, where they run smaller than elsewhere. Mr. Brown and others who have observed our freshwater fishes closely, assert that they cannot distinguish the male from the female, although they have purposely opened hundreds of them. I have opened a good number myself, but at the time I did not know of this fact, and naturally supposed that they were ordinary females. I am inclined now to consider that they are bisexual, and will take the first opportunity to enquire into this matter more fully. Unfortunately, the specimens in my collection have the intestines removed. Blackfish are sometimes taken in the brackish water of tidal rivers.

Anguilla Australis, the Common Eel of Australia and Tasmania, is very abundant in all our rivers. Large numbers are caught in the Tamar and its principal tributaries, the North and South Esk. Some of the eels have been taken in the Ringarooma and South Esk Rivers over 30 lbs. in weight, and over 20 inches in girth. The market supply could be greatly extended if there were any demand for them.

Prototroctes maræna, the Freshwater Herring, or Cucumber Fish, although rarely exceeding ¾ lbs. weight, and 12 inches long, is perhaps the finest of our native freshwater fishes. It has an adipose fin, and is closely allied to the true Salmonoids of European waters. It is to a certain extent migratory; but whether it approaches the lower reaches of the streams to spawn in suitable redds, or whether it is necessary to approach the brackish water for some other reason, is not yet quite clear. They are stated by Mr. Brown to have been found in brackish water in the Tamar a considerable distance below the confluence of the North and South Esk Rivers. They are a clean cut, handsome shaped fish, with small head and elongate body, like a diminutive salmon. They are chiefly insect feeders, and during the season they at one time could be caught in vast numbers in nearly all our rivers. Although in many of our streams they appear to be again on the increase, it is remarkable that about 14 years ago they suddenly almost disappeared from most of our rivers where they were formerly plentiful. The general conclusion is that this disappearance of the herring was due to a wide spread epidemic. In some places it is stated that thousands of dead fish were seen floating down the rivers. The fins, eyes, and gill-covers appeared to be covered with a fungus. It is therefore likely that at particular periods they are subject to the widespread attack of some species of *Saprolegnia*,

similar to that which attacks the *Salmo salar* of Scotch and English Rivers, as described by Professor Huxley. They are caught chiefly with rod and line,—a fly-hook baited with a "gentle" seems to be the mode of capture in greatest favour among sportsmen.

Retropinna Richardsoni, the Smelt of New Zealand, is also found in the various estuaries of Tasmania at certain periods of the year. It scarcely exceeds 3 to 4 inches long, and is usually found in myriads in the shrimp-nets, together with the silver-belly Sand-smelt *(Atherina, sp.)*, the Jolly-tail *(Galaxias attenuatus)*, and the Anchovy. The Jolly-tails, Sand-smelts, and Smelts are frequently termed 'Whitebait,' and are esteemed a great delicacy for the table. In the Tamar all these little fishes may be caught in vast numbers. Dr. Günther formerly supposed that *R. Richardsoni* was confined to New Zealand, but it is now known to be common to Australia and Tasmania also.

The various species of Native Trout *(Galaxias)* are more numerous, and are found more widely spread than any other freshwater fish in Tasmania. *G. auratus*, the Golden Lake Trout, is found at an altitude of nearly 4000 feet, while *G. attenuatus* is generally found at the lower levels, and are most abundant not far away from the influence of brackish water, which they freely enter. *G. truttaceus*, the Spotted Trout, is found in the inland streams; a variety ascends the mountain rivulets, and hence it is termed the Mountain Trout. They are all small fishes, with rounded scaleless bodies and flattened heads. The Golden Lake Trout *(G. auratus)* is the largest. Specimens of this fish, which is most closely allied to *G. truttaceus*, are in my possession measuring 11 inches long.

The Lamprey, though abundant in some rivers, seems not to be in favour in the market, as they are rarely seen there.

Introduced Fishes successfully acclimatized in Tasmanian Waters.

It is no small credit to Tasmania that she is the first Colony in the Antipodes which has succeeded in the remarkable achievement of stocking her waters with European fishes, from eggs hatched in her establishment at New Norfolk, on the Plenty, which were originally taken from the parent fish and artificially impregnated in England. The history of the Salmon experiment of Tasmania is now

a famous one, and need not be enlarged upon here. It is necessary, however, that a brief reference should be made to it, and to the fishes now successfully established in our waters, and included among the Catalogue of Tasmanian Fishes. It is now nearly 33 years ago since Sir W. Denison, Mr. Burnett, Capt. Stanley, Mr. A. Young, and others, originated the idea of stocking Tasmanian rivers with the Salmon of Europe. Many trials and proposals were made, and repeated failures ; but these experiments were in one sense a success, for they eventually led the minds of such men as Gottlieb Boccius and Mr. J. A. Youl, C.M.G., to ponder over and eventually to overcome all obstacles and difficulties. For, although the shipments of 50,000 ova in each of the years 1852, 1859, and 1862, by the *Columbus*, *S. Curling*, and *Beautiful Star* failed altogether, yet, mainly owing to the enthusiastic ardour and intelligent direction of Mr. Youl, in conjunction with English and Tasmanian naturalists, success at last crowned their labours by the safe arrival of the *Norfolk*, in the year 1864, with healthy impregnated ova, packed in moss, and surrounded by ice, in a suitable chamber.

Mr. Seager, the Secretary of the Tasmanian Salmon Commissioners, has kindly given me the following particulars. Of the 102,000 ova of *Salmo salar*, and 1500 eggs of *Salmo fario* (Itcham Trout), it is estimated that about 34,700 of the former and 300 of the latter arrived at the Salmon Ponds on the Plenty in a healthy condition ; and of these it is further estimated that 3000 of *Salmo salar* and 300 *S. fario* were successfully hatched and eventually liberated in the Plenty. In 1866 another consignment of about 102,000 ova of *S. salar* and 15,000 of *S. trutta* arrived, from which about 6000 of the former and 496 of the latter were successfully hatched, and eventually liberated in the same tributary of the Derwent. The result of this has been that the River Derwent is now stocked with the migratory sea-going Salmonoids and the Brown Trout ; while in all the principal rivers of the island the Brown Trout has been successfully established. Indeed, it is noteworthy that the Brown Trout hatched in the Ponds from a box of ova supplied by Frank Buckland and Francis Francis, are the progenitors of all the Trout which now exist in the Australian Colonies.

The following is a statement, also supplied by Mr. Seager, of the ova and fry forwarded to the various places between the years 1869 and 1881 from the breeding establishment on the Plenty ; viz.—

	Fry.	*Ova.*
To rivers and streams throughout Tasmania	57,190	36,600
Victoria	..	81,500
New South Wales	..	21,500
South Australia	..	20,000
Western Australia	..	800
New Zealand	..	18,850
TOTAL	57,190	179,250

For a fuller account of the Salmon experiment I have only to refer to the many interesting papers contained in the Proceedings of this Society contributed by the late Mr. Morton Allport, to whom also the success of the experiment in Tasmania is in a large measure due.

The ova were obtained originally from the following streams in England and Scotland—

Salmo salar—Ribble and Hodder, Lancashire.
Severn, Worcestershire.
Dovey, Wales.
Tyne, Northumberland.
Tweed, Scotland.
Salmo trutta—Tweed, Scotland.
Salmo fario—Itcham and its tributaries, near Southampton.

Among those gentlemen who rendered their valuable aid in procuring ova, and in forwarding the success of the various experiments, may be mentioned the following:—Mr. Frank Buckland, Mr. Brady, Mr. Francis Francis, Mr. Ramsbottom (father and son), W. Allies, and Mr. Johnston. In Tasmania we have associated with Mr. Allport the following gentlemen who have specially taken an interest in the introduction of the Salmonidæ from the first, viz.:—Sir Robert Officer, Dr. Milligan, Mr. John Buckland, Dr. Agnew, Mr. Curzon Allport, and Mr. Robt. Read, upon whose estate the Salmon Ponds have been constructed.

Besides the acclimatization of three species of Salmon, to Mr. Morton Allport is mainly due the successful introduction to our waters of the following well known European fishes:—

The River Perch ..... *Perca fluviatilis.*
The Common Tench ..... *Tinca vulgaris.*
The Crucian Carp ..... *Carassius vulgaris.*
The Golden Carp ..... *Carassius auratus.*

These are to be found in our various rivers, and are so well known that they need no description. Victorian and New Zealand Rivers have been successfully stocked from Tasmania with the River Perch, the Tench, and the Crucian Carp.

Of these latter the Tench is the only fish of importance which has become really abundant in Tasmania. The Perch seems to thrive well in certain lakes where introduced, but not to the same extent as the Tench.

With respect to the exact nature of the Derwent migratory Salmonoids, there has been much discussion as to whether the *Salmo salar* has really established itself or not. The handsome fish which is now so numerous in the estuary of the Derwent is within certain limits a most variable form, —some individuals being almost identical in all specific characters with the grilse form of *S. salar*, while others partake more of the character of the equally valuable *S. trutta* and its still more closely allied congener, *S. Cambricus*. It is clear to me, however, that the prevailing form found in salt water is a mean between these, and it is this overlapping of the closely agreeing characteristics of these so-called species which renders it so puzzling to determine to which of them any one individual belongs. The question, which has excited much interest in Tasmania, is confused by the notions of imperfectly informed persons, who, by the use of such a misleading common name as 'Bull Trout,' have led many to think that we have only succeeded in acclimatizing the common Brown Trout and its varieties in our waters, and they often, in ignorance, speak of our fine migratory fish as if it were a coarse, destructive fish of no value. It is to be regretted, where legislation may be concerned, that erroneous notions should be circulated in this way. By such people the fanciful views of amateur pisciculturists or sportsmen are deemed to be of equal value to the utterances of learned ichthyologists such as Dr. Günther, whose profound knowledge forces them to speak with extreme caution.

We only know as yet that we have a fine non-migratory Trout (the Brown Trout), and a splendid sea-going migratory Salmonoid. The question is, not *S. fario* versus *S. trutta*, or *S. fario* versus *S. salar*, but the more difficult one of determining whether the variable, handsome, migratory fish, which is frequently captured far out at sea, is (1) *S. trutta*, (2) *S. Cambricus*, (3) *S. brachypoma*, (4) *S. salar*, (5) all of these in variable numbers, (6) a hybrid partaking in varying degrees of the characters of the four

named species, or (7) one or other of those named but modified by transfer to a new environment. If the individuals which prevail agreed with or fell within the classified limits of any one species we would not have the slightest difficulty in determining their specific value; but when no one individual comes exactly within the limits of the written characters, it is necessary that the seven propositions advanced by me should be answered satisfactorily before any one can pronounce with confidence on the subject.

Mr. Allport, who knew very well the niceties of distinction between *S. salar* and *S. trutta*, inclined strongly to the opinion that our Derwent Salmonoids are grilse of the former, and not *S. trutta*. Dr. Günther and Professor M'Coy have had the disadvantage of determining the nature of the species from single individuals sent to them at odd times. They consequently, from such disconnected points, could have no means of determining the curve of variability, and I am not surprised therefore that, respectively, at different times, they have pronounced certain individuals to be *S. salar*, *S. trutta*, *S. Cambricus*, and a hybrid between *S. salar* and *S. trutta*. Odd specimens cannot determine the curve of variability, nor can they determine whether the four fish, so differently named, were not after all the progeny of the same parents.

The following are curious facts. A Brown Trout, caught in the Mersey, with a coarse head, weighing 22½ lbs., girth 24 inches, contained 7 lbs. of very large mature ova. Each ovum was of a pale straw colour, with a conspicuous pinkish nucleus. The colour of the pinkish nucleus gave a decidedly pinkish tinge to the ova in mass. The pectoral fin of this fish had 16 distinct rays.

A short, but silvery variety of Brown Trout, which frequents the wharves in brackish water at Launceston, weighing about 5 lbs., has pinkish flesh, and well-developed pyloric appendages. In one individual I counted as many as 72, all of them larger than the average size. A fish of similar habit, called by some "White Trout," is found, common, in brackish water at Bridgewater. The latter, however, is generally more elongate, and individuals have been captured over 22½ lbs. in weight.

A handsome migratory Salmonoid, caught recently below Bridgewater, weight 9 lbs., total length 28 inches. In colour, form of body and tail, shape of caudal and other notable characters, it agreed with the characteristics of *S. salar*; yet in the tail series of transverse scales, certain characters of

the operculæ, the slightly obtuse snout, and in the relatively long maxillaries, were more in accord with the characteristics of *S. trutta*. The shape and number of pyloric cæca were within the overlapping number common to both.

It is begging the whole question to assume hybridism when the prevailing type is similarly variable, unless we assume also that the ova of one species were artificially impregnated by the semen of the other by mistake prior to dispatch from England. This is conceivable ; but when we consider the names of those who carefully selected the fish in England which were stripped, it is not at all probable. Besides, the theory of hybridism is to me extremely unsatisfactory. It assumes that we know the exact measure of the external influence of varying light, food, and the local nature of the medium in which these animals exist. The extraordinary facilities for intercrossing among fishes naturally must also be taken into consideration, together with the fact that the extremes of each type steadily perpetuate themselves in European waters.

As directly bearing upon this subject, it is noteworthy that already in New Zealand and Tasmania the allied non-migratory species, *S. fario*, var. *Ausonii*, has developed into distinct types, which are peculiarly characteristic of particular streams. This clearly shows that differences of this kind are not sufficiently fixed to remain unaffected by environment,—that they are in fact *racial* and subordinate to influences of immediate environment, and not fixed or specific, and remaining constant in spite of such accidental influences.

Marine Fishes.

Berycidæ.

There are only two known representatives of this family in Tasmanian waters, viz., *Beryx affinis* (G.): *Trachichthys Macleayi*, (Johnston). They are seen on rare occasions, and are consequently of little importance from a utilitarian point of view. The greater number of genera belonging to the family live at great depths. The genus *Beryx* is sometimes found at a depth of over 300 fathoms.

Percidæ. *The Perch Family.*

This family is of considerable importance. It is represented in Tasmanian waters by ten genera and thirteen species.

So far as the fish market is concerned, the most important members are—

1. *Anthias rasor* .... Tasmanian Barber or Red Perch.
2. *Arripis salar* .... Native Salmon.
3. *Arripis truttaceus*.. Native Salmon Trout.

The first of these is generally caught in the winter season, along with the Trumpeter *(Latris hecateia)*; and although not taken in great quantity, it is nevertheless, from its quality, highly esteemed.

The Native Salmon *(A. salar)* are brought to market in the greatest abundance all the year round. They enter rivers and approach wharves in myriads at certain seasons, chiefly in spring, and afford the angler passable sport, as they dash greedily at bait or artificial fly, and sometimes are known to vie with their noble namesake in the plucky manner in which they play the sportsman's reel. It is almost certain (as stated by Prof. M'Coy) that the Native Salmon Trout *(A. truttaceus)* is but the immature form of *A. salar*. In the young state they are barred or spotted,—the markings becoming fainter as they increase in size, and disappearing altogether in the mature forms. They are of handsome shape, sometimes reaching 7 lbs. weight. They are most esteemed for food, however, when they are under 1 lb. weight.

The other members of the group are unimportant either as regards size or numbers brought to market.

Mullidæ. *The Red Mullet Family.*

The only known member of this highly-prized family of fishes is the Red Gurnet or Red Mullet of our fishermen *(Upeneichthys porosus)*. It is very scarce, however, for it is seldom seen in the market.

Sparidæ. *The Bream Family.*

Of the Bream family there are five representatives in Tasmanian waters; viz.—

1. *Chrysophrys australis*, Günth. The Common or Silver Bream.
2. *Girella tricuspidata*, Cuv. and Val. The Black Bream.
3. *Girella simplex*, Rich. .. The Sweep.
4. *Pagrus unicolor*, Cuv. and Val. The Snapper.
5. *Haplodactylus arctidens*, Rich.

Although all the members of this family are valuable food fishes, there are only three of the list which are sufficiently numerous on our Tasmanian coasts to claim our attention as affecting the market supply, viz., the Silver Bream *(C. australis)*, the Black Bream *(G. tricuspidata)*, and the Sweep *(G. simplex)*.

The first of these, the Silver Bream, enters the brackish waters of creeks and rivers during the summer months in considerable numbers. They subsist chiefly upon crabs and other hard-shelled animals which abound in such places, and which they crush with their strong jaws, armed as they are with rows of molar teeth. They are supposed to shed their spawn in the brackish shallows during the months of November and December, returning to the sea before the close of June. At the mouth of Brown's River, the Jordan, the Scamander, and other favourite places, the amateur fisherman could always find abundance of sport in former years; but, latterly, in some of these places their numbers appear to have greatly diminished, chiefly caused, it is affirmed, by the use of fixed nets across the mouths of the streams, by which large quantities of the immature fish are ruthlessly destroyed, and possibly obstructing the ingress of the mature spawning fish. It would be well if a stringent measure were passed by Parliament prohibiting the use or otherwise limiting the fixture of nets in such situations.

The Sweep *(Girella simplex)* and the Black Bream *(Girella tricuspidata)* are not taken in much abundance towards the south of Tasmania, nor do they seem to ascend the estuaries so freely as the Silver Bream *(C. australis)*. They are principally vegetable feeders,—their rows of fine incisors, frequently tricuspidate, being well adapted for the purpose. They are most frequently taken together in nets (graball) in the bays of the North-West and North-East Coasts, particularly the Tamar, Port Sorell, Bridport, the Mersey, George's Bay, and the Scamander. Those sent to Hobart are generally caught at Southport.

The Snapper *(Pagrus unicolor)* is seldom seen in the southern waters of Tasmania, even where the reefs, depth of water, and other conditions seem to be favourable. This splendid fish seems to favour the warmer latitudes, for it abounds, and forms the chief market supply, along the coasts of Australia. Its place in Tasmanian waters, especially in the south, seems to be occupied by the Trumpeter family *(Latris)*, which latter seems to favour the deep fringing reefs of the colder southern latitudes. The North Coast of

Tasmania lacks the deep fringing reefs which seem to be the favoured resort of the Snapper. This may account for the rare appearance of this fish on our northern coasts, where, from other considerations, it might be expected to be found.

The fifth representative *(Haplodactylus arctidens)* is referred to by Dr. Richardson as found at Port Arthur, but it is seldom seen in the market. It has simple lanceolate incisors, and is a vegetable feeder, like the Sweep and Black Bream.

Squamipinnes.

It is very doubtful whether we have any representative of this family in Tasmanian waters, although the species *Scorpis Georgianus* (C. et V.) has been stated to have been seen. It is, consequently, of little interest as regards the local fish market. Dr. Günther states with respect to this family, that they abound chiefly in the neighbourhood of coral reefs; and that the beauty and singularity of distribution of the colors of some of the genera are scarcely surpassed by any other group of fishes. Comparatively few are used as food. They are carnivorous, feeding on small invertebrates.

Cirrhitidæ. *The Perch and Trumpeter Family.*

This is by far the largest and most important family, so far as the edible fishes of Tasmania are concerned. It comprises 6 genera and 13 species, chief among which are—

The Real Trumpeter *(Latris hecateia)*, Rich.
The Red and Silver Bastard *(Latris Forsteri)*, Cast.
The Black and Silver Perch *(Chilodactylus macropterus)*, Perkins.
The Carp *(Chilodactylus Allporti)*, Günther.
The Magpie Perch *(Chilodactylus gibbosus)*, Rich.
The Real Bastard Trumpeter *(Mendosoma Allporti)*, Johnston.

The first of these, the Real Trumpeter, or Hobart Trumpeter, is brought to market in considerable abundance all the year round, and is deservedly held in repute as the finest of the Australian edible fishes. It commands a ready market in the neighbouring Colonies, whether fresh, smoke-dried, or salted. Many, indeed, consider the smoked Trumpeter equal, if not superior, to the Finnon Haddock of Scotland *(Gadus æglefinnis)*. It is therefore worthy of special notice.

The Trumpeter proper is readily known from the other members of the genus by its finer and more elongate head, and the three or four characteristic longitudinal white bars along the sides of its body. It is very limited in its distribution, and favours the colder southern waters of the Island. The fish are generally found on what are described by the fishermen as coral reefs or banks, 10 to 70 fathoms deep, and 3 to 10 miles off the land. These banks are distributed all round the southern coast of Tasmania, from Macquarie Harbour, in the west, to Seymour, in the east. There is no trustworthy record of Real Trumpeter being caught much further north.* It has been reported that *Latris hecateia* has been found off the coast of Victoria; but, as there are two or three Victorian smacks which regularly fish in Tasmanian waters and bring their fish into Port Phillip direct, it is possible that the supplies so brought into market might be confounded with the supplies brought from the Victorian coast. The duty at one time imposed upon Tasmanian fish might also tend to favour such a belief.

In searching for the right fishing banks, the fishermen test the bottom with heavy sinkers shod with grease. Should there be any traces of coral they consider them favourable indications of the presence of the fish, and they at once proceed to sink their lines, even though it should be 70 fathoms deep. The lines are baited with Crayfish *(Palinurus Edwardsii)*, or, afterwards, Sharks' flesh when the fish come about.

The Real Trumpeter takes bait readily; but, owing to the great depth and strong currents upon these outer reefs, the large deep-water Trumpeter has never been attempted to be taken in nets. All the boats employed in fishing for Trumpeter are termed well-boats,—being fitted up with a chamber to which the fresh sea-water has free communication by numerous perforations on the bottom and sides. Immediately the fish are hauled in they are placed in these open wells, and are thus preserved alive until sold in market. Real Trumpeter will thus feed in confinement; and they have been known to live over three months in the well-boats after capture.

There are two well-marked varieties of Real Trumpeter brought to market in Hobart. The one, the Deep Coral-reef variety, large, and usually full of roe or milt, frequently

* Mr. Barrett has since assured me that two specimens were caught near Waterhouse Island in the neighbourhood of deep water.

attains a weight of from 15 to 20 lbs. Specimens have been captured weighing over 60 lbs. The other, termed Pair or School-fish, is smaller, with a darker hue along the back, with yellowish tinge over the lighter parts, especially on throat and belly. The latter is usually found on a rocky bottom, in shallower water, near shore,* and in this state is never found with mature genital organs, and rarely exceeds 6 to 7 lbs. weight. Unlike the immature Bastard, however, the School-fish or Black Trumpeter, which is most probably the immature form of the Deep Coral-reef Trumpeter, is held in most esteem as an article of food, and commands a higher price in the market. The fishermen are of opinion that the two forms represent distinct species; but, as the general characters are identical,—viz., D. 17 : 1·36 - 38. A. 3·28 - 30. P. 9·8 - 9. L. lat. 110,—and as the smaller form caught in shallower water is never found with the genital organs mature, it is most probable that the latter is the immature form of the larger. It is likely, just as in the well-marked type of Red Bastard Trumpeter *(Latris Forsteri)*, that they seek the deeper coral reefs as they approach maturity. No other conclusion seems possible, taking all the facts into consideration.

The Bastard Trumpeter *(Latris Forsteri)*, D. 16 : 1·37-42. A. 3·33 - 36. P. 9 - 10·8 - 9. L. lat. 115 - 120. Scarcely inferior to the Real Trumpeter, and superior to it in abundance all the year round, comes the Bastard Trumpeter, especially the well-conditioned mature variety known as the White or Silver Bastard. The latter, or mature form, however, is only taken during January, February, and March. This fish has hitherto been confounded with *Latris ciliaris*, (Forst.); but, although the latter species has been reported as existing in Tasmanian waters, it is most probably a mistake: for the two varieties, (the red and white), found in such abundance here, have the general characters as shown above; and although some of them vary within certain limits, there is little doubt but that they must be referred to the *Latris Forsteri* of Count Castelnau, which appears to be the Bastard Trumpeter of Victorian waters. It is true that Castelnau's *L. Forsteri* is described as having only two spines in the anal fin; but most probably this is simply a mistake, and that the Victorian *L. Forsteri* has three spines like all the other representatives of the genus.

The following diagnoses of certain external characters taken indiscriminately from a dozen specimens, will give to

* They have been known to ascend the estuary of the Derwent as far as Hobart.

ichthyologists a notion of the variability of some of them; and when we consider to what extent age and local surroundings modify shape, colour, &c., it may be conceded that it would be hazardous to fix the limits of a species of this genus from an odd or immature individual:—

Latris hecateia, (Rich.) The Real Trumpeter.

	D.	A.	P. br. s.	V.	L. lat.
(1)	17 : 1·37	3·29	17 = 9 8	1·5	110
(2)	17 : 1·38	3·30	18 = 9 9	1·5	110
(3)	17 : 1·36	3·28	17 = 9 8	1·5	110

Latris Forsteri, (Cast.) Bastard Trumpeter.

Red variety.

(4)	16 : 1·40	3·36	18 = 9 9	1·5	115-120
(5)	16 : 1·40	3·35	17 = 9 8	1·5	115-120
(6)	16 : 1·37	3·33	18 =10 8	1·5	115-120
(7)	16 : 1·42	3·34	19 =10 9	1·5	115-120
(8)	16 : 1·41	3·38	18 = 9 9	1·5	115-120

White or Silver variety.

(9)	16 : 1·38	3·34	19 =10 9	1·5	115-120
(10)	16 : 1·40	3·36	18 = 9 9	1·5	115-120
(11)	16 : 1·39	3·34	18 = 9 9	1·5	115-120
(12)	16 : 1·41	3·33	18 =10 8	1·5	115-120

There are to be found individuals which link the two latter varieties imperceptibly together. In exact shade of colour, and number of soft fin rays, scarcely two individuals agree; and hence I am of opinion that the *Latris bilineata* and *L. inornata* of Count Castelnau are merely immature forms of the one variable species common to the waters of Victoria and Tasmania. The first spine of the anal in young specimens may be easily overlooked, and frequently I have observed that in extracting the fish from the meshes of the graball the same spine readily gets broken off. This may account for the anal spines being recorded as 2, instead of 3, in the odd individuals erected into specific rank by Count Castelnau.

The Bastard Trumpeter attains a length of about 21 inches, and rarely exceeds 6 to 7 lbs. weight. It is most prized for food in the Silver Bastard, or mature well-conditioned form. It differs from the Real Trumpeter chiefly in the absence of vomerine teeth, and of the longitudinal bars of light colour along the sides. It has a more broadly oval shape, a shorter and thicker head, and a more fleshy and obtuse snout.

It has, moreover, invariably one spine less in the anterior dorsal; is most abundant on the shallow banks of estuaries, 3 to 6 fathoms deep; enters brackish water more freely; and, unlike the deep coral-reef variety of the real trumpeter, it is generally captured in nets, and rarely takes a bait of any kind. For these reasons it is perhaps scarcely desirable that this abundant species should be included within the same genus as the Real Trumpeter *(i.e., Latris)*. Fishermen generally regard the red and silver varieties of the Bastard Trumpeter as distinct species. The reasons given by them are various, but they generally concur in stating that the red is generally a somewhat smaller and leaner fish; it is almost invariably found on a weedy bottom near shore, and in the upper shallow banks of estuaries, all the year round: while the silver, or white form, is larger, better flavoured, better conditioned, and, for the most part, is generally taken in deeper water in the neighbourhood of reefs towards the mouths of estuaries, during three months of the year only. It is significant, however, that they (the fishermen) generally concur in the statement that the red are always lean, and the silver are as invariably fat. The Red Bastard is rarely caught with maturely developed genital organs,—indeed, the fishermen are mostly all of opinion that they are entirely absent in white and red; but this is a mistake, founded probably upon the circumstance that a large white fatty mass invariably covers and nearly conceals the genital organs of the Silver Bastard, while the undeveloped condition in the red is sufficient to justify the erroneous opinion in respect of its supposed sterility.

With regard to the exact spawning season and the spawning-grounds of the Real and Bastard Trumpeter, little is known. We may recapitulate what has been learned, however, with respect to the former:—They are only found with the genital organs in a mature state in the outer coral reefs, 10 to 70 fathoms deep; the School-fish, which are in all probability the half-grown, or immature, are however found in shallower rocky bottoms nearer land, although an odd one of the latter may be caught at times among the mature forms in deep water. It is probable, therefore, that the mature fish spawn on the reefs in deep water; that the young fry afterwards approach the shallower rocky bottom nearer shore, where they grow up into the stage known as "School-fish." As these approach maturity they return to the deep coral reefs from whence they originally migrated.

The movements of the Bastard Trumpeter are probably very similar to those of the Real Trumpeter. Only the Silver form, found on what may be termed the reefs of the

middle fishing-grounds, appear to be found with mature genital organs; and although it has been shown that the "Paper-fish," or fry, and the Red Bastard, which are most probably the immature state of the Silver form, are found in large numbers in the upper shallow banks of the estuaries, yet it is rarely the case that a mature Silver Bastard is caught in such situations. As the Red Bastard is seldom found mature in these shallows, it follows that the parents must spawn towards the middle-ground reefs, *i.e.*, 5 to 6 fathoms water; that, like the Real Trumpeter, the young fry afterwards approach the upper shallow weedy banks, remaining there until the half-grown poor condition of the Red Bastard, when they again return to the parent ground on the reefs of the middle grounds—6 to 7 fathoms deep—where they speedily, from changes in the nature of the food, or from the altered conditions of the bottom as affecting the light transmitted to them, they assume the rounded proportions and the more silvery appearance of their parents. It is also significant as bearing upon the unity of the two varieties, that the colour of the Red form varies to a remarkable extent: sometimes it is uniformly dark rusty brown on snout, head, and along the back and shoulders, lighter and becoming quite silvery under the lateral line; at other times the color is a much brighter red. There are fine longitudinal streaks of light yellow along the junction of each row of scales; they are deeper on the side near lateral line, becoming obsolete towards belly. These streaks are, however, extremely variable; sometimes they are bilinear, with uncolored spaces of equal breadth between each streak. In the latter case there are generally two well marked olive-colored streaks above, and the same number immediately below the lateral line. Frequently, in both cheeks and opercles, plumbous, with a tinge of pink; cavities of protractile jaws green and blue; throat and tongue very deep blue, almost black. The young are always colored, more or less, like the Red, and are known by some as "Paper-fish." The mature form of the Silver Bastard is alone caught. This is conclusive as favouring the opinion that the Silver is simply the mature form of the Red,—the latter seeking the deeper water and gradually changing condition and colour as they grow older. We have still to account for the total disappearance of the Silver, or mature form, during the 9 months of the year from the reefs where they are usually caught by nets. It would appear from the evidence of intelligent fishermen, that they migrate to the outer deep-water reefs, 30 to 70 fathoms deep, where an odd one is now and again caught by hook and line while fishing for the bait-taking Real Trumpeter. It must be borne in mind that the Silver or Red Bastard rarely take bait, and hence

the odd ones caught on these deep grounds when they have disappeared from the breeding-ground of this species (6 to 7 fathoms) are no index whatever of their numbers in deep water.

It has been stated that, by the improper use of seine-nets, immense quantities of the Paper-fish and other young fry are every season ruthlessly destroyed upon the sandy beaches, and that the valuable mature Silver Bastard and other important market fish are becoming scarcer every year. It is reasonable to suppose, therefore, that the wanton destruction complained of in the upper waters of estuaries may have more to do with the increasing scarcity of the Silver Bastard in the outer reefs than the cause usually advanced by the fishermen themselves, *i.e.*, over-fishing.

If it be satisfactorily proved that the Paper-fish thus referred to are really the fry of the Silver Bastard (and there is little doubt of this), it is imperative, in the interests of our fishermen and our permanent fisheries, that some means should be devised for the better protection of the nursery grounds of these important fishes in the upper waters of estuaries.* The deep-water fishes, like the Real Trumpeter, whose young do not seem to ascend as a rule into the upper waters of estuaries, have only their natural enemies to fear, as they are beyond the reach of the destructive seine-net when drawn up upon the sandy beaches. The young of other fish, such as the Perch (*Chilodactylus macropterus*), the Horse Mackerel (*Trachurus trachurus*), the Mullet (*Agonostoma Forsteri*), the Garfish (*Hemirhamphus intermedius*), the Flounder (*Rhombsolea monopus*), and, indeed, the introduced migratory Salmonoids, are also known to be destroyed in a similar manner.

The Black and Silver Perch, (*Chilodactylus macropterus* and *Chilodactylus asperus.*)

The Black and Silver Perch are the next in importance to the Trumpeter group as regards quality and supply. The form known as the Black Perch is particularly an excellent fish,—some preferring it to the Real Trumpeter. The young are to be caught on the numerous rocky banks, in three to four fathoms water, in the upper bays of the

* A law which would regulate the mesh and the mode of using nets in such places might be devised. The working of such a measure might be committed to the existing Salmon and Fisheries Commissions, whose functions might be extended accordingly.

estuaries, especially in those of the Derwent. They are in this state found in more or less abundance all the year round, and are highly esteemed for the breakfast table. In the various bays in the immediate vicinity of Hobart the young Silver Perch, 7 to 8 inches long, afford ample sport to amateur fishermen. The fish take bait readily,—the mussel, boiled, being a favourite; and, during the months of March, April, and May, it is not uncommon for a party of two or three persons to catch from ten to twenty dozen in a couple of hours. The young specimens are invariably of a bright silvery appearance, with a conspicuous dark-coloured transverse bar across the shoulder and posterior lobe of operculum, and terminating towards root of pectorals. This bar becomes obsolete, or is not so conspicuous, in the mature form; and this may partly account for some of the confusion which still exists in the classification of this most variable species. The pectoral fin has one of its simple rays prolonged far beyond the rest; and this simple character readily distinguishes it from nearly all the rest of the family.

The Black Perch *(C. asperus)* is most probably a mere variety of *C. macropterus*. The former is found invariably upon a rocky bottom, and the latter upon a sandy bottom; and the colour is, undoubtedly, the result of the difference in local environment. The young are all silvery.

This species is most variable within certain limits. No two individuals are alike in all the following characters; viz.—dorsal, spinous, and branched rays, anal soft rays, length of longest simple pectoral ray, length of ventral fin, shade of colour. The Black Perch is only distinguished from the Silver by its condition and quality; in all other respects its general character varies within the same limits. Out of twelve specimens, Black and Silver, taken haphazard, the general characters of both forms varied in each individual within the following limits:—

D. 17-18 : 25-28. A. 3 : 12-14. P. 15 (9+6).
V. 1·5. L. lat. 55+4. L. tr. 6 : 13-14.

In some the ventral fin did not reach to the vent; in others it reached as far as the vent; while in one or two individuals it extended beyond the vent. The longest simple ray extends to varying distances between the first and sixth soft rays of anal. Generally the Black Perch is found in deeper water, and attains a greater size. They were in former times found in great abundance in Adventure Bay. They do not carry them in the wells as a rule, however, as they prick each other with their strong dorsal spines, and

so kill and disfigure themselves. This renders it more difficult for fish of this class to be brought to market. Fishermen have to cure them partially when they are hindered in any way from reaching market. Although some are caught in nets with the Bastard Trumpeter, they are usually caught by hook and line. The remarks applying to the destruction of the Bastard apply equally to the Perch. It is most probable that the mature fish spawn in five to six fathoms water; that, like the Trumpeter family, the young immediately after seek the upper shallow banks of estuaries, remaining there until they are half-grown, when they again gradually return to the parent ground, towards the mouths of estuaries.

The Carp. (*Chilodactylus spectabilis*, Hutton: *C. Allporti*, Günth.)

Although the Carp of the fishermen is common in the market, it is not to be depended upon, for the few that are caught are only found at odd times in the graball while fishing at the mouths of estuaries for the Bastard Trumpeter. There is a ready market for all that are taken, however, for, although somewhat coarse-looking fish, they appear to be highly esteemed. They are, moreover, strong fish, and will live a considerable time in the well. They are seldom taken by hook and line. Little is known of their habits. The fish is of a reddish colour, with about six darker transverse bars across the sides. It was formerly known as *Chilodactylus Allporti*; but Dr. Günther has recently referred our local form to the *C. spectabilis* (Hutton), found also in New Zealand. If the description given by Prof. Hutton be correct as regards the prevailing form in New Zealand, it may be doubtful whether the suppression of *C. Allporti* was advisable, as the description of the latter is different in important characters. The Tasmanian form invariably agrees with Dr. Günther's description:—

	C. spectabilis.	*C. Allporti.*
Height of body in total length—times	more than 3 times	$2\frac{1}{2}$-$2\frac{3}{4}$
Longest ray of simple pectorals	1st	2nd
Head contained in total lengths	$4\frac{1}{4}$ times	4 times
Dorsal { anterior spinous	blackish	light red
Dorsal { posterior soft..	ditto	blackish

If the differences as shown are constantly maintained in the New Zealand form, it may be advisable to retain the specific name *C. Allporti* for the Tasmanian species. Like

the Carp, the Magpie Perch *(C. gibbosus)*, and the Real Bastard Trumpeter *(Mendosoma Allporti)*, are only taken in limited numbers during certain seasons, upon the Perch and Trumpeter ground. They are both good table fish, however; and it may yet be an important matter to study their habits and movements more closely. It is known that the Real Bastard runs in schools; and large numbers have at times been caught at the Schoutens and at Bicheno. Mr. Barnett, who has great experience as a fisherman in Tasmanian waters, states that they are only good for food when full of roe. I was somewhat astonished, two or three years ago, to find that this fish, which is not altogether an uncommon one in our market, should have escaped the notice of former classifiers. It was described by the writer in the Proceedings of the Royal Society of Tasmania, 1880, pp. 54-56. The following are its general characters :—

B. 6. D. 23 : 1·25. A. 3·18. V. 1·5. L. lat. 76.
L. tr. 5 : 16.

The larger scales, greater number of dorsal spines, and the small pointed head with protractile jaws, readily distinguishes it from the members of the Trumpeter group proper.

Triglidæ.

This is also a somewhat important family of fishes in Tasmanian waters,—consisting of eight genera and eleven species. It includes the fish locally known as the Rock Gurnets, the Flatheads, and the Butterfly, Kumu, and Flying Gurnards. The Rock Gurnet *(Sebastes percoides)*, found more abundantly in the northern coasts, is held in great esteem for the table, and is obtained in the vicinity of George Town in considerable numbers. The various individuals are brilliantly coloured red and orange; and, like all its family, are well armed with dangerous head bucklers and sharp spines. The Common Flathead *(Platycephalus bassensis*, Cuv. and Val.), is, however, the most important member of the family on our coasts. The Flatheads are rather repulsive-looking fishes, with reptile-looking flattened heads and bodies; and their sharp gill-cover spines make it awkward for the inexperienced hand when they are captured by hook. They are termed "bottom fish,"—their flattened under surface being well adapted for following close the surface of the ground, like the common Flounder. They may be considered the scavengers of our shallow waters, for they are found everywhere around our coasts, in estuaries and around wharves, all the year round. When no other fish can be obtained the Flathead may always be depended upon. They are good edible fish, and would be

much more highly prized for the table were it not that they are repulsive-looking and are so common.

As regards appearance, the following three members of the family present a wonderful contrast to the last; viz.—

The Butterfly Gurnard *(Lepidotrigla vanessa)*, Rich.
The Flying Gurnard *(Trigla polyommata)*, Rich.
The Kumu Gurnard *(Trigla Kumu)*, Less. & Gaim.

At times during the winter season these most beautifully coloured fishes, with their gaudily painted pectoral wings, may be seen around our wharves in small schools, dashing, or rather flying through the water, with sudden bounds after their prey. The pectoral fin is a most beautiful object, measuring, expanded, in some individuals of the Flying Gurnard, six inches long by six broad. The under surface is most brilliantly coloured blue, orange, and red, with pure white and blue margins. There are two large conspicuous black patches near the base, which, bordered with deep blue and white, form a most beautiful object in this fish, with its body-scales of burnished golden-yellow and silver. They are rarely captured, however, on our coasts, and are therefore unimportant here from a commercial point of view. It would appear that they are caught more frequently off the coasts of New Zealand. Latterly, the family *Triglidæ* has been divided into two,—the Gurnet group, under the name *Scorpænidæ;* and the Flathead and Flying Gurnard group, under the name *Cottidæ.*

Trachinidæ.

This family is represented in Tasmanian waters by five genera and six species. They include amongst them the Cat Fishes, the Freshwater Flathead or Sandy, and the much prized Whiting. Indeed, for commercial purposes, the latter is the only member of the group which need engage our attention. The Tasmanian Whiting *(Sillago ciliata*, Cuv. and Val.,) is a most valuable market fish. It fetches a higher price in the market, for its size, than any other fish. These fish are usually taken in seine-nets, during the months of November, December, and January, in the Derwent and along the East Coast. They also may be taken with hook and line; and a dozen or so are frequently captured in this way at odd times in the upper waters about Sandy Bay as late as July. They go in schools; but they are stated to have greatly fallen off in numbers during the last year or two. The reason for this decrease has not yet been satisfactorily determined. They are a delicious little

fish, averaging a quarter of a pound in weight, silvery, with elongate snout and body. The sides are faintly marked with yellowish bars, which become obsolete towards belly.

Sciænidæ.

There is undoubtedly one member of this family in Tasmanian waters, although it is rarely seen in the market. It is termed the "Kingfish" in Victoria, although it must not be confounded with *Thyrsites Solandri* (Cuv. & Val.), our "Tasmanian Kingfish." The fish belonging to this family is thought by Dr. Günther to be the "Maigre" of European waters—*Sciæna aquilla*. Other naturalists, however, have considered the Australian species to be distinct from the European one, and the late Count Castelnau has given it the name of *S. antartica*. It is just possible that there may be two species, but this is extremely doubtful. Dr. Günther states the members of this family prefer the neighbourhood of the mouths of large rivers, into which they freely enter, and he also attributes their scarcity in Australia to the fewness of large rivers which enter the ocean.

Trichiuridæ.

This is not a large family of fishes in Tasmanian waters, but the individuals of one genus at least are so abundant, and all the members are so valuable as food, that it may be even reckoned on equality with the Trumpeter group in importance as affecting the market supply. The family comprises the following species; viz.—

1. *Lepidopus caudatus* .... The Frost Fish.
2. *Thyrsites atun* ..... The Barracouta.
3. *Thyrsites Solandri*..... The Tasmanian Kingfish.

The first of these, "The Frost Fish," is common from the south of England to the south of New Zealand. A specimen was recently taken in the Derwent which measured 5 feet 6 inches long; greatest depth of body behind shoulder, 6 inches; least depth at tail peduncle, three-fourths of an inch; thickness, not much more than an inch. It is captured at odd times during the winter season, and has been known to enter the Derwent as far as Sandy Bay. It is esteemed as the most delicious of all the edible Fishes in New Zealand, where it appears to be caught more frequently.

The next species, "The Barracouta," is caught all round the coast, especially at the mouth of the Derwent, in the greatest abundance, during ten months of the year, (November to October). These fish prey upon the shoals of

young or small fry which swim near the surface—principally sprats, anchovies, &c.; although they are so swift and rapacious that even the English "Sea Trout" and other large fish fall a ready prey to them. In the absence of the still more terrible Kingfish (*T. Solandri*), they reign supreme amongst the scale fishes; their strong jaws, armed with terrible looking teeth, rendering them a most formidable enemy. The fishermen usually take the Barracouta by a rude instrument, first used it is believed by the Maories, and termed a "jig." The jig is simply a long stick, from the extremity of which a wire or cord is suspended, armed with a double hook attached to a small block of wood. Upon these hooks a bit of colored cloth, or the skin of a shark, may be attached. When the fish are about they may be jigged aboard with wonderful rapidity while the vessels are sailing at any speed. Great quantities are thus caught and brought to market, where they are much esteemed, and, for a limited quantity, command a ready sale. The local market, however, is so limited, that it is easily overstocked; and, although a large quantity is exported, there is not sufficient demand to encourage the fishermen to extend the supply.

There appears to be no systematic curing establishments, where large quantities might be profitably disposed of. Dr. Hector states that dried Barracouta are imported into the Mauritius and Batavia as a regular article of commerce, being worth £17 per ton. This being the case, I am surprised that a trade in this fish, which can be got in the neighbourhood of Hobart almost in unlimited quantities, is not more systematically and extensively carried out. The fish usually measures about three feet long, and averages 8 lbs. in weight. Fishermen say that it would pay them if 3*s.* a dozen could always be got for them, *i.e.*, under ½*d.* per lb. Surely with such a fine fish as this better results might be obtained. It is a reproach to our local enterprise when fishermen complain that "at times there are so many caught that no price can be got for them."

These remarks equally apply to the next important member of this genus, the Tasmanian Kingfish (*T. Solandri*). This species appears upon our Southern coasts, at times in immense numbers, the height of the season being May and June. Three fishermen have frequently been known to capture over 40 dozen of these fish in a single night, each fish averaging 12 to 14 lbs. in weight. The principal fishing grounds for this important fish are Recherche, Wedge Island, and Adventure Bay. The individual fishes resemble the Barracouta, but may be easily recognised by their

greater thickness, the much larger eyes, and the fewer detached finlets on the tail (two),—the Barracouta having usually six behind the dorsal and anal. They do not approach the surface during the day time. They are always captured during the night, at varying depths from the surface to ten fathoms deep—the bait usually being horse-mackerel or barracouta.

The jaws of the Kingfish are also very formidably armed with strong, long teeth, and they are so voracious that the fishermen are obliged to use strong barbless hooks which are immediately attached to an iron chain and swivel. Even this strong line has been at times insufficient for these powerful fish: recently a large individual was captured, which, when its stomach was opened, disclosed a chain, swivel, and hook, which it must have swallowed some time previous to capture. At the time when it was taken it appeared to be a strong, healthy fish. The Kingfishes do not appear during each season in equal numbers. A few years ago they were to be found entering the bays and inlets towards the mouth of the Derwent in such vast numbers that they were stranded by tons on the long shallow sandy beaches. At such times immense numbers were taken and sold for manure to hop-planters and others. Recently they have not appeared in such numbers, but no satisfactory reason can as yet be assigned for the irregularity of their appearance in this respect. Some reason has been advanced to show that they follow the main body of the Horse-mackerel, which approaches our shores from the south-west, going in a northerly direction. When these shoals of Horse-mackerel are in greatest abundance they are followed by the Kingfish and other enemies in corresponding numbers. Their migratory movements, when better understood, may explain the irregularities which are for the present inexplicable. The Kingfish, although it averages from 12 to 14 lbs. weight, sometimes reaches a weight of 20 lbs. The usual price in the market is 5*s.* per dozen. When abundant they are largely exported.

Professor M'Coy has described another species, termed by him also "The Tasmanian Kingfish" (*T. micropus.*) It must be extremely rare, however, for I have never seen a specimen, and so far as our local fishermen observe, they are not aware of a second species of Kingfish.

Scombridæ.

The family has been divided by some authors into two, under the names *Nomeidæ* and *Cyttidæ*. It includes the following fishes:—

1. The English Mackerel ..	*Scomber Australasicus*, Cuv. & Val.
2. The Tunny.....	*Thynnus thynnus*, L.
3. The Pilot Fish	*Naucrates ductor*, L.
4. The Sucking Fish	*Echeneis remora*, L.
5. The John Dorey	*Zeus faber*, L.
6. The Bastard John Dorey	*Cyttus Australis*, Rich.
7. The Butterfly Fish	*Gasterochisma melampus*, Rich.

The English Mackerel is seen on the East Coast, occasionally in large numbers, each year, moving in a northerly direction. There are few regular fishermen on the East Coast, however, and little is locally known of the habits of these fishes. They have been known to enter the estuary of the Derwent in large numbers as far as Bridgewater, but, owing to the absence of proper means for capturing them, they rarely find their way to the market. This statement also applies to the Bastard John Dorey (*Cyttus Australis*), which is rarely captured, although during the month of May it has been known to enter the estuaries of the Derwent and Tamar in considerable numbers. I am satisfied that the local fishermen have not the proper appliances for the capture of this valuable fish. I suppose a trawl-net is best adapted for their capture, but these nets are not employed here.

The other members of the family enumerated above are only caught at odd times around the coast, and do not affect the market supply. I am doubtful, however, whether the *Zeus faber*, *i.e.*, the true John Dorey, is to be found in Tasmanian waters. It is recorded from Tasmania by Dr. Günther, but it must be exceedingly rare, for I have never seen a specimen.

Carangidæ.

This is a very important family of fishes in Tasmanian waters. It includes the following valuable food fishes:—

The Horse Mackerel.....	*Trachurus trachurus*, Cuv. and Val.
The White or Silver Trevally	*Caranx Georgianus*, Cuv. and Val.
Port Jackson Kingfish	*Seriola Lalandii*, Cuv. and Val.
Tasmanian Yellow-tail	*Seriola grandis*, Cast.
Snotgall Trevally	*Neptonemus brama*, Günth.
Mackerel Trevally.....	*Neptonemus dobula*, Günth.
Port Jackson Snotgall	*Neptonemus travale*, Cast.
Skipjack	*Temnodon saltator*, Bl.

The four most important as regards the market, are—The Horse Mackerel, the White or Silver Trevally, the Snotgall Trevally, and the Mackerel Trevally.

The first, the Horse Mackerel, occurs in these waters in vast numbers. The young are seen all round the bays of the upper waters of the Derwent during the autumn. The mature fish are in fair esteem in the market, but the fishermen are prevented from extending the 'catch' of these numerous fishes because of the limited demand. They are not exported. The young appear to form the chief prey of the Kingfish *(Thyrsites Solandri)*.

The Silver Trevally are very much prized for food, and are caught at times in considerable quantities in the Tamar and at South Arm during the autumn. Although it is said that they grow to a considerable size, the smaller ones are alone seen in local markets. They are caught by graball and seine, as a rule, but they take bait readily, and may be caught with hook and line. They are extremely pretty, silvery fish, with a barbed keel along each side towards the tail.

The Snotgall Trevally *(Neptonemus brama)*, although inferior in quality to the Silver and Mackerel Trevally, from its greater abundance and size is of much greater importance as regards the general market supply. The young enter the upper waters of the Derwent, and are caught by rod and line from the jetties and wharves about Hobart in considerable numbers during the months of March and April. The Snotgall is better flavoured when it is under one pound in weight. The larger individuals are coarser, and are found towards the mouths of estuaries, in deep water. They are frequently found from two to two feet six inches long, and at this size would average twelve to fourteen pounds in weight. They are taken with hook and line, without a sinker, and are thus caught sometimes in very large quantities. They are sold in the market at rates averaging from 8*s*. to 12*s*. per dozen for 12 lb. to 14 lb. fish, and are exported in considerable quantities to Victoria, where the larger fish appear to be in greater favour than in the local market.

The Mackerel Snotgall or Trevally *(Neptonemus dobula*, Günth.) seldom reaches a length of twelve inches, is more elongate for its size than the last species, and is esteemed a greater delicacy for the table. Unfortunately, although appearing in the estuary of the Derwent during March and April in considerable numbers in certain years, they are

not always to be depended upon. They mysteriously appear and disappear. This season they have been captured in considerable numbers, with the more common species, around the jetties and wharves ; but it is stated that it has been upwards of four years since they were last seen in the same estuary. Their migratory habits are not very well known. The other members of the family are seldom seen in Tasmanian waters, and are therefore unimportant.

Gobidæ, Pediculati, Blennidæ, Sphyrænidæ, Atherinidæ.

There are fourteen species in Tasmanian waters which belong to the above families, which include the Gobies, the Hand Fishes, the Blennies, the Silver-bellies, and the Tasmanian Jack or Pike. With the exception of the last named, which is rarely captured, they are all small fish ; and, although some of them are peculiarly interesting from a naturalist's point of view, they are of no value whatever in the fish market. They may therefore be ignored in this general sketch.

Mugilidæ. *The Gray Mullet Family.*

There are only two representatives of the Mullet Family known to exist in Tasmanian waters ; viz.—

The Sand Mullet..	*Mugil cephalotus*, Cuv. and Val.
The Sea Mullet ..	*Agonostoma Forsteri*, Bl.

The first of these is found principally towards the north-east of Tasmania (the Scamander and George's Bay), and is very highly prized in the market. It attains a much greater size than the following species ; but its distance from the chief towns is sufficient to account for its great scarcity in the market, where it always commands a good price.

The Sea Mullet is caught in the shallow bays of the upper waters of estuaries, particularly those of the Derwent and Tamar, in very large numbers. In the latter river the young ascend regularly as far as the Cataract Bridge, Launceston, every year, about the months of November and December, when they are caught in large numbers by amateur fishermen with the rod and line. It is supposed that they follow the ordinary shoals of prawns which are then found in myriads in the fresh water of the North Esk and in the Tamar. It is most probable that these young fish linger near the spawning beds in the lower salt-water flats until about the time of the appearance of the prawns, and then ascend into the upper fresh-water flats along with

them.* The supposed spawning grounds in the Derwent are situate above Hobart,—viz., Prince of Wales' Bay, Cornelian Bay, Lindisferne Bay, and the various sheltered mud-flats between these points and Bridgewater.

On a holiday hundreds of pleasure seekers may be seen between Bridgewater and Hobart with rod and line,—the chief attraction being Mullet-fishing. The favourite spots between these points on the Derwent appear to be Risdon, Flat Rock, Elwick Jetty, Berriedale, Triffitt's, Austin's Ferry, and Bridgewater. These points, too, are frequented by enthusiastic anglers all the year round. It is no uncommon occurrence for a single angler at these places to land four to six dozen fish, averaging ¾ lb. weight. Occasionally individuals are caught reaching 1¾ lbs. Prior to the closing of the River Derwent above Hobart for the protection of the introduced Salmonoids, the indiscriminate use of seine-nets almost destroyed the fish in these upper waters. From the evidence of old anglers it appears to be certain that, since the closing of the river, all fish have rapidly increased in numbers, size, and quality; the ruthless destruction of young fry on the nursery grounds has ceased; and it is affirmed with confidence that more fish are now caught with rod and line alone than could be got by sweeping the bays with the seine-net prior to its prohibition in this part of the river. It is also worthy of note that the class who principally fish in these upper waters are tradesmen, to whom the fish caught are a most welcome addition to the household fare. The fish measure, on the average, 8 to 12 inches long, has two dorsal fins, the first considerably in advance of the second, composed of four spines. Otherwise, the fish has a remarkable general resemblance to the Herring; and on this account it is frequently called by that name in New Zealand, where it also seems to be abundant. Dr. Günther states, in respect of other members of this family, that, if attention were paid to their cultivation, great profits could be made by fry being transferred into suitable backwaters on the shore, in which they rapidly grow to a remarkable size. Local advantage might be taken of this suggestion.

Centriscidæ, Gobiesocidæ.

The only fishes belonging to these families are—

* Dr. Günther states that their food consists of organic substances contained in mud or sand,—their organs of the pharynx being well adapted for filtering the mud or sand which they partially swallow.

The Bugler or Trumpeter.. *Centriscus scolopax*, L.
Another species, known as . *Crepidogaster Tasmaniensis*, Günth.

They are of no value for food, and are very scarce. The first named fish is also called "Bellows Fish," from its singular resemblance to that instrument. The snout is produced into a long tube.

Trachypteridæ. *The Ribbon Fish Family.*

Two representatives of this remarkable family of fishes exist in Tasmanian waters; viz.:—

The Ribbon Fish ..... *Regalecus gladius*, Cuv. and Val.
Spotted ditto .... *Trachypterus altivelis.*

A specimen of the first named, *R. gladius*, was captured on the shore near the Penguin about 3 years ago, which measured 14 feet long. It was afterwards exhibited in Launceston and Hobart as "The Sea Serpent"—its mane-like rays over the head, and its extraordinary length, giving common favour to this idea. The Spotted Ribbon Fish caught recently at Spring Bay, *T. altivelis*, is a smaller fish, but so extremely thin and transparent that it has been preserved by laying it flat upon a paper surface, after the manner of ordinary mounted seaweed. Dr. Günther states with respect to these singular fishes, that when they "reach the surface of the water the expansion of the gases within their body has so loosened all parts of their muscular and bony system that they can be lifted out of the water with difficulty only, and nearly always portions of the body and fins are broken and lost."

Gadidæ. *The Cod Family.*

This is a most important family of fishes as regards market supply; although it only comprises two species in these waters—

Bull-kelp Cod ..... *Lotella Swanii*, Johnston;
Rock Cod—Cape Cod .... *Pseudophycis barbatus*, Günth.;

the individuals of one of these, *P. barbatus*, "Rock-cod," exist in such wonderful abundance that they are captured during a portion of the year in quantities far exceeding the local demand. They are caught in moderate numbers all the year round, although their season for a variety known to fishermen as the Deep-water, or Cape-cod, is from May to September. It would appear that the latter is simply the mature form of the "Rock-cod," which enters the upper waters of estuaries in vast numbers during the

month of May. Certain shallow banks seem to be favourite localities, probably because their food—small squids and crustaceans—exist in such places in great abundance. There is one minute pretty colored pea-shaped crab which seems to be eagerly sought after by them, for during capture large numbers of these tiny crustaceans drop from their capacious mouths while unhooking them. Their numbers entering estuaries during different seasons vary to a remarkable degree. It is not easy to account for this, but it has been noticed that they are most abundant when the "brit" and other crustaceans appear in greatest numbers. It is quite conceivable, therefore, that the seasonal variation of temperature and meteorological conditions may determine to a great extent the development of the small crustaceæ, and through them regulate the natural increase of the Rock-cod and other fishes which so largely subsist upon them. The Rock-cod rarely exceeds 2½ lbs. weight, although its appearance would be apt to lead one to suppose that the ordinary mature individuals are at least double this weight. The prevailing colour is tawny brown on back, creamy or pinkish-white on belly. The dorsal has only two divisions, the anterior one composed of from 9 to 11 soft simple rays. The flesh is rather soft, but it is held in fair esteem as food. It will cure well. When smoked with cedar sawdust they are highly prized. It is stated by experienced fishermen that if greater care were taken in the modes of smoking and curing, our fish would be held in much greater esteem. As the Rock-cod may be caught during the season in quantities far exceeding local demand, it would be well if greater attention were paid to the preservation of this fish, and so secure a wider market.

Ophidiidæ. *Ling Family.*

There are two members of this family in Tasmanian waters; viz.:—

The Ling..... *Genypterus Australis*, Cast. *(blacodes?)*
Ditto ..... *Fierasfer Homei*, Rich.

The first of these is alone important as regards the market supply. These fish usually are captured on a weedy or rocky bottom, in from 3 to 8 fathoms water, with hook and line. The average weight is about 7 lbs., but individuals are known to reach a weight of 15 lbs. They are sometimes captured on the surface. It would appear that if in pursuit of prey they happen to breach on the surface, they rupture the air-bladder or sustain some other injury. They are held in fair esteem in the market, but are only

caught in numbers at odd times, and therefore cannot be much depended upon.

The second species, *Fierasfer Homei*, Rich., is rarely captured.

Pleuronectidæ. *Flat Fish Family.*

There are four members of this family stated to exist in Tasmanian waters, but only two are found abundantly. These are—

1. The Sole of fishermen . *Amnotretis rostratus*, Günth.
2. The Flounder ..... *Rhombsolea monopus*, Günth.

These fishes are generally taken in the shallows of estuaries and along the sandy coasts, by seine-nets. They are among the most highly prized fishes for the table, and are taken in considerable quantities all the year round. They are rarely caught with hook and line. There is a law in existence prohibiting the sale of Flounders under 9 inches, but it would appear from the evidence of various fishermen that the law is evaded to a very great extent. From the evidence of Mr. Barnett it would appear that the individuals brought to the Hobart market are much below the size formerly captured, and he attributes this to overfishing. It would seem to be impossible to regulate the mesh of the seine so as to allow the escape of the young fry of flounders and other important food fishes, and large numbers are destroyed either through wanton carelessness in not immediately returning undersized fish to the water, or because they are actually destroyed by the drawing of the seine-net.

As the use of the seine needlessly destroys young fish far out of proportion to the few captured, its use should be confined to particular localities. It is perhaps difficult to devise a better mode for the capture of certain fish now principally obtained by seine-nets, but it is undoubtedly a barbarous engine of destruction, and it would be of the greatest service if some improvement could be devised which would have the effect of rendering it less destructive to the young fry on the nursery grounds. In the meantime, where there are no naturally protected nursery grounds, such as exist among the snags of the Nelson shoals on the Tamar, the only alternative would be to close particular localities in estuaries so far as the use of the seine-net is concerned.

During former years the Flounder was much more abundant in the waters of the Tamar and Derwent; but,

until recently, when they appear again to be on the increase, their numbers fell off so much that it was hardly profitable to search for them. It was reasonable to assign this decrease to the indiscriminate use of the seine-net, and the partial closure of the two rivers may have something to do with their reappearance in great numbers. It must be granted, however, that other causes unknown may have also operated together with those assigned.

Scombresocidæ. *Garfish Family.*

There is only one species belonging to this family known to exist in Tasmanian waters ; viz.—

The Garfish ..... *Hemirhamphus intermedius*, Cast.

It is found in great abundance in the shallow waters in estuaries during the summer months, and is most highly esteemed in the market. It does not ascend within the influence of the fresh water so freely as the other migratory fishes, and its capture by seine-net is not affected by the closing of the upper waters of estuaries. There is a good demand for all the Garfish brought to market, and they usually fetch a price from 4*d.* to 9*d.* per dozen. The fish may be captured at any time between April and October. The mesh of the seine-net used in its capture usually measures a quarter of an inch from knot to knot.

Gonorhynchidæ.

There is only one member of this family known locally ; viz. :—

The Sand Eel ..... *Gonorhynchus Greyi*, Rich.

It is rarely captured, however, and is therefore of little interest from a commercial point of view.

Hoplegnathidæ.

There is only one representative of this family said to exist in our waters, viz., *Hoplegnathus Conwayii*, Rich. ; but it is rarely taken, and is of little importance.

Labridæ. *The Parrot Fish Family.*

There are nine representatives of the Parrot Fish family in Tasmanian waters, of which the following are the most common :—

1. Blue Groper ..... *Cossyphus Gouldii*, Rich.
2. Parrot Fish ..... *Labrichthys bothryocosmus*, Rich.
3. Purple Parrot Fish .. *Labrichthys fucicola*, Rich.
4. Banded Parrot Fish .. *Labrichthys laticlavius*, Rich.
5. The Ground Mullet or Kelp Fish..... *Odax balteatus*, Cuv. & Val.
6. The Stranger..... *Odax Richardsoni*, Günth.

The first and last of these seem to be the only members of the family that are held in any degree of favour as food. Fishermen however state that, although not in favour, they are all good for food. It is stated that the Blue Groper, though little appreciated, is exceedingly good. In the Report of the Royal Commission on Fisheries of New South Wales, it is recorded that the head of this fish makes the most delicious dish one can well conceive. The Blue Groper is uniformly dark purplish ; the upper profile of head bent downwards in a regular curve ; caudal fin truncated ; four anterior canine teeth in each of the jaws, sometimes reaching a length of from thirty-nine to forty-two inches. The Stranger is caught occasionally in the upper waters of the estuaries of the Derwent ; is in fair esteem for the market,—though, as its name implies, it is only obtained occasionally. It is of a curiously elongate shape, like the Pike, snout produced, body and fins marbled, and streaked with faint yellow. The other members of the family are noted for the beauty of their colours. They invariably feed upon shell-fish, their jaws being well armed for this purpose. The most of them have very thick lips and strong canine teeth. The colours in some of the species vary considerably; and it is possible that this feature may have led classifiers astray in some cases.

Clupeidæ. *The Herring Family.*

Of this important family of fishes there are only three species known to exist in Tasmanian waters ; viz.—

The Anchovy ..... *Engraulis encrasicholus*, var. *Antipodum*, L.
The Sprat ..... *Clupea sprattus*, L.
The Pilchard ..... *Clupea sagax*, Jenyns.

The two former exist in our waters in vast shoals, and form the prey of the Barracouta, Mackerel, and other fishes. They sometimes ascend into the upper waters of the estuaries of the Derwent and Tamar ; and occasionally they have been known to have stranded themselves in millions while pursued by their natural enemies. No attempt has

yet been made to make use of these fishes in Tasmania. No doubt attention will in time be drawn to this valuable source of wealth. At present there are no proper means among us for their capture; their migratory habits are little understood; and there are no establishments in our midst for preserving them. It is not creditable to local enterprise that this source of wealth should have remained so long without an attempt being made to utilise it.

It is unfortunate that our waters should not also contain the *Clupea harengus*, the Common Herring of European waters. The successful introduction of various species of *Salmonidæ* into our rivers from Great Britain gives hope that the Herring may also be introduced. There are great difficulties in the way, but they may in time yield before improved means of transit; and it is not impossible that we may yet see our southern waters the home of this, the most useful of all food fishes.

Muræniдæ. *The Eel Family.*

There are four representatives of this family in Tasmanian waters, but there are only two of them important as regards the market supply; viz.—

The Common Eel ..... *Anguilla Australis*, Rich.
The Conger Eel ..... *Conger vulgaris*, Cuv.

The first of these is referred to under the heading "Freshwater Fishes."

The Conger Eel is brought to market in considerable quantities, and is largely exported. They are caught all the year round, and are sold at a very low price. They vary greatly in size, and weigh from 7 to 50 lbs. They are chiefly taken by hook and line.

Pegasidæ, Syngnathidæ, Scleroderмi, Gymnodontes.

The fishes belonging to the above families number twenty-seven species in Tasmanian waters, and include the Pipe Fishes, Sea Dragon, Sea Horses, Leather Jackets, Globe Fishes, Porcupine Fish, Sun Fishes. With the exception of certain individuals of the Leather Jacket Family, there are none of them of any marketable value, and need not engage our attention. The Leather Jackets are singular fishes, with a single erectile, barbed or toothed, dorsal spine, a coarse granular skin, and having wonderfully strong jaws armed with sharp cutting teeth. Some of them are said to be very good for the table when skinned;

but they are not held in esteem in the market, and consequently they are seldom seen there.

Chondropterygii. *Sharks and Rays.*

The following is a list of this group, so far as known to exist in Tasmanian waters:—

Callorhynchus antarticus, Lacep.	The Elephant Fish.
Carcharias glaucus, L.	The Blue Shark.
Galeus canis, Rondel.	The Tope, or School Shark.
Zygæna malleus, Shaw	The Hammer-headed Shark.
Mustelus antarticus, Günth.	Smooth-head.
Lamna cornubica, Flem.	Porbeagle or Blue Shark.
Odontaspis Americanus, Mitch.	The Grey Nurse.
Alopecias vulpes, L.	Thrasher.
Notidanus indicus.	
Scyllium maculatum	Spotted Sea Snake.
Scyllium laticeps	The Sea Snake.
Parascyllium variolatum, Dum.	
Crossorhinus barbatus, L.	Wobbigong.
Heterodontus Phillipii, Lacep.	Port Jackson or Bull-head Shark.
Acanthias vulgaris, Risso.	Spotted Spiny Dog.
Acanthias Blainvillii, I.	Spiny Dog.
Rhina squatina, L.	The Angel Shark.
Pristiophorus cirratus, Latham	Saw-fish.
Pristiophorus nudipinnis, Günth	Saw-fish.

None of these fishes are used as food in Tasmania, although the Dog Fishes are very abundant. Certain of them *(Galeus canis)* are captured, and the livers boiled down for oil. The fins of this shark are also exported for the preparation of isinglass. It is affirmed by the fishermen that the use of deep-sea lines would be valueless here on account of the vast number of destructive Sharks.

Torpedinidæ.

There are four members of this group known in Tasmanian waters, which include the Electric Torpedo, the Thorn Back, and the Stingaree. They are not of any value, however, and may be ignored.

CLASSIFIED CATALOGUE

OF

THE FISHES OF TASMANIA.

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SUB-CLASSES AND ORDERS.

Sub-class I. Teleostei.

Fishes with a bony skeleton and completely separated vertebræ; the posterior extremity of the vertebral column either long or covered with bony plates. Bulb of the aorta simple, with two opposite valves at the origin; branchial free.

Order I. *Acanthopterygii.* (*Type*, Trumpeter.)

Some of the rays of the dorsal, anal, and ventral fins not articulated, forming spines; the inferior pharyngeal bones separated. Air-bladder, if present, without pneumatic duct. (Families 1 to 22.)

Order II. *Acanthopterygii Pharyngognathi.* (*Type*, Parrot Fish.)

The inferior pharyngeal bones are coalesced, with or without a medium longitudinal suture. Part of the rays of the dorsal, anal, and ventral fins not articulated, forming spines. (Family 23.)

Order III. *Anacanthini.* (*Type*, Flounder and Sole.)

Vertical and ventral fins (except in *Gadopsis*) without spinous rays. The ventral fins, if present, are jugular or thoracic. Air-bladder, if present, without pneumatic duct. (Families 24 to 28.)

Order IV. *Physostomi.* (*Type*, Salmon and Herring.)

All the fin rays articulated: only the first of the dorsal and pectoral fins is sometimes more or less ossified. The ventral fins, if present, are abdominal, without spine. Air-bladder, if present, with a pneumatic duct. (Families 29 to 38).

Order V. *Lophobranchii.* (*Type*, Sea-horse.)

The gills are not laminated, but composed of rounded lobes, attached to the branchial arches. Gill-cover reduced to a large simple plate. Air-bladder simple, without pneumatic duct. A dermal skeleton. (Families 39 and 40.)

Order VI. *Plectognathi.* (*Type*, Leather-jacket: Toad-fish.)

Teleosteous fishes, with rough scales, or with ossifications of the cutis in the form of scutes or spines; skin sometimes entirely naked. Skeleton incompletely ossified, with the vertebræ in small number. Gills pectinate; a narrow gill-opening in front of the pectoral fins. Mouth narrow; the bones of the upper jaw generally firmly united. A soft dorsal fin, belonging to the caudal portion of the vertical column, opposite to the anal: sometimes elements of a spinous dorsal besides. Ventral fins none, or reduced to spines. Air-bladder without pneumatic duct. Nearly all are marine fishes. (Families 41 and 42.)

Sub-class II. Chondropterygii. *(Sharks and Rays.)*

Skeleton cartilaginous; skull without sutures. Body with medial and paired fins, the hinder part abdominal; caudal fin with produced upper lobe. Gills attached to the skin by the outer margin, with several intervening gill-openings: rarely one gill-opening only. No gill-cover. No air-bladder. Three series of valves in the bulbus arteriosus. Intestine with a spiral valve. Optic nerves commissurally united, not decussating. Ovaries with few and large ova, which are impregnated, and, in some, developed internally. Embryo with deciduous external gills. Males with prehensile organs attached to the ventral fins.

Order 1. *Holocephala.* *(Type*, Elephant Fish.)

One external gill-opening only, covered by a fold of the skin, which encloses a rudimentary cartilaginous gill-cover; four branchial clefts within the gill-cavity. The maxillary and palatal apparatus coalescent with the skull. (Family 43.)

Order II. *Plagiostomata.* *(Type*, Hammer-shark: Tope: Dog-fish: Skate.

From five to seven gill-openings. Jaws distinct from skull. (Families 44 to 56.)

Sub-class III. Cyclostomata. *(Type,* Lamprey.)

Skeleton cartilaginous and notochordal, without ribs and without real jaws. Skull not separate from the vertebral column. No limbs. Gills in the form of fixed sacs, without branchial arches, six or seven in number on each side. One nasal aperture only. Heart without bulbus arteriosus. Mouth anterior surrounded by a circular or sub-circular lip: suctorial. Alimentary canal straight, simple, without cæcal appendages, pancreas, or spleen. Generative outlet peritoneal. Vertical fins rayed. (Family 57.)

Sub-class IV. Leptocardii. *(Type,* Lancelet.)

Skeleton membrano-cartilaginous and noto-chordal, ribless. No brain. Pulsating sinuses in place of heart. Blood colourless. Respiratory cavity confluent with the abdominal cavity: branchial clefts in great number, the water being expelled by an opening in front of the vent. Jaws none. (One Family only known, No. 58.)

EXPLANATION OF TERMS, &c.

Terms relating to the Head.

Snout.—The upper part of head situate in front of eyes.

Occiput.—The hinder part of the head or skull.

Gill-cover.—Consists of four broad flat bones joined together on each side of the head. The anterior with vertical free margin is called the *præ-operculum;* the upper posterior bone, the *operculum;* the lower posterior bone, the *sub-operculum;* and the bone forming the base, the *inter-operculum.*

Gill-opening.—The vertical opening or *slit* leading to respiratory organs,—the gills.

Branchiostegals.—The bony rays supporting the membrane or cover to the gill-opening.

Maxillary.—The second bone of upper jaw, often flat and inflated, and sometimes armed with teeth. The *inter-maxillary* or *præ-maxillary* is the anterior bone of upper jaw.

Mandibles.—The bones of lower jaw.

Vomer.—The thin bone over roof of mouth dividing nostrils, the base sometimes armed with teeth.

Palatines.—Bones situate on either side of vomer, the base sometimes armed with teeth.

Terms relating to the Body.

The body is composed of *head* and *trunk.* It is *compressed* and *elevated* when it is flattened laterally, as in the Bastard Dorey. It is *depressed* when flattened vertically, as in the Skate. It is *elongate* when shaped like the Salmon. The narrow extremity of tail is termed the *peduncle.*

The *Lateral line* is the median line along the sides of certain fishes formed by a series of pierced scales. The latter are sometimes interrupted, and may be in one or more rows longitudinally.

Terms relating to the Fins.

Usually there are two "paired" fins on fishes, corresponding to, or, as they are termed, the *homologues* of the fore and hind limbs of the higher *vertebrates.* The first pair *(pectoral),* when present are situate under the shoulder, close to gill-opening. The second pair *(ventral)* are variously placed,—under the chin they are *jugular*; under pectoral, or shoulder, *thoracic;* behind shoulder, *abdominal.* The following are unpaired:—The *dorsal* fin or fins are situate on the median line of the back; the *anal* on the median line between *vent* and *caudal* fin; the *caudal* is placed vertically on the extremity of vertebræ or tail. When the latter is deeply notched, it is *forked* or *furcate;* when margin is concave, *emarginate;* convex, *rounded;* straight, *truncate.*

Finlets.—Small detached rudimentary fins situate behind the dorsal and anal fins, as in the Barracouta.

Terms relating to the Fin Rays.

The fins are either rayless, when composed of a simple fatty integument or skin *(adipose),* or the membrane is supported by fine or stout rays, composed of bone or cartilage.

When the rays are solid and jointless they are termed *spines;* when they are jointed they are *articulate*, and are termed *soft rays.* The latter are either *branched* or *simple;* when the branch is divided at the base it is said to be Y-shaped, and is counted as one ray.

Terms relating to the Teeth.

Teeth are sometimes arranged in bands and patches, or in single or in many series, and may be found on mandibles, maxillaries, vomer, palatines, or tongue; or they may be *absent* in one or all of the situations named. They are *villiform* when very fine, or minute conical teeth arranged in a band; *setiform* shaped, like a bristle; *granular*, small molar teeth; *incisors*, front cutting teeth; *canines*, large projecting dog-like teeth; *pavement-like*, as in certain of the sharks.

Terms relating to the Scales.

Margins simple, *cycloid;* margins serrated or toothed, *ctenoid;* scales with hardened plates of bony enamel, *ganoid;* scales modified into spines, *scutes.*

Abbreviations.

* Edible fish. * * Principal edible fish forming market supply.

(A.) Common to Australia and Tasmania. (Z.) Inhabits New Zealand.

(A.Z.) Common to Australia, Tasmania, and New Zealand.

(T.) Peculiar to Tasmania. (E.) Found also in the waters of the Northern Hemisphere. (I.) Introduced.

B. Branchiostegals. D. Dorsal fin. A. Anal fin. V. Ventral fin. P. Pectoral fin. C. Caudal fin.

L. lat. refers to the series of scales along the lateral line.

L. tr. The series of scales transversely, counting usually from first spine of dorsal obliquely across side to vent. The · or : indicates the division and the number of scales on either side of lateral line.

\- The hyphen between figures, that the characters vary to the extent indicated by the figures.

: When this sign occurs between figures, thus—D. 17 : 34, it indicates that the *dorsal* fin has two divisions, 17 rays, usually spines, in the first division, and 34 rays, usually soft *branching rays*, in second division.

· When this sign occurs between figures, thus—A. 3·9, it indicates that, although not properly separated into two divisions, the first series of rays are *spinous*, and the series after the period are soft simple or *branched rays.*

I. II. III. IV. V. VI. When Roman figures are used, thus—D. 17 : 4·12 : VI., they indicate that there are *six finlets* behind the regular divisions of the dorsal fin, as in the Barracouta.

Cæc. pylor. refers to the pyloric appendages, which are short, skinny, cord-like, closed tubes attached to the stomach of some fishes. In the genus *Salmo* they exist in considerable number.

EXPLANATION OF KEY TO ORDERS AND FAMILIES.

THE Key is arranged according to the branched or binary system of the French Naturalist, Lamarc. This plan has been adopted, with great success, by the late Rev. W. W. Spicer, M.A., in his "Handbook of the Plants of Tasmania."

The method consists of a series of pairs of characteristic descriptions so arranged that the student, by commencing with the first pair, is led, by the acceptance always of one out of two propositions, to the next pair by the aid of numbers, which correspond with consecutive index numbers to the several pairs of the descriptive propositions. This course is pursued until the student is finally brought to the *Family* number, which, for distinction, is printed in Roman characters. By turning to the corresponding number in Classified Catalogue, the student may easily find the particular genus and species by means of the symbolic and abbreviated characters given after the name of each species under the family.

For example: if the fish under examination be the *Hobart Trumpeter*, the student would find, under Primary Division, that it agreed with the first proposition of No. 1, which leads to pair No. 4. The examination of No. 4 would lead to the acceptance of the *second* proposition, leading to pair No. 8. It, in turn, by following a similar course, would lead to the adoption of the following, in sequence; viz.—No. 10, the *first* leading to No. 11; No. 11, the *first* leading to No. 12; No. 12, the *second* leading to No. 15; No. 15, the *first* leading to No. 16; No. 16, the *first* leading to No. 17; No. 17, the *second* leading to No. 18; No. 18, the *first* leading to No. 19; No. 19, the *second* terminating in CIRRHITIDÆ—VI. If we now turn to that family in the Classified Catalogue, we would find that the number of spinous and soft rays in Dorsal, Anal, and Pectoral (viz.—D. 17 : 1·36 - 38. A. 3·28 - 30. P. 9·8 - 9.) would finally lead to the true name of species, viz., *Latris hecateia*, Rich.—The Trumpeter.

A little practice will enable any person of ordinary intelligence to determine any of the known Tasmanian fishes by this method.

KEY TO THE ORDERS AND FAMILIES.

PRIMARY DIVISIONS.

1. Fishes with a bony skeleton.
   Gills free, with one opening on each side; caudal symmetrical, or absent. TELEOSTEI. 4.
„ Fishes with a membranous or cartilaginous skeleton.
   Gills attached, with several openings. 2.

2. Skeleton cartilaginous. 3.
„ Skeleton membranous.
   Eye rudimentary; mouth a longitudinal fissure. LEPTOCARDII. 67.

3. Body eel-like; mouth circular, suctorial. CYCLOSTOMATA. 67.
„ Body shark-like; caudal unsymmetrical. CHONDROPTERYGII. 9.

NATURAL ORDERS.

4. All the fin rays soft, articulated.* 5.
„ Portion of the fin rays spinous, not articulated. 8.

5. Gill-openings more or less wide, one on each side; body scaly or smooth. 6.
„ Gill-openings reduced to narrow slits, usually situated in front of pectoral fins; body with osseous rings, or skin covered with scutes or spines; never scaly. 7.

6. Ventral fins, if present, jugular or thoracic. ANACANTHINI. 41. (*Type*, Flounder.)
„ Ventral fins, if present, abdominal. PHYSOSTOMI. 44. (*Types*, Salmon; Herring.)

7. Gill-cover reduced to a large simple plate; body composed of osseous rings. LOPHOBRANCHII. 52. (*Type*, Sea Horse.)
„ Gill-opening a narrow slit in front of pectorals; body with rough scutes or spines. PLECTOGNATHI. 52. (*Types*, Leather Jacket; Toad Fish.)

8. Inferior pharyngeal bones separated. ACANTHOPTERYGII. 10. (*Type*, Trumpeter.)
„ Inferior pharyngeal bones coalesced with or without a median longitudinal suture. ACANTHOPTERYGII-PHARYNGNOGNATHI. 53. (*Type*, Parrot Fish.)

9. External gill-opening, one covered by a fold of the skin, jaws coalescent with the skull. HOLOCEPHALA. 54. (*Type*, Elephant Fish.)
„ External gill-openings five to seven; jaws distinct from skull. PLAGIOSTOMATA. 55. (*Types*, Hammer Shark; Dog Fish; Skate.)

* In this group is included certain fishes, like the Salmon, whose first ray of dorsal and pectoral is sometimes more or less ossified.

FAMILIES.

10. No adhesive disc between the ventrals. 11.
„ An adhesive disc between ventrals. GOBIESOCIDÆ—XX.

11. Ventrals thoracic. 12.
„ Ventrals jugular or abdominal. 33.

12. Spinous dorsal *greater* than the soft. 13.
„ Spinous dorsal nearly *equal or less* than the soft. 15.

13. One dorsal fin, or if more, with divisions continuous. 14.
„ Dorsal fins, two, separate.

14. *Teeth feeble; scales none, or minute;* body compressed; eyes lateral; suborbital ring articulated with the P.O.; B. 5-7. TRIGLIDÆ, part (SCORPÆNIDÆ)—VII.
„ *Teeth several, long, and strong in jaws;* cleft of mouth wide; body elongate, compressed; naked, or with minute scales; D. and A. elongate, sometimes with finlets; C. distinct; V. sometimes rudimentary; B. 7-8. TRICHURIDÆ—X.

15. Spinous dorsal *nearly as long* as the soft. 16.
„ Spinous dorsal shorter than soft. 22.

16. One dorsal fin, or if more, with divisions continuous. 17.
„ Dorsal fins, *two*, separate; 16 A.; two long barbels under chin; body elongate, covered with large scales. (UPENEICHTHYS POROSUS.) MULLIDÆ—III.

17. Teeth trenchant in front of the jaws or lateral series of molar teeth. SPARIDÆ—IV.
„ Teeth not so constructed. 18.

18. Scales cycloid or rudimentary. 19.
„ Scales finely ciliated or ctenoid. 21.

19. Teeth small, in villiform bands on jaws; some on palate. 20.
„ Villiform teeth on jaws; none on palate; lower pectoral rays simple, and generally stout. CIRRHITIDÆ—VI.

20. Head and præoperculum armed; scales sometimes rudimentary. TRIGLIDÆ, part (SCORPÆNIDÆ)—VII.
„ Head normal; præoperculum often serrated. PERCIDÆ, part—II.

21. Anal rays 3·9; spines of fins very strong; at inferior limb directed forwards. PERCIDÆ, part—II.
„ Anal with about 27 soft rays; body compressed, elevated; jaws with an outer series of stronger teeth. The soft dorsal armed, anal falcate, the former covered with scales; uniform brownish. B. 7. D. 9·26. A. 3·27. (SCORPIS GEORGIANUS) SQUAMIPINNES—V.

22. One dorsal fin, or if more, with divisions continuous. 23.
„ Two dorsal fins, separate. 29.

23. A posterior canine tooth present. LABRIDÆ—XXIII.
„ Without canine teeth. 24.

24. Three free pectoral rays; head cuirassed. TRIGLIDÆ, part—VII.
„ Pectorals normal; head not cuirassed. 25.

25. No caudal fin. TRACHYPTERIDÆ—XXI.
„ Caudal fin present. 26.

26. Spines on each side of tail. CARANGIDÆ, part—XII.
„ Otherwise constructed. 27.

27. Ventrals with more than five soft rays; opercular bones armed with two distinct spines; scales ctenoid. B. 8 or 4. BERYCIDÆ—I.
„ Ventrals with five soft rays. 28.

28. Caudal rounded; body compressed and much elevated. B. 7 or 8. SCOMBRIDÆ, part—XI.
„ Caudal forked. V. 1 : 5. PERCIDÆ, part—II.

29. A papilla near vent; ventrals sometimes united. GOBIIDÆ —XIII.
„ Without papilla; ventrals not united. 30.

30. Scales ctenoid. 70.
„ Scales cycloid or absent; with or without finlets. 31.

31. Finlets absent.
a. Lateral line not armed with plates; A. fin with less than twenty soft rays. SPHYRÆNIDÆ—XVI.
b. Lateral line often armed with plates; two A. spines remote from soft portion; soft rays more than 20. CARANGIDÆ, part—XII.
„ Finlets present. 32.

32. Ventrals long; scales cycloid, moderate; body oblong, compressed; teeth small. SCOMBRIDÆ, part—XI.
„ Ventrals moderate; scales absent, or moderately small; teeth variable; V. sometimes rudimentary, or absent; body elongate, compressed. SCOMBRIDÆ, part—XI.

33. Ventrals jugular. 34.
„ Ventrals abdominal. 38.

34. Spinous dorsal greater than the soft; scale small, or naked; one, two, or three dorsal fins (small fish). BLENNIDÆ—XV.
„ Spinous dorsal less than the soft. 35.

35. One dorsal fin. 36.
„ Two dorsal fins. 37.

36. Ventrals of a single bifid ray; a small portion of the D. and A. formed into true spines. GADOPSIDÆ (GADOPSIS MARMORATUS)—XXIV.
„ Ventrals 1 : 5. Mouth vertical or oblique. TRACHINIDÆ, part—VIII.

37. Body frequently covered with minute spines; carpal bones prolonged, forming a sort of arm for pectorals; gill-opening reduced to a small foramen, situated in or near axil; tentacle sometimes plumose on snout. PEDICULATI —XIV.
„ Body smooth or scaly; teeth in villiform bands, sometimes with pointed and conical canines; gill-opening wide; eyes frequently directed upwards. TRACHINIDÆ, part —VIII.

38. Two dorsal fins. 39.

39. Mouth produced into a tube; body elevated; teeth, none; scales none, or small; body covered with a cuirass or with nonconfluent ossifications. (CENTRISCUS SCOLOPAX.) CENTRISCIDÆ—XIX.
„ Mouth not produced; body not elevated. 40.

40. Spines of the first D. more than four. 40*a*.
„ First D. with four stiff spines. MUGILIDÆ—XVIII.

40*a*. No barbels; spines of first dorsal feeble, flexible; teeth minute; a silvery band along the side. Minute fishes. ATHERINIDÆ—XVII.

41. Body symmetrical, with an eye on each side of the head. 42.
„ Body unsymmetrical; both eyes on the same side of the head, on the upper, which alone is coloured. PLEURONECTIDÆ—XXVIII. (*Type*, Flounder.)

42. Ventrals thoracic; tail tapering to a fine point; no caudal. MACRURIDÆ—XXVI. (*Type*, Ling.)
„ Ventrals jugular. 43.

43. One, two, or three dorsal fins, occupying nearly the whole of the back; one or two A. fins, with or without a barbel; caudal free, or, if united to D. and A., the dorsal has a separate anterior portion; V. with several rays. GADIDÆ—XXV. (*Type*, Rock Cod.)
„ One dorsal united to caudal; no separate anterior dorsal or anal. OPHIDIIDÆ—XXVI. (*Type*, Ling.)

44. Second dorsal composed of an adipose fin, without bony rays. 45.
„ No adipose fin present. 47.

45. Dorsal fin very elongate, occupying nearly entire length of back; opercular apparatus incomplete; oviduct present. SCOPELIDÆ—XXX.
„ Dorsal not elongate; opercular apparatus complete; no oviduct. 46.

46. First dorsal before the vent; margin of upper jaw nearly altogether formed by maxillary; body naked, or scaly; pyloric appendages, none; minute fishes. HAPLOCHITONIDÆ—XXIX. (*Type*, Freshwater Herring.)
„ First dorsal over the vent in minute species, before the vent in the larger introduced species; body covered with scales; margin of upper jaw formed by the intermaxillaries laterally; pyloric appendages generally numerous. SALMONIDÆ—XXXI. (*Types*, Salmon; Smelt.)

47. Body apparently scaleless. 48.
„ Body with scales. 49.

48. Dorsal short; belly rounded; vertical fins not continuous with caudal; in creeks, fresh or brackish. GALAXIDÆ—XXXII. (*Type*, Jollytail.)
„ Dorsal and anal long and continuous with caudal; body rounded or band-shaped; under lens the scales become apparent; no ventrals. MURÆNIDÆ—XXXVIII. (*Type*, Freshwater Eel.)

49. Mouth with barbels; scales spiny; mouth inferior; gill-opening narrow. GONORHYNCHIDÆ—XXXV.
„ Barbels, none. 50.

50. A series of keeled scales on each side of belly; mouth terminal; lower jaw produced; dorsal opposite to anal. SCOMBRESOCIDÆ—XXXIII. (*Type*, Garfish.)
„ Sides not armed with keeled scales. 51.

51. Abdomen frequently compressed into a serrated edge. CLUPEIDÆ—XXXVI. (*Types*, Anchovy; Sprat.)
„ Abdomen rounded. Freshwater fishes. CYPRINIDÆ—XXXIV. (*Types*, Carp; Tench; Gold Fish.)

52. Bony fishes, composed of plates or osseous rings; dorsal rays; teeth minute or absent. 68.
„ Fishes with rough scutes or spines; jaws armed with distinct teeth. 69.

53. Marine fishes, generally with brilliant colours; frequently armed with canine teeth. LABRIDÆ—XXIII. (*Type*, Parrot Fish.)

54. One external gill-opening only; produced snout, with soft pear-shaped appendage. CHIMERIDÆ—XLIII. (*Type*, Elephant Fish, *Callorhyncus antarticus*, Lacep.)
„ External gill-openings, 5 to 7. 55.

55. Eye with a nictitating membrane. Two dorsals and an anal. CARCHARIDÆ—XLIV.
Eye without a nictitating membrane. 56.

56. Anal fin present. 57.
„ No anal fin. 60.

57. Two dorsal fins. 58.
„ One dorsal fin opposite anal. NOTIDANIDÆ—XLVII.

58. First dorsal above or behind the ventrals. SCYLLIDÆ—XLVI. (*Type*, Dog-fish.)
„ First dorsal between pectorals and ventrals. 59.

59. Teeth acute. LAMNIDÆ—XLV.
„ Teeth obtuse. CESTRACIONIDÆ—XLVIII. (*Type*, Port Jackson Shark.)

60. Gill-openings lateral. (Sharks.) 61.
„ Gill-openings ventral. (Rays.) 63.

61. Snout much produced, with lateral saw-like teeth. PRISTIOPHORIDÆ—LI. (*Type*, Saw-fish.)
„ Snout normal. 62.

62. Dorsal fins, two, without spines. RHINIDÆ—L. (*Type*, Angel Shark.)
„ Dorsal fins each armed with a spine. SPINACIDÆ—XLIX. (*Type*, Spotted Dog-fish.)

63. Snout produced. 64.
„ Snout not produced; rounded; caudal well developed. TORPEDINIDÆ—LIII. (*Type*, Torpedo.)

64. Snout with a detached pair of cephalic fins; spine on the tail; sides of head free from pectoral fin. MYLIOBATIDÆ —LVI. (*Type*, Whip-tail Ray.)
„ Snout otherwise constructed. 65.

65. Pectorals not extending to snout; two dorsals on tail. RHINOBATIDÆ—LII.
„ Pectorals extending to, or confluent at, extremity of snout.

66. Spine on tail; tail without lateral longitudinal folds. TRYGONIDÆ—LV. (*Type*, Stingaree.)
„ Two dorsals on the tail; tail with a longitudinal fold on each side; no serrated caudal spine. RAJIDÆ—LIV. (*Type*, Skate.

67. Head without barbels; sometimes with pouch under throat; fresh-water. PETROMYZONTIDÆ—LVII. (*Type*, Lamprey.)
„ Cirri on each side of fissure-like mouth; marine. CIRRSOTOMI —LVIII. (*Type*, Lancelet.)

68. Ventral fins present. PEGASIDÆ—XXXIX.
„ No ventral fins. SYNGNATHIDÆ—XL.

69. The elements of a spinous dorsal and ventral fins generally present. SCLERODERMI—XLI.
„ No spinous dorsal. No ventrals. Pectoral fins. A soft dorsal, caudal, and anal fin. GYMNODONTES—XLII.

70. Præoperculum armed. TRIGLIDÆ, part—VII (COTTIDÆ.)
„ Præoperculum not armed. SCLÆNIDÆ—IX.

CLASSIFIED CATALOGUE

OF

TASMANIAN FISHES.

Sub-class I. Teleostei.

Fam. I. BERYCIDÆ.

1. Beryx affinis, G. (A.) *Nannegai* of Sydney Fishermen.
D. 7 : 12. A. 4 : 12 - 13. V. 1 : 7. L. lat. 41 - 43.
L. tr. 6 : 12.
Günth. Cat. I., p. 13. Allp. MS. Macleay's Cat., 317.
Rare.

2. Trachichthys Macleayi, Johnston. (T.)
D. 5 : 13. A. 3·10. V. 8. L. lat. 50. Ventral keel 13 scutes.
Proc. Roy. Soc. Tas., 1880.
Rare. Derwent. Colour, uniform bright golden yellow.

Fam. II. PERCIDÆ.

3. Perca fluviatilis, Rondel. (I.) *English River Perch.*
Common Reservoir, Stony Steps, Hobart; Lake Dulverton; Early Rises; Breadalbane.

4. Callanthias Allporti, Günth. (T.) *Allport's Perch.*
D. 11 : 10. A. 3 : 10. L. lat. 46.
Ann. and Mag. Nat. Hist., 1876, vol. XVII., p. 390.
Allp. MS. Macl., 14.
Rare. Species described from two specimens sent to Dr. Günther by Mr. Morton Allport.

5. Anthias Rasor, Richards. (A.) *Red Perch* or *Tasmanian Barber.*
D. 10 : 21. A. 3 : 9. L. lat. 54. L. tr. 4 : 18.
C. pylor. 6.
Günther's Cat., I., p. 93. Allp. MS. Macl. Cat., 16.
Common during the winter season, mouths of estuaries.
Scorpis Hectori, Hutton, appears to be very similar in most respects (even to ornament) to this species, which is in high esteem in the market during the season.

6. Microperca Tasmaniæ, nov. sp. *Native Freshwater Perch.*

D. 8 : 1·7 - 8. A. 3·8. V. 1·5. L. lat. 28 - 30. L. tr. 12. P. 13.

Body compressed. Length of head equal to depth of body at shoulder, and contained in total length four times. Præoperculum not serrated. Scales relatively large ctenoid. Eye large, nearly as broad as length of snout; the latter contained in head four times; dorsal deeply cleft; the first spine slightly pointing forward when erect; situated immediately over the posterior extremity of pectoral; the second and third spines longest. Anal commencing in a vertical line, scarcely in advance of the first spinous ray of second dorsal. The second dorsal and the anal soft rays gradually increase in width, the last two or three being of equal length, and nearly half the height of the body. Caudal peduncle somewhat elongate. Caudal truncate. Colour dark olive, with a pinkish streak along the sides from shoulder to tail. Base of dorsal, anal, and caudal pinkish, with blackish margins. Belly silvery, tinged with gold. Eye dark blue, with golden streak around eye-ball. Abundant in the rivers of the South and North Esk. The young are found in large numbers in the shallow lagoons having connection with the rivers during some portion of the year. Length, 3 inches to 3½ inches.

7. Lates colonorum, Günth. (A.) *Brackish-water Perch.*

D. 8 : 1·10. A. 3·8. L. lat. 55. L. tr. 8 : 21.

Macl. Cat., 2. George's Bay (Swan).

I have seen one specimen from Anson's Lagoon. This species is said to be abundant in the fresh and land-locked brackish waters of the North-east Coast, particularly Anson's River. (Swan.)

8. Apogon Guntheri, Cast. (A.)

D. 7 : 1·9. L. lat. 26. L. tr. 11 - 12.

Cast. Proc. Zool. Soc. Vic., I., p. 46. Allp. MS. (*Novæ Hollandiæ.*) Macl. Cat., 91.

Rare. Considered by Mr. Macleay that it may be identical with Val., *A. Novæ Hollandiæ.*

9. Arripis truttaceus, Cuv. and Val. (A.Z.) *The Native Salmon.**

D. 9 : 16 - 17. A. 3 : 10. L. lat. 48 - 52. L. tr. 6 : 12. Cæc. pylor. 50.

(*A. salar*, Rich.) Günth. Cat., I., p. 253. Allp. MS. Macl. Cat., 112.

Young entering estuaries in great numbers. Abundant all the year round. The young are spotted and barred. The markings disappear in mature individuals. (*A. salar.*)

10. Histiopterus recurvirostris, Rich. (A.) *Boar Fish.**

D. 9 : 15. A. 3·10 - 11. V. 1 : 5. P. 18. L. lat. 130.

Rich. Voy. *Erebus* and *Terror*, p. 34. Cast. Proc. Zool. Soc. Vic., I., p. 109. Allp. MS. Macl. Cat., 156.

Captured occasionally in the Derwent.

11. Erythrichthys nitidus, Rich. (A.Z.)
B. 7. D. 9 : 3 : 1·9 - 10. A. 5·10. L. lat. 96.
L. tr. 8 : 20.
Günth. Cat., I., p. 395. Allp. MS. Macl. Cat., 185.
Rare.

Fam. III. MULLIDÆ.

12. Upeneus porosus, Cuv. and Val. (A.Z.) *Red Mullet.*
D. 8 : 1·8. A. 7. L. lat. 30.
Günth. Cat., I., p. 400. Allp. MS. Macl. Cat., 227.
Rare. I have not seen any specimens.

Fam. IV. SPARIDÆ.

13. Girella tricuspidata, Cuv. and Val. (A.) *Black Bream.***
D. 15 : 11 - 13. A. 3·11 - 12. L. lat. 50 - 54.
L. tr. 10 - 11 : 20 - 23.
Günth. Cat., I., p. 428. Macl. Cat., p. 231.
Common Formby, Port Sorell, George's Bay, Southport. Does not ascend estuaries as far as *Chrysophrys Australis*, (Günth.)

14. Girella simplex, Rich. (A.) *The Sweep.***
D. 15 - 14 : 12 - 13. A. 3·11 - 12. L. lat 55.
L. tr. 11 - 12 : 20 - 23.
Günth. Cat., I., p. 429. Macl. Cat., 232.
Common Southport. Taken with *G. tricuspidata.*

15. Haplodactylus arctidens, Rich. (T.)
D. 16 : 1·18. A. 3·7. Cæc. pylor., 4. Vert. 16 : 18?
Günth. Cat., I., p. 335. Allp. MS. Macl. Cat., 240.
Port Arthur. Rare.

16. Chrysophrys Australis, Günth. *The Tasmanian Silver Bream.***
D. 11 : 10 - 11. A. 3·8. L. lat. 44 - 45. L. tr. 5 : 13.
Günth. Cat. I., p. 494. Allp. MS. Macl. Cat., 259.
Abundant during certain seasons at the mouths of rivers and streams. Scamander River, George's Bay, Brown's River, Jordan River.

17. Pagrus unicolor, Cuv. and Val. (A.Z.) *Schnapper.***
D. 12 : 10. A. 3·8. L. lat. 52. L. tr. 8 : 17.
Cæc. pylor. 5.
Günth. Cat., I., p. 468. Allp. MS. Macl. Cat., 255.
Abundant on Australian coasts. Not common. Its place seems to be occupied in Tasmanian waters by the Trumpeter (*Latris hecateia*, Rich.) (See Gen. Obs.)

Fam. V. SQUAMIPINNES.

18. Scorpis Georgianus, Cuv. and Val. (A.)
D. 9 : 26. A. 3 : 27.
Günth. Cat., II., p. 64. Allp. MS. Macl. Cat., 209.
Rare. Not seen.

Fam. VI. CIRRHITIDÆ.

19. CHIRONEMUS MARMORATUS, Günth. *Large Kelp-fish.**

D. 14 : 1·18. A. 3·6. L. lat. 55.

Günth. Cat., II., p. 76. Macl. Cat., 263.

Caught occasionally towards the mouth of the Derwent.

20. CHILODACTYLUS SPECTABILIS, Hutton.

D. 17 : 26. A. 3·9. L. lat. 55. L. tr. 5 : 16.

Hutton, Cat. New Zealand Fishes, p. 8. Allp. MS. Macl. Cat., 272.

Not seen. (See *C. Allporti*, Günth.)

21. CHILODACTYLUS ALLPORTI, Günth. *The Carp.*

D. 17 : 25 - 28. A. 3·9. P. 8·6. L. lat. 55 - 56.

Günth. Ann. Nat. Hist., 1872, vol. X., p. 184. Macl. Cat., *(C. spectabilis)*, 272.

Common around the coast. Abundant Wedge Bay, 5 to 6 fathoms. Caught in graballs. I have retained, for the present, this species, notwithstanding the fact that Dr. Günther has suppressed the name in favour of Hutton's *C. spectabilis*. The differences, which are constant, are, that in *C. Allporti* the fourth spine of dorsal is never as long as fifth and sixth ; the fifth, sixth, and seventh being nearly equal, and longest. In *C. spectabilis* the upper one of the six simple rays appears to be longest: in *C. Allporti* the second uppermost is invariably the longest. In the latter, too, the anterior dorsal at least is light reddish, not blackish, as in the description of the New Zealand form.

22. CHILODACTYLUS MACROPTERUS, Rich. *Black and Silver Perch.***

D. 17 - 18 : 25 - 28. A. 3·12 - 14. P. 9·6.

L. lat. 55+4 - 5. L. tr. 6 : 13 - 15.

(*C. asperus*, Rich.) Günth. Cat., II., p. 78-9. Allport MS. Macl. Cat., 267, 268.

Abundant all the year round. Mature individuals in the neighbourhood of reefs 5 to 6 fathoms. Young ascend to the shallow banks of estuaries. The Black Perch is most esteemed as food. A most variable species. (See GEN. OBS.)

23. CHILODACTYLUS NIGRIPES, Rich.

D. 18 : 26. A. 3·10. L. lat. 61. 5 simple pectoral rays.

Günth. Cat., II., p. 82. Allp. MS. Macl. Cat., 270.

Approaches the variable *C. macropterus* very closely. I have not seen any specimens. Doubtful.

24. CHILODACTYLUS GIBBOSUS, Rich. *The Magpie Perch.***

D. 17 : 26 - 33. A. 3·9 - 10. L. lat. 63. 6 simple rays.

Günth. Cat., II., p. 84. Macl. Cat., 271.

Not uncommon. Caught off Wedge Bay, in 5 to 6 fathoms water, in graball. In the Tasmanian specimens there are invariably 6 simple pectoral rays, the second uppermost

being longest, the third nearly reaching to it. The prominent feature however, not noted in the original description, is the two broad dark brownish transverse bands,—the first, from the fifth to the thirteenth dorsal spines, running obliquely backwards and terminating under the belly behind ventral; the second, from about the third to the eleventh soft dorsal spines, terminating towards the posterior rays of anal. It is doubtful whether the Tasmanian form can fairly be included within the *C. gibbosus*, Rich.

25. NEMADACTYLUS CONCINNUS, Rich.

D. 17 : 28. A. 3·15. L. lat. 50. Cæc. pylor. 4. Vert. 34.
Günth. Cat., II., p. 85. Allp. MS. Macl. Cat., 275.

Rare. Port Arthur. I have not seen any specimens. I have often seen the scales rubbed off the opercles of *Chilodactylus macropterus*: in this state the latter would agree with *Nemadactylus concinnus* in nearly every respect, with the exception of number of branchiostegals, which latter may be an abnormal feature in the original type. Requires confirmation.

26. LATRIS HECATEIA, Rich. (Z). *The Trumpeter.***

D. 17 : 1. 36-38. A. 3·28-30. P. 9·8-9. L. lat. 110.
Günth. Cat., II., p. 86. Allp. MS. Macl. Cat., p. 276.

Abundant all the year round. Esteemed as the finest of all our edible fishes. Caught—"school-fish," half-grown, in 10 to 20 fathoms water; the mature fish in 20 to 80 fathoms on coral reef banks or reefs, Macquarie Harbour to Seymour. (*See* GEN. OBS.)

27. LATRIS FORSTERI, Cast. (A). *The Red and Silver Bastard Trumpeter.***

D. 16 : 1·37-42. A. 3·33-36. P. 9-10·8-9. L. lat. 115-120.
Cast., Proc. Zool. Soc. Vic., vol. I., p. 77. Macl. Cat., 278.

The young and half-grown fish, known as Red Bastard Trumpeter, are got in shallower banks of the estuaries in great abundance all the year round. The Silver or mature Bastard Trumpeter is only taken in graball nets, in 5 to 6 fathoms water, during January, February, and March. It would appear that the mature fish live at a great depth, 20 to 80 fathoms, all the remainder of the year, and only approach the shallower reefs, 5 to 6 fathoms deep, during spawning season. Next to the Real Trumpeter, the Silver Bastard is most prized for food. Abundant during the season, January to March. (*See* GEN. OBS.) (*L. inornata*, Cast.), (*L. bilineata*, Cast. ?)

28. LATRIS CILIARIS, Forst.

D. 17 : 39. A. 3·32. L. lat. 84. Six simple pectoral rays.
Günth. Cat. II., p. 86. Allp. MS. Macl. Cat., 277.

I have never seen this species in Tasmanian waters. I am of opinion that local naturalists have hitherto confounded the last species with *L. ciliaris*, Forst., and that it does not exist here.

29. MENDOSOMA ALLPORTI, Johnston. *The Real Bastard Trumpeter*** of Fishermen.

B. 6. D. 23 : 1·25-26. A. 3·18-19. P. 15-16.
L. lat. 72-74; L. tr. 5 : 16-17.
Proc. Roy. Soc. Tas., 1880, pp. 54-55.

Not uncommon during the winter season. Found while Trumpeter-fishing off the south-east coast.

Fam. VII. TRIGLIDÆ.

(Includes the Scorpænidæ and Cottidæ, erected into independent families in recent works.)

30. SEBASTES PERCOIDES, Soland. (A.Z.) *Gurnet.**

D. 11 : 1·12. A. 3·5. L. lat. 60-65.
Günth. Cat., II., p. 101. Allp. MS. Macl. Cat., 282.

Abundant about George Town; common round the coasts on rocky bottom. *S. Allporti*, Cast., appears only to be a variety of *S. percoides*.

31. SCORPÆNA CRUENTA, Soland. (A.Z.) *Gurnet.*

D. 11 : 1·10. A. 3·5. L. lat. 45?
Günth. Cat., II., pp. 115, 520. Allp. MS. Macl. Cat., 284.

Common on shallow rocky bottom all round the coasts and estuaries. The species common about Hobart has only 25 rows of scales along lateral line. Either Solander's species is wrongly described in this particular, or the Tasmanian form is a distinct species.

32. SCORPÆNA PANDA, Rich. (A.Z.)

D. 12 : 1·8. A. 3·5. L. lat. 67.
Günth. Cat., II., p. 117. Allp. MS. Macl. Cat., 287.

Not common.

33. GLYPTAUCHEN PANDURATUS, Rich. (A.)

D. 17 : 7. A. 3·6. V. 1·5.
Günth. Cat. II., p. 121. Allp. MS. Macl. Cat., 291.

Rare.

34. HOLOXENUS CUTANEUS, Günth. (T.)

D. 7 : 3·10. A. 9. C. 12. V. 1·5.
Ann. Mag. Nat. Hist., 1876, vol. XVII., p. 393.
Allp. MS. Macl. Cat., 299.

I have not seen the above, but I have good reason for supposing that the fish, not otherwise mentioned, known here as the *Velvet Fish*, is probably the same, although the spinous characters are not in agreement with those of *H. cutaneus*. They are as follows:—

B. 5. D. 8 : 5·10. A. 3·9. C. 12-13. V. 1·5. *Velvet Fish.*

The body is compressed, covered like the fins with loose skin, which in a great measure connects and conceals the minute spinous rays in the sinus between the anterior and posterior dorsal rays. The whole of the skin on body and fins is covered with minute glandular skinny appendages, so soft to the touch as to give the notion of velvet. The colour, when fresh, is a uniform deep purple, sometimes more or less marbled with yellow, which probably changes to white in spirits. The teeth are more

granular than villiform. Average total length, 10 inches. In all other respects it agrees with *H. cutaneus*. Should it prove to be a distinct species I propose for it the name *Holoxenus Güntheri*.

35. PENTAROGE MARMORATA, Cuv. et Val. (A). *The Soldier.*
B. 7. D. 12-13 : 10. A. 3·6.
Günth. Cat., II., p. 132. Allp. MS. Macl. Cat., 300.
Common in shallow banks of estuaries. The spines are evidently poisonous weapons, as they inflict painful wounds.

36. PLATYCEPHALUS BASSENSIS, Cuv. et Val. (A). *The Common Red Flathead.* *
D. 1 : 7 : 14. A. 14. L. lat. 115.
Günth. Cat., II., p. 179 *(Tasmanius)*. Allp. MS. Macl. Cat., 444.
Abundant all round the coasts and estuaries.

37. PLATYCEPHALUS CINEREUS, Günth. (A). *The Black Flathead.* *
D. 1 : 7 : 12. A. 12. L. lat. 120.
Allp. MS. Macl. Cat., 450.
Brought to market rarely. Not uncommon.

38. LEPIDOTRIGLA VANESSA, Rich. (A.) *Butterfly Gurnard.**
D. 11 : 17. A. 17. L. lat. 70. Cæc. pylor. 8.
Gunth. Cat., II., p. 197. Allp. MS. Macl. Cat., 461.
Captured occasionally in the estuaries of the Derwent and Tamar.

39. TRIGLA POLYOMMATA, Rich. (A.) *The Flying Gurnard.**
D. 7-9 : 12-13. A. 12. Cæc. pylor. 8.
Günth. Cat., II., p. 204. Allp. MS. Macl. Cat., 464.
Not uncommon, during May and June, in the estuaries of the Derwent and Tamar.

40. TRIGLA KUMU, Less. and Garn. (A.Z.) *The Kumu Gurnard.**
D. 9-10 : 16-17. A. 15. Cæc. pylor. 6.
Günth. Cat., II., p. 204. Macl. Cat., 463.
Rare. Derwent.

Fam. VIII. TRACHINIDÆ.

41. KATHETOSTOMA LÆVE, Bl. (A.Z.) *Stone-lifter*; *Cat-fish.*
D. 17. A. 17. V. 1·5.
Günth. Cat. II., p. 231. Allp. MS. Macl. Cat., 406.
Not uncommon on northern coasts.

42. PERCIS ALLPORTI, Günth. (T.)
D. 5 : 21. A. 16. L. lat. 62. L. tr. 3½ : 15.
Allp. MS. Macl. Cat., 409.
Rare. Derwent.

43. APHRITIS URVILLII, Cuv. and Val. (T.) *Freshwater Flathead* or *Sandy.**

D. 6 : 19. A. 25. L. lat. 65. Cæc. pylor. 4.

Günth. Cat., II., p. 242. Allp. MS. Macl. Cat., 410.

Common in the lower waters of fresh-water streams near to the sea, especially on the eastern coast. All the specimens examined by the writer had seven spines in anterior dorsal fin. The first spine is invariably closely adpressed to the second, and hence the possibility that a mistake has been made.

44. SILLAGO CILIATA. Cuv. and Val. (A.) *The Whiting.***

D. 11 : 1·17 - 18. A. 2·18 - 19. P. 14 - 15. L. lat. 70. L. tr. 4 - 5 : 11 - 12.

Günth., II., 245. Allp. MS. Macl. Cat. *(Bassensis)*, 414.

The characteristic form found occasionally in abundance during the months of November, December, and January has the above characters. When caught, however, there are six to seven faint irregularly oblique bars running across the sides in a forward direction from dorsal to lateral line. Faint oblique streaks of olive upon interspaces between dorsal rays. There are invariably 70 rows of scales along lateral line. Depth in total length varies from 4½ to 5½ times. Average length 10 inches. The Tasmanian Whiting may be an intermediate form linking *S. maculata* (Quoy and Gaim.) and *S. ciliata* (C. and V.) Highly esteemed as food.

45. SILLAGO MACULATA, Quoy and Gaim. (A.) *Spotted Whiting.***

D. 11 : 1·20. A. 1·21. L. lat. 70. L. transv. 5·6 : 7.

Günth. Cat. II., 245. Macl. Cat., 412.

It is doubtful whether this form exists in Tasmanian waters. Some of the last-mentioned variable species, however, can with difficulty be separated from *S. maculata.*

46. BOVICHTHYS VARIEGATUS, Rich. (A.)

D. 8 : 18. A. 13.

Günth., II., p. 250. Allp. MS. Macl. Cat., 419.

Rare.

Fam. IX. SCIÆNIDÆ.

47. SCIÆNA ANTARTICA, Cast. (A.) *Victorian Kingfish.*

D. 9 : 1·27. A. 2·7. P. 17. L. lat. 68.

Allp. MS. Macl. Cat., 329. Cast. Proc. Zool. Soc., vol. I., p. 100.

Rare in Tasmanian waters.

48. SCIÆNA AQUILA, Lacep. (E.) European *Maigre.*

D. 10 : 1·26 - 27. A. 2·7. L. lat. 53. L. tr. 11·20.

Günth. Cat., II., p. 292. Allp. MS. Macl. Cat. *(Antartica)*, 329. Cast. *(Antartica)*. Proc. Zool. Soc., vol. I., p. 100.

There is some reason for the belief that only one species exists in Australian waters. As Dr. Günther recognises an

important difference in *L. lat.* as of specific value, there is no doubt but that Cast. *S. antartica* is distinct from the *Maigre* of Europe. I have, however, retained both species, as it is conceivable that both forms may exist in Tasmanian waters.

Fam. X. TRICHIURIDÆ.

49. Lepidopus caudatus, White. (Z.E.) *The Frost Fish* or *Scabbard Fish.*

D. 102 - 104. A. 24 - 25. Cæc. pylor. 23. Vert. 41 : 71.

Günth. Cat., II., p. 341. Allp. MS. Macl. Cat., 333.

Odd individuals caught in the Derwent occasionally in the winter. Wide-world in its range of distribution,—Europe, Africa, Australia, and New Zealand.

50. Thyrsites atun, Cuv. and Val. (A.Z.) *The Barracouta.***

D. 20 : 1·10 : VI. A. 1·10 : VI. Vert. 37.

Günth., Cat., II., p. 350. Allp. MS. Macl., 336.

Most abundant off the South-east Coast, preying chiefly upon the shoals of Anchovies and Sprats. Caught with a jigger abundantly all the year round.

51. Thyrsites micropus, M'Coy.

D. 17 : 4·12 : VI. A. 2·11 : IV. V. 1·1. P. 14.
C. 22 : 4·4.

M'Coy. Ann. and Mag. Nat. Hist., 1873, vol. XI., p. 338.
Macl. Cat., 337.

Prof. M'Coy terms this the "Tasmanian Kingfish," but this seems to be a mistake. The following species, *T. solandri*, is the common fish known by that name here. *T. micropus*, (M'Coy) must be extremely rare, as I have not yet met with a fish which agrees with the above characters.

52. Thyrsites Solandri, Cuv. and Val. *The Kingfish* of Tasmania.**

D. 17 - 18 : 1·17 - 18 : I - II. A. 1·13 - 18 : II.

Günth. Cat., II., p. 352. Allp. M.S. Macl. Cat., 338.

Migratory. Appear in immense numbers at certain seasons (December to June) in pursuit of the Horse Mackerel. Caught with a swivelled barbless hook, at night. Voracious in the extreme,—individuals frequently attacking each other, and also the allied species, the Barracouta.

The following five specimens, taken from a large number indiscriminately, give a fair notion of the variability of some of the characters of the species as found in Tasmanian waters :—

(1.) D. 18 : 1·17 : II. A. 1·16 : II. P. 14.
(2.) D. 18 : 1·17 : I. A. 1·15 : II. P. 14.
(3.) D. 18 : 1·17 : II. A. 1·13 : II. P. 14.
(4.) D. 18 : 1·17 : II. A. 1·14 : II. P. 14.
(5.) D. 18 : 1·7(3): II. A. 1·14 : II. P. 15.

No. 5 has been deformed. The soft dorsal portion had received an injury at one time, and three abortive detached finlets have grown in place of the usual ten destroyed.

Full size (No. 2) about 38 to 40 inches long, and about 18 inches greatest girth. One of the most important food fishes of Tasmania.

Fam. XI. SCOMBRIDÆ (including the *Nomeidæ* and *Cyttidæ* of some authors).

53. GASTEROCHISMA MELAMPUS, Rich. (Z). *Butterfly Fish.*

B. 7. D. 17 : 1·10 : VI. V. 1·5. H. 2·10 : VI. P. 21. L. lat. 64. L. tr. 27.

Günth. Cat., II., p. 387. Hutton, Cat., N.Z., p. 20.

The fish from which the above characters were taken was recently captured at the mouth of the estuary of the Derwent. Hitherto it has only been seen on rare occasions off the coast of New Zealand. The following are the principal dimensions :—Total length, 39 inches ; length of body, 35 inches ; length of head, 8¾ inches ; length of snout, 4 inches ; length of pectoral fin, 5¼ inches ; length of anal fin, 5¾ inches (not reaching to vent as in Dr. Günther's figure ; greatest depth, 9 inches ; least depth, 1 inch ; breadth of eye, ¾ inch ; distance of extremity of maxillary from snout, 4 inches ; distance of 1st ray of posterior dorsal from snout, 20¼ inches ; distance of extremity of 1st ray of anal from snout, 23 inches. In the figure in Dr. Günther's "Study of Fishes," p. 455, the anterior dorsal spines exceed in length the 1st soft rays of dorsal and anal. In the mature specimen above described, the highest of the gently arched anterior dorsal spines are not so long as either the first longest soft ray of anal or dorsal, which are nearly equal.

54. SCOMBER AUSTRALASICUS, Cuv. and Val. *The English Mackerel*, or *Southern Mackerel.* **

D. 10 : 1·11 : V. A. 1 : 1·11 : V. L. lat., about 160.

Günth. Cat., II., p. 359. Allp. MS. Macl. Cat., 392.

I have not seen specimens, but the fishermen assure me that a fish called by them *The English Mackerel* is seen in immense shoals, after long irregular intervals of time, on the East Coast, followed, as in the case of the Horse Mackerel, by their rapacious enemies the Kingfish. Professor M'Coy (Zool. Vict., Dec., III., p. 43,) gives reasons for regarding the Hobson's Bay species,—which most probably may prove to be identical with the Tasmanian,—to be merely a variety of *Scomber pneumatophorus* (De la Roche), viz.—

D. 12 : 1·11 : V. A. 1·12 : V. P. 19. C. 17.

55. THYNNUS THYNNUS, L. (E). *The Tunny.*

D. 14 : 1·13 : IX. A. 2·12 : VIII. Vert. 16·23.

Günth. Cat., II., p. 362. Allp. MS.

Seen occasionally in the estuary of the Derwent. Have not examined any specimens.

56. NAUCRATES DUCTOR, L. (E). *The Pilot Fish.*

D. 3 - 6 : 1·26 - 28. A. 2·16 - 17. Cæc. pylor. 12 - 15. Vert. 10 - 16.

Günth. Cat., II., p. 374. Allp. MS. Macl. Cat., 559.

Not uncommon in Tasmanian waters.

57. ECHENEIS REMORA, L. (E). *The Sucking Fish.*
D. 16 - 18 : 22 - 24. A. 25. Cæc. pylor. 6. Vert. 12 : 10.
Seen occasionally.

58. ZEUS FABER, L. (E). *John Dorey.*
D. 10 : 23. A. 4·22. V. 1·6.
Günth. Cat., II., 393. Allp. MS. Macl. *(australis)* Cat., 386.
I have not seen any specimens from Tasmanian waters. Fishermen usually designate the following species by the name "John Dorey," and hence the evidences given are very unsatisfactory.

59. CYTTUS AUSTRALIS, Rich. (A.Z.) *The Bastard Dorey.***
B. 8. D. 8 : 1·28 - 29. A. 2·30. P. 11. V. 1·6.
Günth. Cat., II., p. 396. Allp. MS. Macl. Cat., 387.
Abundant during the month of April in the estuaries of the Derwent and Tamar, but although a fine edible fish it is rarely captured, probably owing to the lack of the proper kind of net. Graball and seine-nets only are used by Tasmanian fishermen.

Fam. XII. CARANGIDÆ.

60. TRACHURUS TRACHURUS, Cuv. and Val. (A.Z.) *Horse Mackerel.* **
D. 8 : 1·32 - 35. A. 2 : 1·25 - 29. L. lat. 75 - 86.
Günth. Cat., II., p. 419. Allp. MS. Macl. Cat., 347.
Appear in immense shoals at times between January and June, and might with proper appliances become the source of a valuable industry. Their appearance in very large schools is an indication of the presence of the much prized Kingfish.

61. CARANX GEORGIANUS, Cuv. and Val. (A.) *The White* or *Silver Trevally.***
D. 8 : 1·26 - 29. A. 2 : 1·22 - 24. L. lat. 20 - 25.
Günth. Cat., II., p. 440. Allp. MS. Macl. Cat., 350.
A valuable food fish. Immense numbers of the young have at times been captured in the estuaries during the autumn. The larger fish, 10 to 12 lbs. weight, are taken in deeper water.

62. SERIOLA LALANDII, Cuv. and Val. (A.) *Port Jackson Kingfish.*
D. 7 : 1·32 - 34. A. 2 : 1·20 - 21.
Günth. Cat. II., p. 463. Allp. MS. Macl. Cat., 365.
Doubtful. I have not seen any specimens. May have been mistaken for the following species.

63. SERIOLA GRANDIS, Cast. (A.) *Tasmanian Yellow-tail.* **
D. 6 : 1·32 - 35. A. 0 : 1·20. P. 21. V. 5.
Cast., Proc. Zool. Soc. Vic., vol. I., p. 115. Macl. Cat., 368.
Appear in schools; abundant off the George Town Heads regularly during a brief season (autumn) every year. Take bait greedily.

64. NEPTONEMUS BRAMA, Günth. (T.) *Snotgall Trevally.* **

D. 7 : 2·27 - 29. A. 2 : 1·22 - 23. L. lat. 88. L. tr. 16 : 25.

Günth. Cat. II., p. 390. Macl. Cat., 370.

The young are caught about the wharves at Hobart in abundance during the months of February, March, and April. They sometimes, in the mature state, reach a size of 2 ft. 6 in., and weigh from 12 to 14 lbs. (Barnett). The large fish do not ascend the upper shallow waters of estuaries.

65. NEPTONEMUS DOBULA, Günth. (T.) *Mackerel Trevally.***

D. 7 : 1·37 - 40. A. 2 : 1·23. Vert. 24.

Günth., Pro. Zool. Soc. Lond., 1869, p. 429. Allp. MS. Macl. Cat., 371.

This is a smaller and more elongate fish than the former; is considered a greater delicacy for the table; and rarely attains a length of 12 inches. Its habits are similar to the former species, but approaches the upper waters of estuaries seldomer and more irregularly.

66. NEPTONEMUS TRAVALE, Cast. *Port Jackson Snotgall.*

D. 6 : 2 - 30. A. 2 : 2·21. L. lat. 93.

Cast., Proc. Zool. Soc. Vic., vol. I., p. 119. Allp. MS. Macl. Cat., 372. Tasmania (Allport).

Doubtful. I have not seen any specimens from Tasmanian waters.

67. TEMNODON SALTATOR, Bl. *Tailor* or *Skipjack.*

D. 8 : 1·24 - 26. A 1 - 2 : 1·26 - 28. L. lat. 90 - 100. L. tr. 8 : 19. Vert. 12 : 14.

Günth. Cat., II., p. 479. Allp. MS. Macl. Cat., 375.

An odd individual caught occasionally in the Derwent.

Fam. XIII. GOBIIDÆ.

68. GOBIUS TAMARENSIS, nov. sp.

B 4. D. 6 : 1·8. A. 1·8. L. lat. 32. P. 16 - 18. C. 18 - 19.

Height of body seven times in total length, the length of head four times, and the greatest breadth behind orbits, six times. Head depressed; eyes approximating towards top of head, looking upward and outward. Snout obtuse convex, one and a half times breadth of eye, and contained three and a half times in length of head; interorbital space narrow, half the breadth of eye; head and nape naked. Colour when alive, greyish. Body and vertical fins marbled with very fine reddish-brown dots. The extremities of the rays of second dorsal and anal fins blackish; there are eleven scales between anal fin and 1st ray of 2nd dorsal; caudal fin rounded; dorsal and anal fin-rays one and a half times as long as snout—when stretched they do not reach caudal by a distance greater than their own length.

Enters the fresh water of the Tamar in great abundance. Two inches to two and three-fourth inches long.

This species approaches very close to *Gobius lateralis*, (Macleay.)

Fam. XIV. PEDICULATI.

69. BRACHIONICHTHYS HIRSUTUS, Lacep. *The Hand-fish.*

D. 1. 2 : 10 - 19. A. 9. P. 7. V. 1·4.

Günth. Cat., III., p. 182. Allp. MS. Macl. Cat., 430 - 431.

I am of opinion that *B. hirsutus* and *B. lævis* cannot be separated. *B. hirsutus* is very variable in colour, in the development of the minute spines on surface of skin, and in the number of soft rays of dorsal. The membrane connecting anterior spines is not connected with the first of the series, which is rather a species of tentacle than a spine. The tentacle is lax, hangs forward, and its lobe is really plumose in living specimens. Not uncommon in the estuary of the Derwent. Mrs. Meredith has very faithfully painted this species in her "Tasmanian Friends and Foes," under the name *B. politus.*

70. BRACHIONICHTHYS POLITUS, Rich. *The Red Hand-fish.*

D. 1 : 2 : 17. A. 9. P. 9. V. 1 : 4.

Rich., Voy. of *Ereb.* and *Ter.*, p. 16. Allp. MS. Macl. Cat., 432.

Rare. For reasons stated under the preceding species, it is not improbable that there may be individuals which may link the two species together.

Fam. XV. BLENNIDÆ.

71. BLENNIUS TASMANIANUS, Rich. *Blenny* or *Bully.*

B. 6. D. 12 : 17 - 18. A. 2·19. P. 14.

Günth. Cat., III., p. 214. Allp. MS. Macl. Cat., 545.

Common.

72. SALARIAS MELEAGRIS, Cuv. and Val. *Blenny.*

D. 12 : 20. A. 22.

Günth. Cat., III., p. 256. Allp. MS. Macl. Cat., 562.

Common.

73. CLINUS DESPICILLATUS, Rich. *Blenny.*

D. 3·35·4. A. 2·25. V. 1·3.

Günth. Cat., III., p. 271. Allp. MS. Macl. Cat., 572.

Common.

74. CRISTICEPS AUSTRALIS, Cuv. and Val. *Blenny.*

D. 3·27 - 29·5 - 8. A. 2·23 - 25. V. 1·3. Vert. 15 : 31.

Günth. Cat., III., p. 275. Allp. MS. Macl. Cat., 580.

Common.

75. CRISTICEPS FORSTERI, Cast. *Blenny.*

D. 3·29·4. A. 26. V. 1·3.

Cast. Proc. Zool. Soc. Vic., vol. I., p. 132. Allp. MS. Macl. Cat., 588.

Common.

Fam. XVI. SPHYRÆNIDÆ.

76. LANIOPERCA MORDAX, Günth. *Tasmanian Jack* or *Pike.**
D. 5 : 1·19. A. 2·25 - 29. P. 16. L. lat. 66.
Günth. Ann. and Mag. Nat. Hist., 1872, vol. X., p. 183. Allp. MS. Macl. Cat., 608.
Not uncommon in the Derwent.

Fam. XVII. ATHERINIDÆ.

77. ATHERINA PRESBYTEROIDES, Rich. *Silver Belly.*
D. 9 : 10 - 11. A. 1·12. P. 11. Vert. 46.
Günth. Cat., III., p. 397. Allp. MS. Macl. Cat., 397.

78. ATHERINA HEPSETOIDES, Rich. *Silver Belly.*
D. 9 : 1·11. A. 1·14. P. 15. Vert. 48.
Günth. Cat., III., p. 397. Allp. MS. *(hepsetus?)* Macl. Cat., 609.
Port Arthur (Richardson).

79. ATHERINA HEPSETUS, L.
Günth. Ann. and Mag. Nat. Hist., 1876, p. 396. Allp. MS.

80. ATHERINA MICROSTOMA, Günth. *Silver Belly.*
D. 6 : 1·10. A. 1·12. P. 12. L. lat. 40. L. tr. 8.
Günth. Cat., III., p. 401. Allp. MS. Macl. Cat., 614.
Tasmania (Günther).

81. ATHERINA TAMARENSIS, nov. sp. *Silver Belly.*
B. 7. D. 8 : 1·11. A. 1·10 - 11. V. 1·5. P. 13.
L. lat. 42. L. tr. 9.
Body somewhat compressed; cleft of mouth oblique. The origin of the first dorsal commences almost on a vertical line behind ventral. Eye relatively large, one-third the length of head, and slightly exceeding the length of snout. Scales cycloid, of moderate size. Three series of scales above silvery band which runs along the sides. Teeth minute.
Abundant Launceston Bar, River Tamar.

82. ATHERENICHTHYS JACKSONIANA, Quoy and Gaim.
D. 8·1 - 11. A. 1·18.
Günth. Cat., III., p. 402. Allp. MS. Macl. Cat., 618.
Tasmania (Allport; Günther).

Fam. XVIII. MUGILIDÆ.

83. MUGIL CEPHALOTUS, Cuv. and Val. *Sand Mullet.***
D. 4 : 1·8. A. 3·(7)8. L. lat. 38 - 40. L. tr. 14 - 15.
Günth. Cat., III., p. 419. Allp. MS. Macl. Cat., 631.
Common along the North-East Coast, George's Bay, Scamander River.

84. AGONOSTOMA FORSTERI, Bl. *Sea Mullet.***
D. 4 : 1·10. A. 3·12. L. lat. 55. Cæc. pylor. 3.
Günth. Cat. III., p. 465. Allp. MS. Macl. (Diemensis) Cat., 641.
Abundant in all the estuaries. Ascends the Tamar as far as Launceston, and the Derwent above Bridgewater.

Fam. XIX. CENTRISCIDÆ.

85. CENTRISCUS SCOLOPAX, L. (E.) *The Bugler* or *Trumpet Fish.*
B. 4. D. 5 : 12. A. 20. P. 16. V. 5. C. 6 + 4 + 5 + 7.
Günth. Cat., III., p. 518. Allp. MS. Tasmania (Allport).
It is questionable whether the Tasmanian species may not be *C. humerosus*, Rich. I have not yet examined any local specimens.

Fam. XX. GOBIESOCIDÆ.

86. CREPIDOGASTER TASMANIENSIS, Günth.
B. 5. D. 10. A. 9.
Günth. Cat. III., p. 597. Allp. MS. Macl. Cat., 648.
Tasmania (Günther).

Fam. XXI. TRACHYPTERIDÆ.

87. REGALECUS GLADIUS, Cuv. and Val. (E.) *The Ribbon Fish.*
B. 6. D. 342. A. 0. C. 0. P. 14. V. 1.
Günth. Cat., III., p. 308. Allp. MS. Macl. Cat., 651.
Specimen examined, 14 feet long, captured at the Penguin, Tasmania.

88. TRACHYPTERUS ALTIVELIS, Kner.
B. 6. D. 7 : 190. A. 0. C. 6 : 4 - 6. P. 11. V. 7.
Günth. Cat., III., p. 303.
Specimen in Royal Society's Museum, Hobart. Caught at Spring Bay, on the East Coast of Tasmania.

Fam. XXII. HOPLEGNATHIDÆ.

89. HOPLEGNATHUS CONWAYII, Rich.
D. 12 : 12. A. 3·12.
Günth. Cat., III., p. 357. Allp. MS.
Tasmania (Allport.)

Fam. XXIII. LABRIDÆ.

90. COSSYPHUS GOULDII, Rich. *Blue Groper.**
D. 11 : 11. A. 3·11. L. lat. 39. L. tr. 6 : 14.
Günth. Cat., IV., p. 111. Allp. MS. Macl. Cat., 693.
Common.

91. LABRICHTHYS BOTHRYOCOSMUS, Rich. *Parrot Fish.**
D. 9 : 11. A. 3·10. L. lat. 27. L. tr. 3 : 9.
Günth. Cat., IV., p. 114. Allp. MS. Macl. Cat., 695.
Common. (See GEN. OBS.)

92. Labrichthys fucicola, Rich. (A.) *Parrot Fish.*
B. 6. D. 9 : 11. A. 3·10. C. 14. P. 13. V. 1·5.
L. lat. 27.
Macl. Cat., 715.
Tasmania (Macleay.) Colour dark plum purple, towards belly buff, with four pale spots on the back. (See Gen. Obs.)

93. Labrichthys psittacula, Rich. *Parrot Fish.*
D. 9 : 11. A. 3·10. L. lat. 27. L. tr. 3·9. Vert. 9 : 16.
Günth. Cat., IV., p. 114. Allp. MS. Macl. Cat., 696.
Common. (See Gen. Obs.)

94. Labrichthys laticlavius, Rich. *Parrot Fish.*
D. 9 : 11. A. 3·10. L. lat. 26. L. tr. 3·9. Vert. 9·16.
Günth. Cat., IV., p. 115. Allp. MS. Macl. Cat., 698.
Common. (See Gen. Obs.)

95. Labrichthys tetrica, Rich. *Parrot Fish.*
D. 9 : 11. A. 3·10. L. lat. 27. L. tr. 3·9.
Günth. Cat., IV., p. 116. Allp. MS. Macl. Cat., 700.
Common. (See Gen. Obs.)

96. Labrichthys Cuvieri, Cast.
D. 9 : 11. A. 3·10. L. lat. 27.
Cast. Proc. Zool. Soc. Vic., vol. II., p. 53. Macl. Cat., 708.
Hobart (Cast.)
It may be well to state here that I consider the classification of the genus *Labrichthys* to be far from satisfactory. I have good reason to believe that dependence upon colour markings, however peculiar and brilliant, is to a great extent delusive. Like the genus *Monocanthus*, many of them change colour with age. There are none of the genus in much favour as food,—with the exception of the Blue-head.

97. Odax balteatus, Cuv. and Val. (A.) The *Ground Mullet* of Fishermen.
D. 15-17 : 12 - 13. A. 3·12 - 13. L. lat. 39. L. tr. 4 : 13.
Vert. 19 : 17.
Günth. Cat., IV., p. 240. Allp. MS. Macl. Cat., 751.
Common. Entering fresh water occasionally. Derwent; George's Bay.

98. Odax Richardsoni, Günth. (A.) *The Stranger.**
D. 17 : 13. A. 3·11 - 12. L. lat. 60. L. tr. 7 : 20.
Günth. Cat. IV., p. 241. Allp. MS. Macl. Cat., 753.
Caught occasionally in the Derwent.

Fam. XXIV. GADOPSIDÆ.

99. Gadopsis marmoratus, Rich. (A.) *Freshwater Blackfish.**
B. 6. D. 10 - 13 : 25 - 26. A. 3 : 18 - 19. V. 1.
Günth. Cat., IV., p. 318. Allp. MS. Macl. Cat., 763.

Abundant Ringarooma, Forrester, the Piper, and other rivers of the north-east of Tasmania, where they grow to a considerable size, and are highly esteemed for food. The species has been introduced from the north-east into the North and South Esk Rivers, and probably other streams, where they are now abundant, and afford ample sport to the meditative angler who cares to linger over a calm still water-hole during the hours of the night season. The angler must be careful, however, to provide himself with a good bull's-eye lantern, or his labours will be fruitless.

Prof. M'Coy has minutely described two species,—viz., *G. gracilis*, Yarra River, and *G. gibbosus*, Bunyip River, Gippsland,—based upon a slight variation of relation of length of head to body, together with an equally slight variation in the number of dorsal spines and other characters, which are extremely inconstant in this variable form. Having closely studied the variability of the Tasmanian *G. marmoratus* I am unable to admit that the characters which distinguish *G. gracilis* and *G. gibbosus* are sufficient to separate them from Richardson's *G. marmoratus*, for the individual variations of the latter species in the North Esk and other rivers of Tasmania are greater than the differences which Prof. M'Coy considers sufficient to form distinct specific characters. In support of this I give the general characters of seven individuals now before me, taken together from a spot near Corra Lynn, on the North Esk. They fairly represent the individual variability :—

B.	D.	A.	P.	L. lat.	L. tr.	Total Length.	Head.	Head in Total Length.
						inches.	inches.	times.
(1) 7	13 : 26	3·19	17	130 to 140.	18-20 : 48-55.	$7\frac{5}{8}$	$1\frac{3}{4}$	4·3
(2) 7	12 : 26	3·18	17			$6\frac{1}{8}$	$1\frac{1}{2}$	4·0
(3) 7	12 : 26	3·18	17			$5\frac{1}{4}$	$1\frac{3}{16}$	4·4
(4) 7	12 : 28	3·18	17			$10\frac{3}{4}$	$2\frac{1}{2}$	4·7
(5) 7	12 : 26	3·18	17			8	$1\frac{5}{8}$	4·9
(6) 7	13 : 26	3·18	17			$8\frac{1}{4}$	$1\frac{7}{8}$	4·3
(7) 7	11 : 27	3·17	17			$5\frac{3}{8}$	$1\frac{3}{16}$	4·5

Thus the dorsal spines vary between 11 and 13, and the relation in length of head to total length from 4 to 4·9 times in the latter. These limits cover *G. marmoratus*, Rich. ; *G. gracilis*, M'Coy ; and *G. gibbosus*, M'Coy ; and the other points described are equally variable within limits. I think it is clear, therefore, that the two last-named species cannot well be recognised. It is very hazardous in this genus to create a new species based upon the examination of only two or three individuals. It must be remembered also, that specimens in spirits would have the soft membrane bordering the flat opercular spine greatly contracted. This would affect the relative length of head and body.

Fam. XXV. GADIDÆ.

100. LOTELLA SWANII, nov. sp.

B. 7. D. 4 : 60. A. 55. V. 8. P. 22 - 23. L. lat. 200. L. tr. 22 : 62.

Head contained 4⅔ times in total length, and greatest depth 4¼ times. Length of snout equal to diameter of eye, and about one-fifth the length of head. Distance between orbits half again as broad as diameter of eye. There is a series of 8 to 11 irregular teeth in upper and lower jaws. Scales small. Colour uniformly dark brown. Not common.

The above form appears to be intermediate between *L. phycis*, Schleg., and *L. callarius*, Günth. The differences are so marked, however, that I have thought it best to raise it into specific rank for the present. I am aware that there is a great variability in the allied genus *Pseudophycis*, and particularly in the common species known here as the Rock Cod *(P. barbatus)*, Günth.; and when a larger number of individuals is examined it will be seen whether the limits of variability justify the separation or not. This is the species, probably, recorded in Mr. Allport's list as *L. phycis*.

Total length, 11 inches; length of body, 10 inches; length of head, 2½ inches; length of snout, ¼ inch; length of barbel, ¾ inch; breadth interorbital space, ¾ inch; longest ventral ray, 1½ inches; longest anterior dorsal ray, 1 inch (3rd and 4th); longest posterior dorsal ray, ¾ inch; longest anal ray, ¾ inch; greatest depth of body, 2⅝ inches; least at caudal peduncle, ⅝ inch; snout to termination of first dorsal, 9¼ inches; snout to termination of anal, 9⅛ inches; snout to first ray of anterior dorsal, 2¾ inches.

101. PSEUDOPHYCIS BARBATUS, Günth. *The Common Rock Cod.***

D. 9 - 11 : 48 - 57. A. 44 - 57. V. 5. L. lat. 100 - 140. P. 22 - 26. C. 28 - 29.

Ann. Mag. Nat. Hist., 1863, p. 116. Macl. Cat., 769. M'Coy, Zool. of Vict., Dec., II., p. 29.

Common all the year round on all our coasts, and entering the shallow banks of estuaries in immense numbers during the winter months, when they are caught in very large numbers by amateur fishermen with hook and line. The young also appear in these shallows in very large numbers during the months of April and May. The Rock Cod, although somewhat soft, is held in great esteem as an article of food. The local variety agrees with the limits described by Prof. M'Coy, is equally variable, but it appears to present a local difference in the average size of scale. The Derwent Rock Cod rarely has more than 100 rows of scales along the lateral line. In all other respects it agrees with Prof. M'Coy's description already referred to. Mr. Allport has *P. bacchus* in his MS. list; but, as *P. barbatus* is not referred to, I am convinced that the latter was mistaken for the former. I have never seen a representative of *P. bacchus* in Tasmanian waters.

Fam. XXVI. OPHIDIIDÆ.

102. Genypterus Australis, Cast. *The Ling.***
B. 7. D. 159. A. 123 - 126. P. 19. L. lat. 261 - 307.
Cast. Proc. Zool. Soc. Vic., vol. I., p. 164. Mac. Cat., 731. M'Coy, Zool. of Vic., Dec., III., p. 37.
Common occasionally in market. Highly esteemed as food. Prof. M'Coy is of opinion that the *G. Australis* may not be distinct from *G. blacodes*, Forst.

103. Fierasfer Homei, Rich.
B. 7. Vertical fins continuous, very low.
Günth Cat., IV., p. 382. Macl. Cat., 774. Allp. MS.
Rare. I have not seen any specimens. Tasmania (Rich.)

Fam. XXVII. MACRURIDÆ.

104. Macrurus Australis, Rich. (A.)
D. 13·88. A. 87. V. 7. L. lat. 130. L. tr. 4 : 15. V. 14 : 53.
Günth. Cat., IV., p. 391. Allp. MS. Macl. Cat., 776.
Captured occasionally in the Derwent.

Fam. XXVIII. PLEURONECTIDÆ.

105. Amnotretis rostratus, Günth. (T.) *The Sole* of Fishermen.**
B. 7. D. 79 - 81. V. dext. 6 - 7, sin. 4. L. lat. 89 - 90.
Günth. Cat., IV., p. 458. Allp. MS. Macl. Cat., 784.
Common in the upper shallows of estuaries. Valuable market fish. Taken in graball. Does not take bait.

106. Rhombsolea monopus, Günth. (A.) *The Common Flounder.***
B. 5. D. 59 - 60. V. 6. A. 42 - 43.
Günth. Cat., IV., p. 459. Allp. MS. Macl. Cat., 785.
Abundant in the upper shallows of estuaries. Taken in nets. Does not take bait.

107. Rhombsolea tapirina, Günth. (A.) *Flounder.***
B. 6 - 7. D. 64 - 66. A. 46 - 50.
Günth. Cat., IV., p. 459. Allp. MS. Macl. Cat., 786.
Common, but not so often seen in market as the two preceding species.

108. Solea liturata, Rich. (T.)
Rich. Trans. Zool. Soc., III., p. 156. Tasmania (Rich.)
I have not seen the description, and I doubt the existence of this genus in Tasmanian waters.

Fam. XXIX. HAPLOCHITONIDÆ.

109. Prototroctes maræna, Günth. (A.) *The Freshwater Herring* or *Cucumber Fish.***
B. 6. D. 10. A. 19. P. 13. L. lat. 78. L. tr. 19.
Günth. Cat., V., p. 382. Allp. MS. Macl. Cat., 824.

Abundant in all our principal rivers. Affords the finest sport of all our fishes to anglers. It is very much esteemed as a delicious table fish. Unfortunately, the introduction of the English Brown Trout *(Salmo fario* var. *Ausonii)* into many of our rivers threatens the extinction of this most valuable native fish. Sometimes reaches 12 to 13 inches long.

110. Haplochiton Sealii, nov. sp. *The Derwent Smelt.*

B. 6. D. 8-9. A. 19-20. V. 7. P. 9-12. Vert. 56-57.

Body naked. Total length, 5·3 times length of head, and nearly 10 times the height of the body. Head somewhat broad, depressed; interorbital space wide. Teeth in a single series, small, hooked, on maxillary and mandible,—minute on palate. Eye relatively large, diameter equal to length of snout, which latter is contained in head 3·2 times. Maxillary extending to a vertical line drawn through centre of eye; posterior end slightly enlarged, and curved downwards. Lower jaw slightly longer. Dorsal situated rather in advance of vent and behind ventral fin. Belly rounded. Adipose fin, membranous, rudimentary, broadly deltoid. Body ornamented with extremely minute dots; from the ventrals forward these minute blackish dots invariably form two parallel interrupted lines which ultimately gradually approach and unite at an acute angle under the mandibles. Silvery band along sides. This interesting species has the same migratory habit as *Retropinna Richardsoni*, Günth. It appears in the upper waters of the Derwent, near New Norfolk, in large shoals during the months of October and November. The females are then full of mature ova, which are comparatively large when compared with the size of the fish. The introduced English Salmonoids appear to prey upon these little fish to a great extent. When chased, the little fish may be seen leaping in scores from the surface of the water.

Average length, mature, 1½ to 2 inches.

Fam. XXX. SCOPELIDÆ.

111. Alepidosaurus ferox, Lowe.

B. 6-7. D. 41-44. A. 14-17. P. 14-15. V. 9-10.

Günth. Cat., V., p. 421. Allp. MS. Macl. Cat., 837.

Tasmania (Rich).

I have not seen any specimens.

Fam. XXXI. SALMONIDÆ.

112. Retropinna Richardsoni, Gill. (A.Z.) *Whitebait* or *Smelt.***

B. 6. D. 11-12. A. 17-20. P. 11. V. 6. L. lat. 61.

Günth. Cat., VI., p. 171. Macl. Cat., 840.

Captured in great abundance in the River Tamar, in the prawn nets, during the months of February and March, together with a species of *Atherina*, and *Galaxius attenuatus*, and are generally termed by fishermen, *Whitebait*. Dr. Günther had formerly supposed that this species

was confined to New Zealand; it appears, however, to be common to Australia and Tasmania. These little fishes are much esteemed as food for the breakfast table.

113. Salmo salar, L. (I.) *The English Salmon.***

B. 11-12. D. 14. A. 11. P. 14. V. 9. L. lat. 120. L. tr. 22-26 : 19-22. Vert. 59-60. Cæc. pyl. 53-77.

Günth. Cat., VI., p. 13. Allport, Report Roy. Soc. Tas., Proc. 1866.

Shipment of ova arrived successfully by the *Norfolk*, which was safely delivered at the Salmon Ponds, Tasmania, on 21st April, 1864. Of this shipment at least about 500 fishes were successfully hatched and liberated in the Plenty. Some were retained in the Ponds for breeding purposes. The doubt whether the true *S. salar* has established itself in our waters is not yet set at rest, for no fish over 10 lbs. of a migratory form has yet been caught in the Derwent after the lapse of 18 years. The migratory type now successfully established seems to partake of a character intermediate between *S. trutta*, *S. Cambricus*, and *S. salar*. Many specimens examined by me, caught in the Derwent, agree with the grilse form of *S. salar* in nearly every characteristic, saving the relative length of maxillary bone as compared with snout. The snout is invariably somewhat obtuse, as in *S. trutta*, although in all other respects many individuals agree more closely with its noble congener, *S. salar*, than with the other two mentioned species. (See Gen. Obs.)

114. Salmo trutta, Flem. (I.) English *Sea Trout* or *Salmon Trout.***

B. 11. D. 13. A. 11. P. 15. V. 9. L. lat. 120. L. tr. 24-26 : 36-34. Vert. 59-60. Cæc. pylor. 49-61, rarely less.

Günth. Cat., VI., p. 24; Allport's Report, Proc. Roy. Soc. Tas., 1866.

Ova introduced successfully by the *Lincolnshire* in the year 1866. As already pointed out with reference to *S. salar*, it is difficult to say whether the form resembling the above species, now abundant in the Derwent, is, properly speaking, *S. trutta* or not. It is in many respects more allied to *S. Cambricus*.

The following are the average limits of the common form :—B. 10-12. D. 13-14. A. 11-12. P. 14. V. 9. L. lat. 120. Cæc. pylor. 42-67. Maxillary, relative to snout, longer and thin; transverse series of scales from adipose fin forward to lateral line, 12-14; depth of operculum relative to length, $1\frac{1}{2}$ to $1\frac{1}{3}$; hind part of body moderately elongate; vomerine teeth disappearing in specimens from 3 to 5 lbs. weight; caudal fin invariably emarginate in full grown specimens; colour usually bluish-black on back and shoulders, silvery on sides; parr markings, 11 to 12 bars, frequently seen in smolt stage.

Whether this local form is the result of hybridism, as suggested by Dr. Günther, or is simply the effects of the differing conditions of a new environment, I am as yet

unable to decide,—perhaps a good deal may be due to both influences. It is noteworthy, however, that already in New Zealand and Tasmania the allied species *S. fario*, var. *Ausonii*, has developed into types which are peculiarly characteristic of particular local streams. This variability in relation to environment is very suggestive, and may yet help to explain the trifling variable differences in character, often overlapping, between *S. Cambricus*, *S. gallivensis*, *S. brachypoma*, and *S. trutta* of Scotch, English, and Irish streams.

I have already pointed out (*Mercury*, Hobart, Nov. 25, 1879,) that characters which may be greatly affected by environment are not to be depended upon, and, in the opinion of some authorities in other branches of natural history, such differences would not be recognised as of specific or even sub-specific rank. The assumption of hybridism is to me extremely unsatisfactory, for the reason that the extreme types steadily perpetuate themselves in European waters notwithstanding the extraordinary facilities among fishes for intercrossing by natural means which probably have existed unrestricted for ages.

115. SALMO FARIO, *var.* Ausonii, L. (I.) *English Brown Trout.***
D. 13 - 14. A. 10 - 11. P. 13. V. 9. L. lat. 120. L. tr. 26 : 30. Cæc. pylor. 38 - 51. Vert. 57 - 58.
Günth. Cat., VI., p. 64. Allp. Rep. Pro. Roy. Soc. Tas., 1866.
Ova introduced successfully, together with the former species, per the *Lincolnshire*, in the year 1866.

The species now abound in all the principal rivers of Tasmania, and sometimes reach the enormous weight of 28 lbs., and a length of three feet. The new conditions in our rivers appear to have greatly modified their general form and character. The following limits of variability show that the old limits of characters are not of much value here :—B. 9 - 12. D. 13 - 14. A. 10 - 11. P. 13 - 16. V. 9. L. lat. 120. Pylor. cæc. 41 - 72. Maxillary strong and, relative to snout, generally much longer ; hind part of body generally short and high ; vomerine teeth in specimens 3 to 5 lbs. weight generally disappearing ; caudal fin generally emarginate, not truncate. Colour varying with the nature of the bottom and the country through which the stream passes. They are generally coarse and dark where the streams are choked with heavy dead timber, as in some places in the River Meander ; silvery in gravelly bottoms and open country, as at Simmons' Plains ; and especially so those which have formed the habit of entering the brackish water about the wharves in Launceston.

Fam. XXXII. GALAXIDÆ.

116. GALAXIAS TRUTTACEUS, Cuv. & Val. (T.) *Spotted Trout.***
B. 9. D. 11. A. 14 - 15. V. 7. P. 14.
Günth. Cat., VI., p. 209. Allp. MS. Macl. Cat., 841.
Abundant in most of our freshwater streams, but not descending to brackish water like *G. attenuatus.*

There are two or three varieties :—

Var. *a.*—In the North Esk, without the three characteristic cross-bars upon shoulder.

Var. *b*, Mountain Trout.—Without spots or bars; head more depressed. Colour, grey, with beautiful iridescent specks of green and gold. Mount Wellington.

Var. *c.*—A red-finned variety, found in streams at Gould's Country.

Although not large they are highly prized for the table, and often afford sport to the angler.

117. GALAXIAS AURATUS, nov. sp. *Lake Trout.***

B. 9. D. 11 - 12. A. 14. P. 16. V. 1·7.

The height of the body is contained five times in the total length; the length of head nearly four times. The head is very much depressed. Interorbital space wide, having three pairs of pores over each eye. About seventy distinct pores, mostly in pairs, along usual course of lateral line. Head blackish. Body of a bright transparent golden hue. Spots very large, rounded, and sometimes confluent above lateral line. No blackish bars across shoulder. Ventrals tipped with black; base and tips of anal and dorsal blackish. Pectoral reaches to half the distance from root of ventral. Total length, 9⅝ in.; body, 8½ in.; head, 2½ in.; snout, ¾ in.; depth, 2 in. nearly; interorbital space, 1 in. nearly. This species is confined to the neighbourhood of the Great Lake, at an altitude of about 4000 feet. It attains a larger size than any other member of the genus.

118. GALAXIAS ATTENUATUS, Jenyns. (A.Z.) *The Jolly-tail.***

D. 12. A. 16. P. 12. V. 7.

Günth. Cat., VI., p. 211. Allp. MS. Macl. Cat., 844.

Abundant in all freshwater streams, entering brackish water in vast numbers. Are highly esteemed as a delicacy for the table.

119. GALAXIAS WEEDONI, nov. sp. *Mersey Jolly-tail.**

D. 11. A. 14. P. 15.

Body somewhat compressed. Length of head scarcely exceeding the depth of body, and contained four and a half times in the total length. Pectoral reaches half the distance to root of ventral. Head and body brownish black; back and sides marbled with irregularly transverse wedge-shaped streaks, and bands of darker hue. Caudal bifurcate.

Length, 4½ inches. Mersey River. The finer head and more compressed form, together with marbled sides, distinguish this species from its closely allied congener.

120. GALAXIAS ATKINSONI, nov. sp. *Pieman Jolly-tail.**

B. 9. D. 11. P. 13. A. 14. V. 8.

Length four and one-third times that of the head, and the latter is equal to one and a half times the height of body. Diameter of eye equal to length of snout, and about one-fourth the length of head. Length of pectoral more than

one-half the distance to the root of ventral. The depth of peduncle is not half as long as the distance between caudal and dorsal fins. Colour darkish brown. Sides with sixteen to eighteen regular transverse bands of a deeper shade composed of microscopic dots. These bands are less defined towards tail, and are rather wider than the interspaces. Larger dots are distributed along the lines of vertebræ and ribs. Specimen 2½ inches long. Pieman River (Atkinson).

Fam. XXXIII. SCOMBRESOCIDÆ.

121. HEMIRHAMPHUS INTERMEDIUS, Cant. (A.Z.) *The Garfish.***

D. 15 - 17. A. 18 - 20. P. 11.

Günth. Cat., VI., p. 260, Allp. MS. Macl. Cat., 867.

Abundant during the summer months, and caught largely in seine-nets in our estuaries. They are valuable market fish, although it is to be regretted that their mode of capture by the seine-net appears to commit great havoc among the young of other valuable food fishes.

Fam. XXXIV. CYPRINIDÆ.

122. CARASSIUS VULGARIS, Nilsson. (I.) *The European Carp.*

123. CARASSIUS AURATUS, L. (I.) *Gold Fish.*

124. TINCA VULGARIS, Cuv. (I.) *English Tench.*

Fam. XXXV. GONORHYNCHIDÆ.

125. GONORHYNCHUS GREYI, Rich. (A.Z.) *Sand Eel.**

B. 4. D. 11 - 13. A. 9. V. 9. Cæc. pylor. 6 - 9.

Günth. Cat., VII., p. 373. Allp. MS. Macl. Cat., 883.

Not uncommon in the Derwent.

Fam. XXXVI. CLUPEIDÆ.

126. ENGRAULIS ENCRASICHOLUS *(var. antipodum)*, L. *The Anchovy.**

B. 12 - 13. D. 16 - 17. A. 18 - 20. L. lat. 48 - 50. Vert. 46 - 47.

Günth. Cat., VII., p. 385. Allp. MS. Macl. Cat., 885. *(Antarticus.)*

Abundant; frequently entering rivers Derwent, Tamar, and Huon.

It is surprising that no effort has been made locally to utilise this valuable fish. Fishermen can have no interest in attempting to capture the shoals seen frequently by them towards the mouth of the Derwent, so long as there is an absence of proper curing establishments. Hobart is very favourably situated as a centre for a fishing industry of this kind.

127. CLUPEA SPRATTUS, L. (E.) *The Sprat.**
B. 6 - 7. D. 15 - 18. A. 17 - 20. V. 7. L. lat. 47 - 48. Vert. 47 - 49.
Günth. Cat., VII., p. 419. Proc. Zool. Soc., 1871, p. 672. Allp. MS. Macl. Cat., 899.
Large shoals of these fish are observed by the fishermen to pass along the coasts at certain seasons, attended usually by their rapacious enemies, the Barracouta and Kingfish. Small numbers ascend the Tamar as far as Launceston during March each year. Sometimes the main body mistakes its course, as in 1844, when the Sprats entered the Derwent in immense numbers. The late Mr. Calder gave a description of an immense shoal which had been driven ashore and suffocated, in Simmons' Cove, Bruni Island, in 1867 (Proc. Roy. Soc. Tas., May, 1867). In speaking of the mass of fish thus destroyed at one time, he estimated that there was not less than three hundred tons, which he reckoned would amount to forty-three million eight thousand individual fishes. Dr. Günther, in quoting this instance, urges that "attempts ought to be made to utilise the Tasmanian Anchovy and Sprat in the same way as it is done in Europe." The Sprat does not seem to visit the Australian coasts.

128. CLUPEA SAGAX, Jenyns. *The Pilchard.* (A.)
B. 7. D. 18. A. 18 - 19. L. lat. 50 - 54. L. tr. 13.
A series of more or less distinct blackish spots along the side.
Günth. Cat., VII., p. 443. Allp. MS. Macl. Cat., 890.
Not so common as the sprat. Tasmania (Allport).

Fam. XXXVII. SYMBRANCHIDÆ.

129. CHILOBRANCHUS DORSALIS, Rich. (A.)
Paired fins none. Vertical fins rudimentary. Colour blackish brown, with a median dorsal line.
Günth. Cat., VII., p. 18. Allp. MS. Macl. Cat., 908.
Tasmanian specimens 90 mil. long. (Gunn and Günther.)

130. CHILOBRANCHUS RUFUS, Macleay. (A.)
Colour red, with six or seven blue or dark purple spots along each side. Length three inches.
Macl. Cat., 909. Tasmania (Macleay).

Fam. XXXVIII. MURÆNIDÆ.

131. ANGUILLA AUSTRALIS, Rich. (A.) *The Common Eel.***
Dorsal fin begins at a short distance in advance of anal.
Günth. Cat. VIII., p. 36. Allp. MS. Macl. Cat., 913.
Abundant in all rivers. Reaches to an immense size in the South Esk River.

132. CONGER VULGARIS, Cuv. *The Common Conger Eel.***
Dorsal fin begins nearly opposite to extremity of pectoral fin.
Günth. Cat., VIII., p. 38. Allp. MS. Macl. Cat., 913.
Brought to Hobart market in considerable quantities.

133. Conger Wilsoni, Cast. *Conger Eel.*
Dorsal fin commences behind the extremity of pectoral fin.
Cast., Proc. Zool. Soc. Vic., vol. I., p. 193. Macl. Cat., 914.
Tasmania (Cast).

134. Murænichthys breviceps, Günth.
Origin of dorsal twice as distant from vent as from gill-opening.
Günth. Ann. and Mag. Nat. Hist., 1876, v. XVII., p. 401.
Allp. MS. Macl. Cat., 922.
Rare. Tasmania (Allport).

135. Congromuræna habenata, Rich. (A. Z.) *Silver Eel.*
Upper jaw much projecting beyond lower. Dorsal commences immediately behind the pectoral.
Günth. Cat., VIII., p. 42. Macl. Cat., 916.
Rare. One specimen in Roy. Soc. Museum, caught in the Derwent.

Fam. XXXIX. PEGASIDÆ.

136. Pegasus lancifer, Kaup.
D. 5. A. 5. P. 15. V. 2.
Günth. Cat., VIII., p. 149. Allp. MS. Macl. Cat., 946.
Not uncommon in the Derwent.

Fam. XL. SYNGNATHIDÆ.

137. Syngnathus semifasciatus, Günth. (A.) *Pipe Fish.*
D. 38. Osseous rings, 21 + 49.
Günth. Cat., VIII., p. 162. Allp. MS. Macl. Cat., 947.
Not uncommon.

138. Stigmatophora argus, Rich. (A.) *Pipe Fish.*
D. 49 - 52. Osseous rings, 20 + about 75.
Günth. Cat., VIII., p. 189. Allp. MS. Macl. Cat., 965.
Common.

139. Stigmatophora nigra, Kaup. (A.) *Pipe Fish.*
D. 39 - 40. Osseous rings, 17 + about 72.
Günth. Cat., VIII., p. 190. Macl. Cat., 966.
Enters the Tamar occasionally.

140. Stigmatophora gracilis, Macleay. (T.) *Pipe Fish.*
D. 58. Osseous rings, 20 + 56.
Macl. Cat., 970. Length, 5 inches. Tasmania (Macleay).

141. Solenognathus spinosissimus, Günth. *Pipe Fish.*
D. 35. Osseous rings, 27 + 55.
Günth. Cat., VIII., p. 195. Allp. MS. Macl. Cat., 973.
Common, Derwent.

142. Phyllopteryx foliatus, Shaw. (A.)
D. 30. Osseous rings, 18 + 35.
Günth. Cat., VIII., p. 196. Allp. MS. Macl., 974.
Common.

143. HIPPOCAMPUS ABDOMINALIS, Kaup. (T.) *Sea-horse.*
D. 28 - 31.
Günth. Cat., VIII., p. 199. Allp. MS. Macl. Cat., 978.
Abundant.

144. HIPPOCAMPUS BREVICEPS, Peters. *Yellow-ringed Sea-horse.*
D. 19 - 21, standing on five rings.
Günth. Cat., VIII., p. 200. Allp. MS. Macl. Cat., 980.
Common.

Fam. XLI. SCLERODERMI.

145. MONOCANTHUS GUNNII, Günth. *Dark Brown Leather-jacket.*
D. 34. A. 33. Skin velvety, dark brown, mottled with black.
Günth. Cat., VIII., p. 247. Allp. MS. Macl. Cat., 993.
Common.

146. MONOCANTHUS CONVEXIROSTRIS, Günth. *Grey Leather-jacket.*
D. 34 - 37. A. 32 - 35. Small spiny distinct scales.
Günth. Cat., XIII., p. 248. Allp. MS. Macl. Cat., 994.
Common.

147. MONOCANTHUS PERONII, Holland. *Pale brown Leather-jacket.*
D. 33 - 35. A. 33. Scales spine-like, with swollen tips like a mushroom.
Günth. Cat., VIII., p. 249. Allp. MS. Macl. Cat., 997. (Güntheri?).
Common.

148. MONOCANTHUS GUNTHERI, Macleay, (M.Peronii, Holland).
Macl. Cat., 998.

149. MONOCANTHUS SPILOMELANURUS, Quoy & Gaim. (A.) *Golden-streaked Eye Leather-jacket.*
D. 30 - 32. A. 28 - 32.
Günth. Cat., VIII., p. 250. Allp. MS. Macl. Cat., 1000.
Common, Sandy Bay.

150. MONOCANTHUS MACULOSUS, Rich. (A.) *Small brown Leather-jacket.*
D. 29 - 33. A. 29 - 30. P. 12.
Günth. Cat., VIII., p. 25. Allp. MS. Macl. Cat., 1001.

151. MONOCANTHUS BAUDINI, Cast. (A) *Lozenge-scaled Leather-jacket.*
D. 35. A. 31. P. 13. C. 8. Scales lozenge-shaped, each armed with three or four spinelets.
Proc. Zool. Soc. Vic., Vol. II., page 55. Macl. Cat., 1007.
Tasmania (Cast).

152. MONOCANTHUS MELAS, Günth. *Black Leather-jacket.*
D. 34. A. 34. Colour brownish black; two whitish bands across chin.
Günth. Ann. and Mag. Nat. Hist., 1876, vol. XVII., p. 402. Allp. MS. Macl. Cat., 1014.
Tasmania (Allport).

153. MONOCANTHUS RUDIS, Rich. *White-banded Leather-jacket.*
D. 34 - 35. A. 34. Brown, uniform or with four indistinct broad, whitish, longitudinal bands.
Günth. Cat., VIII., p. 244. Allp. MS. Macl. Cat., 1020.
Common.

154. MONOCANTHUS HIPPOCREPIS, Quoy and Gaim. *Blue-banded Leather-jacket.*
D. 35 - 37. A. 33 - 36. Brown, with undulated bluish bands on the snout and along the lower side.
Günth. Cat., VIII., p. 246. Allp. MS. Macl. Cat., 992.

155. OSTRACION AURITUS, Shaw. *Trunk-fish.*
Spines, 1 above hind part of orbit, pointing backward.
Günth. Cat., VIII., p. 266. Allp. MS. Macl. Cat., 1036.
Common.

156. OSTRACION ORNATUS, Gray. *Yellow-striped Trunk-fish.*
Spine, 1 above middle of orbit, nearly erect, pointing up and out.
Günth. Cat., VIII., p. 267. Allp. MS. Macl. Cat., 1037.
Common.

Fam. XLII. GYMNODONTES.

157. TETRODON HAMILTONI, Rich. *Toad Fish.*
Back and abdomen covered with minute spines; back and sides marbled with roundish dark brown blotches.
Günth. Cat., VIII., p. 280. Allp. MS. Macl. Cat., 1045.
Common. This globe-fish is stated to be highly poisonous taken as food. It is abundant, entering fresh water at Cataract Bridge on the Tamar.

158. TETRODON RICHEI, Freminv. *Globe Fish.*
Body densely covered with minute spines; light brown above, lower parts uniform white.
Günth. Cat., VIII., p. 285. Allp. MS. Macl. Cat., 1046.
Common in all our estuaries. They inflate their bodies and emit singular sounds when being captured. When inflated the belly floats uppermost.

159. CHILOMYCTERUS JACULIFERUS, Cuv. (A.) *Porcupine Fish.*
D. 16. A. 15. P. 19. C. 9.
Three black spots on each side of the body; jaws without median suture; only 5 spines, in a straight longitudinal series from parietal spine to side of dorsal fin.
Günth. Cat., VIII., p. 313. Macl. Cat., 1063.
Common.

160. Atopomycterus nychthemerus, Cuv. *Slender-spined Porcupine Fish.*

All the spines slender, without ridge; upper part of tail without spine; snout to dorsal, 13 spines in transverse series.

Günth. Cat., VIII., p. 315. Allp. MS. Macl. Cat., 1065.

161. Orthagoriscus mola, L. *Sun Fish.*

D. 17 - 18. A. 14 - 17. C. 12 - 16. P. 12 - 13. Vert. 10 - 7.

Günth. Cat. VIII., p. 317. Allp. MS. Macl. Cat., 1066.

Captured occasionally.

Sub-class II. Chondropterygii.

Fam. XLIII. CHIMÆRIDÆ.

162. Callorhynchus antarticus, Lacep. *The Elephant Fish.*

Snout with a cartilaginous prominence terminating in a cutaneous flap.

Günth. Cat., VIII., p. 351. Allp. MS. Macl. Cat., 1070.

Common in the estuaries of the Derwent and Tamar.

Fam. XLIV. CARCHARIDÆ.

(Eye with a nictitating membrane, an anal fin, two dorsals.)

163. Carcharias glaucus, L. (E.) *The Blue Shark.*

An anal fin. Teeth serrated, those of upper jaw oblique. First dorsal opposite to space between pectoral and ventral fins. Without spine. Mouth inferior.

Günth. Cat., VIII., p. 353. Allp. MS. Macl. Cat., 1074.

Common.

164. Galeus canis, Rondel. (E.) *The Tope.*

Teeth, 34 : 34. The second dorsal fin is only one-third of the size of the first, and somewhat in advance of anal.

Günth. Cat., VIII., 379. Allp. MS. Macl. Cat., 1079.

(Australis.)

Mr. Macleay is of opinion that the Australian form is specifically distinct from the European form. It is termed the "School Shark" by the Port Jackson fishermen. Length about six feet.

165. Zygæna malleus, Shaw. (E.) *The Hammer-headed Shark.*

The length of the hinder margin of one side of the hammer is nearly equal to its width near the eye.

Günth. Cat., VIII., p. 381. Allp. MS. Macl. Cat., 1080.

166. Mustelus antarticus, Günth. (A.)

Origin of dorsal fin behind the inner posterior angle of pectoral. No spine. Teeth small, numerous, similar in both jaws, arranged like pavement, obtuse or with very indistinct cusps.

Günth. Cat., VIII., p. 387. Allp. MS. Macl. Cat., 1081.

Common.

Fam. XLV. LAMNIDÆ.

(No nictitating membrane. An anal fin. Two dorsals, the first opposite to the space between pectorals and ventrals. Nostrils not confluent with the mouth, which is inferior. Spiracles none, or minute.)

167. LAMNA CORNUBICA, Flem. *Porbeagle* or *Blue Shark.*
Teeth 13 - 16 : 12 - 14. Lanceolate, not serrated. Third tooth either side upper jaw small.
Günth. Cat., VIII., p. 389. Allp. MS. Tasmania (Allport.)

168. ODONTASPIS AMERICANUS, Mitch. (A.) *The Grey Nurse.*
Teeth large, awl-shaped, with small additional basal cusps.
Günth. Cat., VIII., p. 392. Allp. MS. Macl. Cat., 1084.
Not uncommon. Length, 10 feet.

169. ALOPECIAS VULPES, L.
Teeth of moderate size, triangular, not serrated. Third tooth upper jaw smallest.
Günth. Cat., VIII., p. 393. Allp. MS. Macl. Cat., 1085.
Tasmania (Allport). Length, seven feet.

Fam. XLVI. NOTIDANIDÆ.

170. NOTIDANUS INDICUS, Cuv.
One dorsal fin only, without spine, opposite to the anal. A single median pointed tooth in upper jaw. Lower tooth with lateral cusps only.
Günth Cat., VIII., p. 398. Allp. MS. Macl. Cat., 1086.
Tasmania (Allport). Length, five feet.

Fam. XLVII. SCYLLIDÆ.

(No nictitating membrane. The first dorsal fin above or below the ventrals. An anal fin. Mouth inferior. Teeth small, several series being generally in function.)

171. SCYLLIUM MACULATUM, Bl.
Teeth of the lower jaw of moderate size, with a long median cusp, and a pair of small cusps on each side. Brownish above and below, with scattered brown spots. Nasal valves confluent.
Günth. Cat., VIII., p. 401. Macl. Cat., 1087.
Length, two feet. Doubtful.

172. SCYLLIUM LATICEPS, Dum.
Teeth very small tricuspid. Nasal valves not confluent, separated by a broad interspace. Brownish, marbled with darker.
Günth. Cat., VIII., p. 404. Allp. MS. Macl. Cat., 1088.
Tasmania (Allport).

173. PARASCYLLIUM VARIOLATUM, Dum.
Teeth small lanceolate, only those of lower jaw with indistinct lateral cusps. The two dorsal fins subequal, the first distant from root of ventral. Anal entirely in advance of

second dorsal. Dark brown above, with more or less distinct black spots.

Günth. Cat., VIII., p. 410. Allp. MS. Macl. Cat.

Tasmania (Allport). Length, two to three feet.

174. Crossorhinus barbatus, L. *Wobbigong.*

Spiracles wide, oblique slits side of head, with skinny appendages (about seven). Upper parts brown, marbled with grey. A whitish spot behind the spiracle.

Günth. Cat., VIII., p. 414. Allp. MS. Macl. Cat., 1095.

Common. Length, five to seven feet.

Fam. XLVIII. CESTRACIONIDÆ.

(No nictitating membrane. Two dorsal fins, the first opposite to the space between pectoral and ventral fins. An anal. Nasal and buccal cavities confluent. Teeth obtuse, several series being in function. Padlike.)

175. Heterodontus Phillipii, Lacep. *Port Jackson* or *Bull-head Shark.*

Günth. Cat., VIII., p. 415 (Cestracion). Allp. MS. Macl. Cat., 1097.

Common in the Derwent and Tamar. Known to the fishermen by the name of Bull-head Shark.

Fam. XLIX. SPINACIDÆ.

(No nictitating membrane. No anal fin. Pectorals not notched at their root. Snout with lateral armature. Each dorsal with a spine.)

176. Acanthias vulgaris, Risso. (A.) *Spotted Spiny Dog.*

Origin of dorsal opposite or behind the inner posterior angle of pectoral.

Günth. Cat., VIII., p. 418. Allp. MS. Macl. Cat., 1099.

Very abundant.

177. Acanthias Blainvillii, Risso. (A.) *Spiny Dog.*

First dorsal conspicuously in advance of the inner posterior angle of pectoral.

Günth. Cat., VIII., p. 419. Allp. MS. Macl. Cat., 1100.

Abundant. Scarcely distinct from *A. vulgaris.*

Fam. L. RHINIDÆ.

(No anal fin. Pectorals deeply notched in front at the root.)

178. Rhina squatina, L. *The Angel Shark.*

Mouth anterior. Pectoral fins large, expanded, in the plane of the body.

Gunth. Cat., VIII., p. 430. Allp. MS. Macl. Cat., 1103.

Common.

Fam. LI. PRISTIOPHORIDÆ.

(Snout much produced, with lateral teeth, saw-like.)

179. PRISTIOPHORUS CIRRATUS, Latham. (A.) *Saw Fish.*
Sets of teeth in upper jaw, 42.
Günth. Cat., VIII., p. 432. Allp. MS. Macl. Cat., 1104.
Not common.

180. PRISTIOPHORUS NUDIPINNIS, Günth. (A.) *Saw Fish.*
Sets of teeth in upper jaw, 35 - 39.

SECOND SUB-ORDER *BATOIDEI. (Rays.)*

(Body depressed. Gill-openings ventral. Tail long. No anal fin. Dorsal fin, if present, on the tail.)

Fam. LII. RHINOBATIDÆ.

(Trunk passing gradually into the strong and long tail, which is provided with two dorsal fins and a caudal. Pectorals not extending to the snout.)

181. TRYGONORHINA FASCIATA, Mull and Henle. *The Fiddler.*
A series of obtuse distant tubercles along the median line of the back.
Günth. Cat., VIII., p. 400. Allp. MS. Macl. Cat., 1111.
Not uncommon.

Fam. LIII. TORPEDINIDÆ.

(Trunk a broad smooth disc. Rayed dorsal and caudal fins generally present. An electric organ.)

182. NARCINE TASMANIENSIS, Rich. *Electric Torpedo.*
Disc elliptical. Colour brownish.
Günth. Cat., VIII., p. 452. Allp. MS. Macl. Cat., 1112.
Length up to six feet. Not common.

Fam. LIV. RAJIDÆ.

(Disc broad, rhombic, generally rough. Tail with a longitudinal fold on each side. Pectorals extending to the snout. No electric organ. No serrated caudal spine.)

183. RAJA LEMPRIERI, Rich. *Thorn-back.*
Spines on the superciliary edge, on the mesial line, between head and humeral cartilage, and a row down middle of tail directed alternately left and right.
Günth. Cat. VIII., p. 463. Allp. MS. Macl. Cat., 1114.
Common.

Fam. LV. TRYGONIDÆ.

(Pectoral fins uninterruptedly continued to and confluent at the extremity of snout. Tail armed with spine, but without lateral longitudinal folds.)

184. Urolophus cruciatus, Lacep. *Stingaree.*
Yellowish uniform, or with one or three blackish longitudinal bands, crossed by others of same colour.
Günth. Cat., VIII., p. 486. Allp. MS. Macl. Cat., 1121.
Abundant in the mud-flats of land-locked bays.

Fam. LVI. MYLIOBATIDÆ.

(Sides of the head free from the pectoral fins; snout with a detached pair of cephalic fins.)

185. Myliobatis aquila, L. *Eagle* or *Whip-tail Ray.*
Median teeth of upper jaw four to six times as broad as long.
Günth. Cat., VIII., p. 489. Allp. MS. Macl. Cat., 1122.
Tasmania (Allport).

Sub-class Cyclostomata.

Fam. LVII. PETROMYZONTIDÆ.

186. Mordacia mordax, Rich. (A.) *Common Lamprey.*
Body eel-shaped. Sectional disc elliptic, with a free lip behind. The first dorsal distant from second.
Günth. Cat., VIII., p. 507. Allp. MS. Macl. Cat., 1127.
Abundant at certain seasons, clinging to the sides of perpendicular rocks under mill-shoots, Cataract Gorge, North Esk, Launceston.

187. Geotria Allporti, Günth. *The Pouched Lamprey.*
Günth., Proc. Zool. Soc. 1871, p. 675. Allp. MS. Macl. Cat., 1131.
Not uncommon in fresh water, Derwent, North Esk, St. Leonard's.

Sub-class Leptocardii.

Fam. LVIII. CIRROSTOMI.

188. Branchiostoma lanceolatum, Pall. *The Lancelet.*
Transparent; slightly iridiscent.
Günth. Cat., VIII., p. 513. Allp. MS. Macl. Cat., 1133.
Tasmania (Allport).

ADDENDA.

The following were described or came under notice during the publication of this work.

1. Lophotes Guntheri, Johnston.

B. 6. D. 221+36. A. 6·14. P. 14. V. 1·5.
L. lat. 208. Reticulate markings.
Johnston, (Proc. Roy. Soc. Tas., 1882.)

Rare.

2. Chilodactylus Mulhalli? Macleay. *The Butter Fish.*

B. 6. D. 15 : 1·25. A. 3·9. V. 1·5.
L. lat. 53. L. tr. 6·16.

Length of head nearly equal to depth of body, and contained four and a-half times in total length. Fifth, sixth, and seventh spine of dorsal longest. Body elongate, and somewhat rounded. Mouth protractile. No teeth on vomer or palatines. Villiform teeth on jaws. Opercles covered with small scales. Scales on body three quarters of an inch square, with margins darker and reduced to a flaccid membrane. Pectoral composed of eight branched and six simple rays, the second of the latter longest, and reaching to a vertical drawn through thirteenth spine. Uniform brownish black. Total length, 29 inches.

I have referred this species doubtfully to *C. Mulhalli*, Macleay. It appears to agree with the species named in every respect, with the exception of the number of anal spines,—the Sydney species having 2, and the Tasmanian 3. It would be well to examine a greater number of specimens to ascertain if this feature be constant.

3. Apogon Lemprieri, nov. sp.

B. 7. D. 6 : 1·10. A. 2·9. L. lat. 27. L. tr. 3·10.

The height of body is equal to length of head, and is contained nearly three times in the total length. Snout short; length about half the diameter of eye, which latter is fully one-third of the length of the head. The maxillary scarcely reaches to the vertical from the posterior margin of eye. Lower jaw prominent. Two minute cavities on upper part of snout. Hinder margin of præoperculum minutely dentate. Anterior ridge simple. Spine of operculum reduced to a soft pointed membrane. No dark spots on root of caudal.

Uniformly brownish, with iridescent shades of purple, gold, and light blue; lighter towards belly. Tips of ventral and dorsal fins blackish. Other fins light reddish.

Total length of specimen caught at Dunkley's Point, Sandy Bay, 4 inches.

Measurement—

Total length	4	inches.
Length of body	$3\frac{1}{5}$	„
Head	$1\frac{3}{8}$	„
Greatest depth	$1\frac{3}{8}$	„
Diameter of eye	11	mil.
Length of snout	5	„
Anterior dorsal, 1st spine	7	mil. long.
„ 2nd spine	16	„
„ 3rd spine	15	„
„ 4th spine	13	„
„ 5th spine	8	„
„ 6th spine	3	„
Posterior dorsal, 1st spine	13	„
Longest ray, ditto	19	„
Longest ray of anal fin	19	„
1st spine ditto	3	„
2nd spine ditto	19	„
Longest ray of ventral fin	21	„

4. Gobiesox cardinalis, Ramsay.
D. 8. A. 6. V. 4. P. 22.
Proc. Linn. Soc. N.S.W., vol. VII., p. 148.

5. Coryphænoides Tasmaniæ (nov. sp.), *Tasmanian Whiptail.*
B. 7. D. 15 : 103. A. 90 (?). V. 8.

Snout short and obtuse, not projecting beyond mouth. Length nearly six times that of the head, which latter is longer than the greatest depth of body, and measures three times the length of snout. Diameter of eye scarcely equal to length of snout. Barbel rudimentary. Scales small, smooth, without ridges or spines. There are eight series of scales between anterior dorsal and the lateral line. The lateral line is composed of about 133 series of scales, the pierced scales being interrupted. First dorsal is composed of 15 feeble jointed rays, the length about twice the diameter of eye. The second dorsal commences near to the termination of first dorsal. The anus is situate under the 17th ray of second dorsal, and nearer to snout than to tail by twice the length of snout. Uniform silvery plumbous, with a purplish shade. Observed in schools at certain seasons, between Port Davey and Macquarie Harbour, and enters the Derwent occasionally. The specimen from which the description has been taken was captured at Kangaroo Bluff by Dr. Graham. Total length, $15\frac{1}{4}$ inches.

It is very probable that *C. denticulatus*, Rich, which is found on the South Australian and New Zealand coasts, also inhabits Tasmanian waters. The latter species is distinguished from that now described by having 11 rays in first dorsal, and

five series of scales between the anterior dorsal and lateral line. *C. variabilis*, Gunth., is closely allied, but the latter has the second dorsal distant from the first; the scales have fine ridges, and each ridge is composed of several spines.

Bibliography.

Rev. J. E. Tenison Woods, F.L.S., &c.:

Fish and Fisheries of New South Wales. Sydney, 1882. (213 pp.)

ERRATA.

Pp. 86, 105, and 121, *for* Blennidæ *read* Blenniidæ.

NOTE AND DESCRIPTION OF THE FIRST DISCOVERED REPRESENTATIVE OF THE GENUS *PUPA* IN TASMANIA.

By R. M. Johnston, F.L.S., etc.

[*Read* 17*th April*, 1882.]

Pupa, *Draparnaud.*

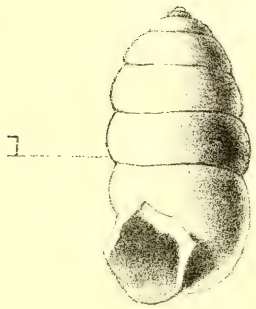
Animal short, stout, acute behind, its upper tentacles developed, its lower ones short, or almost obsolete. Shell oblong-cylindrical, many whorled, often rather thick, mostly ribbed, sometimes deeply umbilicated, generally rather obtuse at the apex; aperture somewhat squarely ovate, generally more or less toothed; lip thickly reflected.

Pupa Lincolnensis, *Angas.*

Pupa Tasmanica, R. M. Johnston.

Shell minute, sinistral, thin, of a uniform light fawn colour, sub-pellucid, oblong-cylindrical, obliquely finely lirate; suture somewhat impressed; spire scarcely contracted towards apex, which is suddenly obtusely rounded; whorls, 6, slightly convex; aperture somewhat squarely ovate, subvertical, with a moderately prominent tooth; peristome simple, margins distant, united by a callous lamina; anterior and columellar margins slightly reflexed. Length, 3 mil.; diam., 1·75 mil. Habitat, sand dunes, Swansea. Abundant.

This interesting species was obtained by me recently in great numbers in the shallow depressions of the sand dunes, where the bleached dead shells were lodged by the action of the wind. They were associated with *Helix Furneauxensis*, Petterd;



PUPA LINCOLNENSIS, (ANGAS.)

H. pictilis, Tate; *H. Stanleyensis*, Petterd; *Bulimus Dufresni*, Leach; and *B. Tasmanicus*, Pfr. The last mentioned species was found in abundance upon the leaves of *Xerotes longifolia*, where, no doubt, among the roots the living specimens of *Pupa Lincolnensis* may be found. The name P. Tasmanica, first given to the shell, has been withdrawn, as on comparison with Angas' *P. Lincolnensis*, kindly given me by Mr. Petterd, I found that the Tasmanian form was not specifically distinct from it.

Hitherto conchologists were of opinion that the genus *Pupa* had no representatives in Tasmania. The discovery of the first representative will, therefore, be of more than usual interest to local naturalists.

Hobart,
December 12, 1881.

ON THE STATE OF THE SURVEYS IN TASMANIA.

By G. McIntyre, Authorised and Licensed Surveyor,
Christchurch, New Zealand.

[*Read 9th May*, 1882.]

At recent meetings of the Royal Society the question of the present state of the surveys in Tasmania and the best methods to be adopted for placing them upon a sound basis was under discussion, and various suggestions were made on the subject. Subsequently, on the 27th October, a letter was published in *The Mercury* under the heading "Field Surveyors," which was intended as a reply to the unfavourable comments which had been made upon the existing survey system. This letter was signed by Mr. J. E. Calder, a gentleman who for several years held the office of Surveyor-General for Tasmania, and is therefore entitled to consideration as dealing with a subject with which it is only reasonable to assume he is well acquainted. Statements, however, are made and reasonings adopted which are open to criticism; while the general impression conveyed to the mind of the unprofessional reader amounts to this:—That the surveys of Tasmania are as good as it is possible to make them in a timbered and rugged country, and that a trigonometrical survey is practically useless.

A system of survey for a large extent of country cannot be considered as in any degree accurate or reliable, unless it is based upon a reference to the True Meridian, which is constant and not subject to the fluctuations and uncertainties attaching,

even under the most favourable circumstances, to the Magnetic Meridian. It is obvious that an unalterable meridian to which all bearings are referred, is, in itself, and apart from any triangulation, of very great value; and when, in addition, the sectional surveys are connected with the stations of a trigonometrical survey, whose relative positions have been accurately determined, a means is afforded by which the boundaries of such sections can be re-established in case of dispute or of obliteration. Such a system is in force in New Zealand and in some of the other colonies—Victoria and West Australia, for example. An accurate triangulation is recognised as an essential and indispensable basis. With this triangulation, sectional surveys are connected, and the position of each peg is tabulated relatively to some trigonometrical station. The limit of error allowed for minor triangulation is two links in the mile, and for sectional work eight links in the mile, the great majority of the surveys executed under this system being actually much within the limit. The true meridian for each meridianal circuit, and which governs the triangulations, is observed as the astronomical station of the circuit. Under a correct minor triangulation, the accumulation of errors inseparable from a system of mere traverse surveys built up the one upon the other, and which in a large extent of country must be very considerable, even where the traverse surveys are carefully executed, is avoided, and the error is not carried forward, but is confined to the country between the trigonometrical stations. The actual error in any circuit traverse, or in a traverse from one trigonometrical station to another, is easily computable by the solution of a series of right-angled triangles, each traverse line being the hypotenuse, and the bearing supplying the angle.

The system in force in Tasmania, looked at from any point of view, must be regarded as extremely faulty, inasmuch as :—

(1.) It is not based upon triangulation.

(2.) The sectional surveys are built up one upon the other, across large areas of country.

(3.) The surveys are not subject to any mathematical check, such as is afforded by a reduction of the traverses to their co-ordinates on the meridian and perpendicular.

(4.) There is no systematic field inspection.

(5.) The limit of error allowed is so great as to preclude anything like accuracy; the confusion and discrepancies arising from this source alone rendering it impossible to re-establish boundaries, even where an admitted starting point is available, within more than a rough approximation.

(6.) In the cities and towns there are no standard survey lines laid down from which to define the true frontage lines of

blocks, and with which to connect the various town surveys required from time to time under the Real Property Act.

(7.) The surveys are made to independent magnetic meridians, the bearings of the initial line in each survey being derived from the compass or needle-reading.

(8.) The office plans and compilations are constructed entirely upon the "building-up" system, without the check afforded by the connection of surveys with accurately determined trigonometrical stations.

With regard to sub-section (7) above, it is perhaps right to note that an independent or isolated survey, executed under the method therein indicated, may be extremely accurate in itself, that is within its own boundaries; but it is obvious that the surveys, effected by a number of surveyors, working to their own independent compass meridians, which, even apart from special local attraction, are certain to vary considerably—cannot be properly compared as to boundaries and relative positions, and are therefore "floating" to an extent which is unknown and practically unlimited.

With respect to sub-section (5), it is not unreasonable to assume that where a certain limit of error is recognised, a considerable proportion of the surveys, especially in rough country, will come nearly up to that limit. The limit of error formerly allowed in Tasmania, and probably still recognised, was 32 links in the mile (1 in 250), a limit three times greater than a fair allowance. A limit of error of 8 links in the mile (1 in 1,000) for ordinary sectional work, is regarded as a maximum allowance under any system professing to give reasonably accurate results.

The statements made by Mr. Calder in the letter above referred to, may be fairly summarised as follows:—

1. That Tasmania is so densely wooded and rugged that it is impossible to adopt a really accurate and scientific system of survey, and its peculiarities "will for ever enforce peculiar modes of surveying."

2. That the setting aside of the compass meridian in favour of the True Meridian would, on account of obstructions, involve a "delay of several hours a day in the frequent determination of the True Meridian, which would be required of the surveyor, in many districts, every time the boundary line ran into a tree too massive to be removed."

3. That "trees are not to be passed by without liability to error;" and that he has found in practice no "better method of mastering the difficulty than that of observing the compass bearing of the line at the point of obstruction, and then proceeding in the same direction from its opposite side. By this process the error is not an increasing one, and though

pretty often repeated in a day's work, will generally not exceed half-a-dozen yards in a mile."

4. That the great errors existing in the maps are really errors of compilation in the office, and not errors of survey in the field.

5. That it is not desirable to undertake the reconstruction of the maps.

6. That the trigonometrical survey executed many years ago was a fraud, and entirely unreliable.

7. That "in the days of field survey inspection" the work of nineteen-twentieths of the surveyors "stood the severest tests that could be applied to it."

It will be convenient to consider these points *seriatim*.

1. Densely-wooded and rugged country.—It is better to show what has been done in other countries, than to advance mere theories; and it can be proved that these obstacles are by no means insuperable. In New Zealand there is to be found as densely-wooded and rugged territory as any that has ever been surveyed in Tasmania, and yet it is found practicable to apply an accurate system throughout. Extracts from the Annual Reports (1880) of some of the chief surveyors will furnish evidence in support of this statement.

The Chief Surveyor for Auckland district says:—"We have in hand at this time 23,000 acres, all of which is situated in the most broken, mountainous, and difficult part of this island." The work of some of the surveyors is "situated in the densely-wooded and precipitous mountains of the East Cape. . . . I wish to state my opinion, based on a $3\frac{1}{2}$ years' trial, that the system of survey . . . has been found to work as well in our forest-clad, broken country of the north, as in the open plains of the south."

In the Wellington district the sectional surveys, amounting to over 93,000 acres, are stated to be "all under forest."

The Chief Surveyor for Nelson speaks of the country, in which a large part of the surveys during the year were situate, as "rugged, mountainous, heavily-timbered, with dense undergrowth," and adds, "the bulk of applications to be surveyed are in isolated sections, or in small groups . . . in many cases only accessible by rough bush packtracks. . . . . Mining surveys in several localities are 3,000ft. and 4,000ft. above sea-level, and generally in bush on rugged mountain sides."

Referring to a portion of the triangulation in Otago, the chief surveyor for that district says, "This work is spread over 30 miles of wild Alpine country, full of bush, and intersected by dangerous snow-fed rivers."

Of the surveys in Southland, the report states that "50 sections, embracing 4,500 acres, were in bush. . . . The gold-mining applications were in densely-timbered broken country."

Enough has been quoted to dispose of the first point advanced by Mr. Calder.

2 and 3. Bush lines and meridian.—One would be led to infer, from the statements made, that the prismatic compass, or the compass attached to the theodolite, afforded the only available method of obtaining the bearings or azimuths of lines, whereas it ought to be taken for granted, as a matter of course, that even in the case of a survey, based upon an independent magnetic meridian, the initial line of the survey was the only one observed by the compass, the bearing thus obtained being transferred to the plate, and all subsequent readings derived therefrom. To whatever meridian the work is done, or from whatever source derived, whether compass or astronomical, the veriest tyro must be aware that the bearings are carried on by the theodolite, and that the proof of accuracy is found in the extent of accordance in the closure, either upon one of the lines of the survey in hand, or at a trigonometrical station. The argument advanced has therefore no foundation either in theory or in practice. If it has been in any degree the practice to make surveys by compass only, it ought to be no matter for surprise if the discrepancies in the various surveys are found to be startling. Still less should those discrepancies be a matter for surprise when we have an authoritative assurance that the most favourable results have been obtained from such a process as running a line by compass bearing to some large tree, and then, after transferring the instrument by guess to a supposed corresponding point on the other side, carrying on the line again by compass bearing; and this not only in an isolated case, but "a dozen or twenty times in every mile." It is also urged that by the mysterious correction of "compensation" the error "will generally not exceed half-a-dozen yards in the mile." Admittedly, therefore, the error may in some cases be much greater; but even what is considered a favourable instance depends entirely upon chance or luck. The errors, it is said, compensate each other to a great extent; but it needs hardly to be stated that the errors may be all the one way—all in the same direction—and then instead of the compensation of errors bringing the net error down to "half-a-dozen yards in the mile," the error may be increased indefinitely.

4 and 5. Errors in maps.—The statements made under this head only furnish an additional condemnation of the system in force. If the surveys are not trigonometrically connected and homogeneous, it is impossible to construct correct general maps, and it need be no matter of surprise that the draftsmen should have failed in the task assigned them, and that the maps are inaccurate. The reconstruction of the maps could only be undertaken, with any hope of placing them upon a more

satisfactory basis, concurrently with or subsequent to the field determination of the true relative positions of a number of points in the several districts.

6. Former triangulation useless.—This assertion, even if established, in no way detracts from the advantages of a trigonometrical survey honestly done, and reliable as a basis of detail operations. Nor is there anything in the nature of such a survey to make it a matter of uncertainty or speculation. If funds are forthcoming, the result ought not to be problematical.

7. Field inspection.—It would be interesting to learn what extent of surveys were rejected or condemned "in the days of field inspection." As the "severest tests" recognised a limit of error of 32 links in the mile, the standard of accuracy can hardly be considered high. To keep within the limit specified was one of the conditions of each surveyor's work, and it is obvious, therefore, that only those surveys which were found on traverse inspection to exceed this limit could be condemned. But, further, as there was no triangulation by which to test the surveys on inspection, the inspector's own work would have to be discounted somewhat, and allowing that officer a limit of error of 8 or 10 links in the mile, as it would only be a traverse inspection, it is not beyond the bounds of possibility to assume that he might pass work which was erroneous to the extent of something like 40 links in the mile, or 4in. in every chain.

Apart from general considerations as to the wisdom and propriety of establishing an accurate system of survey, the fact that under the Real Property Act titles are issued for certain pieces of lands, the boundaries whereof are defined in the certificates and guaranteed, renders it not only desirable but essential that the methods of survey and of record should be such as to effectually guard against overlaps of boundaries and consequent future claims and litigation.

A DESCRIPTION OF THE REMAINS OF TRILOBITES FROM THE LOWER SILURIAN ROCKS OF THE MERSEY RIVER DISTRICT, TASMANIA.

By R. Etheridge, Jun., F.G.S. (of the Museum of Natural History, London.)

[*Read* 13*th June*, 1882.]

I am indebted to the kindness of Mr. T. Stephens, M.A., F.G.S., for an opportunity of examining the fossils which form

the subject of the present communication to the Society. They represent two localities and two horizons, geologically speaking. The first and largest parcel, consisting almost wholly of Trilobite remains, is from the Mersey River District, North Tasmania, whilst the other fossils are from a Conglomerate of unknown age at Table Cape. It will perhaps be best to consider the two as distinct from one another; I shall therefore describe them under separate headings.

1. TRILOBITES AND OTHER FOSSILS FROM THE MERSEY RIVER DISTRICT.

Plates 1 and 2.

Mr. Stephens recorded the discovery of the beds "containing casts of Trilobites," as long ago as 1874, in a short verbal notice on the subject.* It appears that a number of these specimens were forwarded to Europe and America through the late Rev. W. B. Clarke, and casually examined by my father and Professor L. Lesquereux. In the verbal notice referred to, Mr. Stephens says, quoting from a letter received from Mr. Clarke, "Both Mr. Etheridge and Mr. Lesquereux had identified the genera *Phacops*, *Ogygia*, *Calymene*, and *Conocephalites*, and considered the rock to be the equivalent of the Potsdam Sandstone."

Trilobites do not appear to have been found to any great extent in the Palæozoic rocks of Tasmania. Mr. Charles Gould, some years ago, found impressions of them in the rocks of the Mersey River District,† but I am not aware that any description of these has appeared. In his remarks on the Gordon Limestones, a set of beds probably distinct from those now under consideration, Mr. Gould particularly refers to the absence of Trilobites,‡ although he speaks of certain others, as the "*Calymene* beds of Tasmania."

The matrix consists of a fine-grained, friable, and much decomposed grit, in hand specimens of a bright ochreous colour. The mass is almost exclusively composed of the comminuted remains of Trilobites, in the form of casts, from which the whole of the integument and external parts have disappeared. Mr. Stephens writes me, "It is only in this one spot in Tasmania that Trilobites have been found at all, and here they are only obtainable from this friable jointy matrix, which passes into a hard metamorphic sandstone with brecciated bands, either barren of fossils or utterly refractory." He adds, "I have named this formation the 'Caroline Creek beds,' to prevent any mistake as to locality."

The forms I have been able to distinguish amount to four only, or perhaps five, and this has not been accomplished without considerable difficulty, owing to the comminuted and

* Papers and Proc. R. Soc. Tas. for 1874, p. 27.
† Fide Stephens, *ibid* for 1873, p. 38. ‡ *Ibid* 1866, p 27.

fragmentary nature of the remains. Not a single instance of an entire specimen has occurred, and only one in which one of the free cheeks was attached to other portions of the cephalic shield. The parts of the body usually recognisable are the glabella, the pygidium, occasionally an hypostome, and several free cheeks, with eyes attached. No trace of a complete, or even partially complete, thorax has been observed, and the dismembered thoracic segments are not sufficiently well preserved to admit of description. Under these circumstances, it may be imagined with what difficulty the piecing together of these fragments has been attended.

The genus *Asaphus* is certainly represented by two tails, probably indicative of distinct species. No other portions referable to this genus have been noticed. We meet with portions of a fine head, chiefly the glabella, which I cannot do otherwise than refer to *Conocephalites*, and numerous examples of a free cheek, with eye attached, and long genal spines, which, perhaps, belong to the same genus. A fine pygidium occurs in about equal abundance with the glabella just referred to, possessing all the characters of the peculiar genus *Dikelocephalus*. Now, by their size and association, these two portions, the glabella and tail, should belong to one individual, but we cannot definitely unite them in the face of the different characters appertaining to the respective genera to which they belong. It is strange that out of the large number of specimens examined, no proper tail of a *Conocephalites*, or head of a *Dikelocephalus*, has been observed to complete the two forms. Lastly there are a series of small head shields, all more or less of the same type, but whose generic affinity, owing to their fragmentary condition, must be left an open question for the present. They clearly belong to the Conocephaloid type, and appear to have affinities with certain American genera of Trilobites.

Description of the Species.

Genus CONOCEPHALITES (*Zenker*, 1833). *Barrande.* 1852.

Obs. This genus includes Trilobites possessing a semicircular head shield, with a very distinct neck, segment, and furrows. The glabella is conical, attenuates forwards, and is divided by three to four short furrows. The axal grooves are deep and broad; the eyes present or absent, and placed either at the anterior part of the head, beside the angles of the glabella, or near the centre of the side lobes of the head. The course of the facial suture is simple; it commences at the anterior margin of the head shield far out, turns inwards with a curve towards the eye, and then curves towards the post angle and cuts the margin. The pygidium is semicircular, with a 2-8 jointed axis, and slight furrows at the sides.

The best descriptions of *Conocephalites* are those by

Barrande and Burmeister. According to their definitions, a very simple and natural group of Trilobites are retained together, two of the essential points being the division of the glabella by three to four short furrows on each side, and the entire margin to the pygidium. In 1863 Professor James Hall re-defined *Conocephalites*,* much enlarged it, and introduced a number of species differing greatly from the European types. In some of these the glabella is quite undivided, in others there are two furrows on each side, whilst again the border of the tail is produced in some into a spine on each side as in *Dikelocephalus*, besides other modifications of structure.

It would be more appropriate, I think, to retain such forms separate from *Conocephalites*, as represented by the European types of the genus *C. Sulzeri* and *C. striatus*. Indeed, Professor Hall admits a difficulty in referring all his species to *Conocephalites;* perhaps the difficulty might be solved by the institution of a new genus for their reception.

A well marked, and not often dwelt-upon character in *Conocephalites*, is the presence of the ocular ridge or eye line. This appears to be present more commonly in those species in which the eyes are placed wide apart, as in *C. striatus*. Emmrich. Burmeister describes it in the last-named species thus, "A sharp ridge extends itself towards them" (*i.e.*, the eyes), "from the angles of the glabella."† This ridge is well displayed in some of the American Trilobites referred by Professor Hall to *Conocephalites*, for instance, *C. Eos*, *C. diadematus*, etc. Accepting Barrande's definition of the genus as the correct and most satisfactory one, we have a cephalic shield from the Mersey deposit, which appears to correspond generally with it, although not absolutely identical.

CONOCEPHALITES ? STEPHENSI (sp. nov.),
(Figs. 1—3.)

Sp. char.—Cephalic shield, broad, semicircular, with a prominent anterior, and rather flattened margin, glabella elongate, enlarging somewhat towards the front; neck segment, broad, and well marked, without a tubercle. Glabella furrows, four in number on each side, short, and becoming more pit-like towards the front; the basal pair are rather obliquely directed, and are the longest; the most anterior pair are situated in the angle formed by the glabella, front margins, and fixed cheeks; a fifth short, and faint depression exists exactly in the centre of the anterior margin of the glabella. The neck furrow is very deep (in casts), and pit-like at the sides, at the junction of the axal furrows. The latter are deeply excavated, but the marginal furrow in front the glabella is faint. Fixed cheeks broad, of a much less convexity than the glabella, and sub-

* 16th Annual Report, State Cabinet, N. York, 1863, p. 147.
† Organisation of Trilobites, p. 73.

divided into two almost equal parts by a strong double eye-line, or ocular ridge, proceeding diagonally across them from the third glabella pit, on each side. Facial sature cutting the posterior margin far out; posterior margin of the free cheeks broad like the neck segment. Thorax unknown. Free cheeks small, elongately triangular, with a strong broad striate border, and a similar long genal spine; surface granular; eye large, semilunar.

Obs. An entire head shield of *C. Stephensi* is not present in the Collection, all that is usually seen being the glabella and fixed cheeks. The position of the eyes is, however, apparent, just at the termination of the ocular ridge, a point where the shield is always broken away.

The abrupt termination of the short glabella grooves, especially the two basal ones, width of the fore cheek, and presence of the ocular ridge, are characters which clearly separate our fossil from *Dikelocephalus;* neither is it a *Lonchocephalus*, from the absence of the backward cervical spine, shape of the glabella, and increased number of furrows on the latter. *C. Stephensi* has many of the characters of *Conocephalites*, as defined by Hall, but I have already pointed out how this definition departs from that of M. Barrande, and other well-known writers. *C. Stephensi* in no way possesses the facial suture of *Bathyurus* or *Bathyurellus*, whilst it has glabella furrows, which would entirely separate it from the former, and partly from the latter. Barrande has remarked on the resemblance of *Conocephalites* to *Cybele* in some of its features. The expanding glabella pit-like furrows at the sides, diagonal eye line, prominent front margin, and large fixed cheeks of *C. Stephensi* appear to bear out this view. The present species is quite distinct from either of the typical European *Conocephalites*, and so far as I can gather, from any of the American forms referred to this genus. At the same time, it must not be forgotten that we are dealing with casts of the interior, from which the crust has been removed; and, therefore, some allowance has to be made in defining the various proportions of the parts described. The axal furrows of the head do not appear to be anything like so deep as in the European species, or even so broad, neither is there any trace of a cervical principle in *C. Stephensi.* It approaches nearest to *C. striatus*, Emmrich* in which the eyes are widely separated, and the ocular ridges present, but there is a great difference between the two species in the form of the glabella, and its grooves. Equally distinct are *C. Sulzeri*, Schl.† and *C. coronatus*, Barr.‡ the position of the

* See Barrande, Syst. Sil. Bohême, I. Atlas, pl. 14, Figs. 1—7.
† *Ibid*, pl. 14, F. 8—23. ‡ *Ibid*, pl. 13, F. 20—26.

eyes and form of the glabella in both at once separating them.

The presence of the eye-line or ocular ridge allies the Tasmanian Trilobite to Hall's *C. minutus*,§ from the Potsdam Sandstone, but they do not otherwise agree. Again, another American species, *C. diadematus*, Hall,‖ possesses an ocular ridge, and other characters noticeable in *C. Stephensi*. I suspect that, whatever may be the ultimate systematic position of *C. Stephensi*, the latter will prove to be congeneric with it.

I have appended to the description of the cephalic shield named in honour of Mr. Stephens, that of a free cheek, constantly associated with the former. In one case only has any appearance of a free cheek in contact with other portions of the head represented itself, and although in a bad state of preservation, it appears to demonstrate the unity of the parts in question.

Genus DIKELOCEPHALUS. *D. D. Owen.*

DIKELOCEPHALUS TASMANICUS (sp. nov.)

(Fig. 4.)

Sp. char.—Pygidium semi-elliptical, moderately convex, and strongly facetted at the anterior angles. Axis tapering gradually, extending almost to the posterior margin, and of six distinguishable segments and a terminal appendage, more than half the width of the pleuræ at its anterior or wider end. Side lobes, or pleuræ, of about eight coalesced and bent down segments, the first broader than any of the others. Limb broad, produced on each side, opposite the fifth segment, into a strong tapering, diverging, and slightly curved spine, extending beyond the posterior limit of the tail for a distance equal to more than half its entire length, exclusive of the spines.

Obs. The segmentation, broad border or limb, and single lateral spines, leave no doubt of the relation of this tail to the genus *Dikelocephalus*. The spines, however, are much longer than in the generality of *Dikelocephali*, and in this particular resemble some of the North American Trilobites, referred by Hall to *Conocephalites*. For instance, *C. Jowensis* has a pair of long curved spines, but the other characters do not coincide with the Tasmanian tail. Another species, named by Hall simply *Dikelocephalus* has similar spines, but is otherwise distinct.

The remains of no other Trilobite have been met with in these Caroline Creek beds, at all comparable in size to the present fossil, except the head previously described as *Conocephalites? Stephensi*. The latter has been shown not to

§ 16th Annual Report, State Cabinet of N. York, 1863, Pl. 8, F. 5.
‖ *Ibid*, Pl. 7, Figs. 36—38.

possess the characters of *Dikelocephalus*, and we cannot, therefore, with the evidence at our command, justly consider these as parts of one and the same Trilobite. Should future researches show them to be so, then we possess a form with a cephalic shield resembling that of *Conocephalites*, more or less, and a tail almost undistinguishable from *Dikelocephalus*. Such a combination of characters would clearly demand the creation of a new genus for their fossils in question.

Genus ASAPHUS *Brongniart*, 1882.
(Hist. Nat. Const. Foss., P. 17.)
ASAPHUS. sp. *a. (Fig.* 6.*)*

Obs. A pygidium, measuring sixteen lines by eleven, is preserved in so far that the central axis, one entire wing, and a portion of the other, with the concave margin are present. The latter bears very faint indications of the concentric striæ usually seen around the tail of *Asaphus*. The full width of the tail would probably have been about eighteen lines.

ASAPHUS. sp. *b.* (*Fig.* 5.)

Obs. A pygidium with a convex surface, and a generally robust appearance. The axis is large, and shows traces of numerous broad segments. It is a squarer and less oval form than in the last species, and the limb is wider and more concave.

It is possible from the general contour and appearance of these specimens that they represent distinct species.

With remains so fragmentary, it is unnecessary to attempt a comparison with known species.

The remaining Trilobites are in too fragmentary a condition to determine satisfactorily. I shall, therefore, merely describe them as far as the material will allow, and indicate the direction in which their affinities probably lie.

1. A head shield with an oblong roundedly-convex glabella, ornamented with granules, rounded in front, and reaching far forward almost to the anterior margin of the head. The furrows are two in number, the anterior pair very faint (in the cast), and almost transverse, the hinder pit-like and rather more oblique; the axal furrows are deep, but gradually become shallower forwards. The fixed cheeks are broad towards the posterior part of the head, and appear to narrow forwards, forming a limited space of demarcation between the anterior part of the glabella and the front margin; the latter is strong and well marked. No definite description can be given of the facial suture, unless what appears to be a defined margin on the right-hand side of the head is it. (Figs. 8 and 9.)

I am unable to satisfactorily refer this Trilobite to any known genus, and I suspect it will constitute a new form, possessing some of the characters used in Hall's definition of

Conocephalites. The glabella, however, does not decrease in width forwards, and the fixed cheek is too broad; neither can it be placed in *Dikelocephalus.* On the other hand, the Trilobite in question may have some relation with *Loganellus*, Devine* ; but here again there is a discrepancy between their respective facial sutures, if the line visible in the Tasmanian form may be so construed.

2. Fig. 10 represents another species (?), apparently congeneric with the last, and to differ simply in the form of the glabella, which is pear-shape and less robust, and proportionately narrower. I take this to be a second species of the genus to which the former Trilobite belongs.

3. The next form to be referred to is represented by Fig. 11. We observe here much the same outline and convexity of the glabella, but apparently only one furrow on each side. It is in a wretched state of preservation, and too much reliance should not be placed on it.

4. The last specimen (Fig. 12) is a fragmentary head shield exhibiting an almost quadrate glabella, without any trace of a furrow. It is short, convex, and almost square, blunt in front, with the axal and neck furrows strong and deep (in casts). Without committing oneself to a definite opinion, the strong resemblance to Billings' genus *Bathyurus* may be pointed out.

A few words may now be said as to the probable age of the Caroline Creek beds, geologically speaking. In the Lower Silurian Rocks of Great Britain, *Conocephalites* ranges from the Lower Lingula Flags to the Menevian Group, but is chiefly characteristic of the former. *Dikelocephalus*, similarly, is confined to the Lingula Flags in Britain. The genus *Asaphus* has a wider range in time, being known as low as the Tremadoc, and as high as the Llandeilo, but it may be said to be representative of the Caradoc and Llandeilo. In Bohemia, according to M. Barrande's tables, † *Conocephalites* is found exclusively in Etagé *C.*, the equivalent of our Lower Lingula Flags, whilst *Asaphus* possesses very much the same range as in Britain. According to Miller's excellent Catalogue of "American Palæozoic Fossils," *Conocephalites* is confined without exception either to the Potsdam or St. John's Groups. The same authority restricts *Dikelocephalus* to the Potsdam and Quebec Groups of the American Geologists. Now, the Potsdam Group, and in part the St. John's, corresponds in age to our Lingula Flags, and to a portion of M. Barrande's Etagé *C.* The Quebec Group is about the equivalent of the British Arenig Series, or Lower Llandeilo. Accepting, therefore, the determination of the foregoing Trilobites as approximating to the truth, it appears more than probable that the age assigned to the fossils from the Caroline Creek

*See Billings, Pal. Foss., Canada, p. 200. †Syst. Sil. Bohême. 1. Suppl. p. 276.

beds, by Messrs. Etheridge and Lesquereux, is correct, and that this may be looked upon as that of the Lingula Flags or Menevian beds of Great Britain, and the Potsdam Sandstone of North America.

Associated with the Trilobitic remains just described, are those of small discoidal, or planorbicular Univalves. (Pl. 2, Fig. 13 and 14.) The specimens are mere casts, but they present all the appearance of the genus *Ophileta*, Vanuxem, one (Fig. 13) more especially than the other. As a rule, the side of the shell visible in the present specimens is the upper or concave, showing the sunk spire. The whorls are truncate and biangular exteriorly. *Ophileta*, which is chiefly an American genus, occurs commonly in the Quebec Group beds, somewhat higher in the series than the Potsdam Sandstone. On the whole, it strongly corroborates the deduction drawn from the Trilobites, as to the stratigraphical position of the beds in question. There are also the internal casts of a very peculiar bivalve. This I am at present unable to refer to any genus, and must defer an opinion on it to some future occasion. In the meantime it is simply figured. (Pl. 2, Fig. 15.)

2. BRACHIOPODA FROM THE CONGLOMERATE OF TABLE CAPE.
(Plate 2.)

Mr. T. Stephens has described the geological features of portions of the North Coast of Tasmania in a very interesting paper, "Remarks on the Geological Structure of Part of the North Coast of Tasmania," etc. According to his observations, there exist along the line of coast, westward from the River Tamar, beds of conglomerate in a series which is possibly of Silurian age.* Between Port Sorell and Table Cape, and above the former, he describes horizontally bedded conglomerates and breccias, unconformably underlying the Tertiary freestone of the Cape, said by Prof. McCoy to be of Miocene age. The conglomerate in question consists of rolled pebbles, and angular fragments of the primary rocks of the neighbourhood, and the Plutonic rocks associated with them. Mr. Stephens adds, "It contains boulders derived from rocks which are not older than the Lower Carboniferous or Devonian period."†

Mr. R. M. Johnston has likewise described ‡ this deposit, forming, as he states, the floor of the Tertiary beds at the locality in question, and containing here and there highly fossiliferous blocks, in one of which Brachiopoda were abundant. Mr. Johnston believes the Table Cape conglomerate to be identical with that of the Dial Range, which is considered by Mr. Gould to be of Silurian age. The remarks of the

* Papers and Proc. 1869, p. 17. † *Ibid*, p. 18.
‡ Further Notes on the Tertiary Marine Beds at Table Cape. *Papers and Proc. R. S. Tas.* for 1876, p.p. 79—90f.

former, in connection with the Brachiopoda, quite coincide with the specimens forwarded by Mr. Stephens, who gives the locality and horizon as "boulders in a conglomerate of unknown age, near Table Cape, North Tasmania."

The limited number of fossils from the blocks forming the conglomerate of Table Cape are presented to us wholly as internal casts, and are very difficult to decipher. The matrix, as exhibited in hand specimens, varies to some extent. Certain of the masses are from a bluish-grey fossiliferous limestone, whilst other specimens, equally organic-bearing, are of a yellow or drab colour when weathered, and appear to be more arenaceous, almost passing at times into a grit.

With few exceptions, the remains are those of Brachiopoda, and, as the most numerous, will claim our attention first. The others are the impressions of a *Tentaculites*, accompanied by fragments of Crinoid stems.

The commonest, and at the same time the most interesting fossil met with in the specimens under description, is undoubtedly a *Pentamerus* (Pl. 2, Figs. 1, 3, 4, 5, 6, 7, and 8), although at first sight its affinities were certainly obscure. There are several specimens in various stages of preservation, some with portions of the shelly matter remaining; but as the best examples are obtained by fracture of the blocks, entire specimens are seldom seen. The present species have externally a more or less triangular outline, like some varieties of *Pentamerus Knightii*, Sby.*, narrowed towards the beaks and expanded towards the front; but, unlike Sowerby's species, the ventral valve of the Tasmanian shell is very much deflected at the sides and front. The latter becomes almost cuboidal, and, as it were, geniculated, thus producing a perpendicular front to the valves. In this character the shells resemble some Rhynchonellæ, but not otherwise. The surface was covered by radiating ribs, as in *P. Knightii*, but in the casts the umbonal or visceral region is almost smooth, or only bearing traces of the muscular impressions, the ribs commencing to show at a little more than one-third from the beak. This is a very characteristic point, and enables us to identify the species throughout the hand specimens, whether in fragments or partially crushed examples. In Pl. 2, Fig. 3 and 4, are illustrated a characteristic ventral valve, showing the triangular outline and much deflected sides and front. From the beak forwards proceeds the cavity left by the elongated, strong septum, to which would be attached internally the dental plates, and extending for fully one-third the length of the valve. On each side of it, immediately in the umbonal region, is a more or less smooth space, on which are visible the delicate impressions of the

* See Davidson's Mon. Sil. Brachiopoda, T. 17, F. 6 and 7.

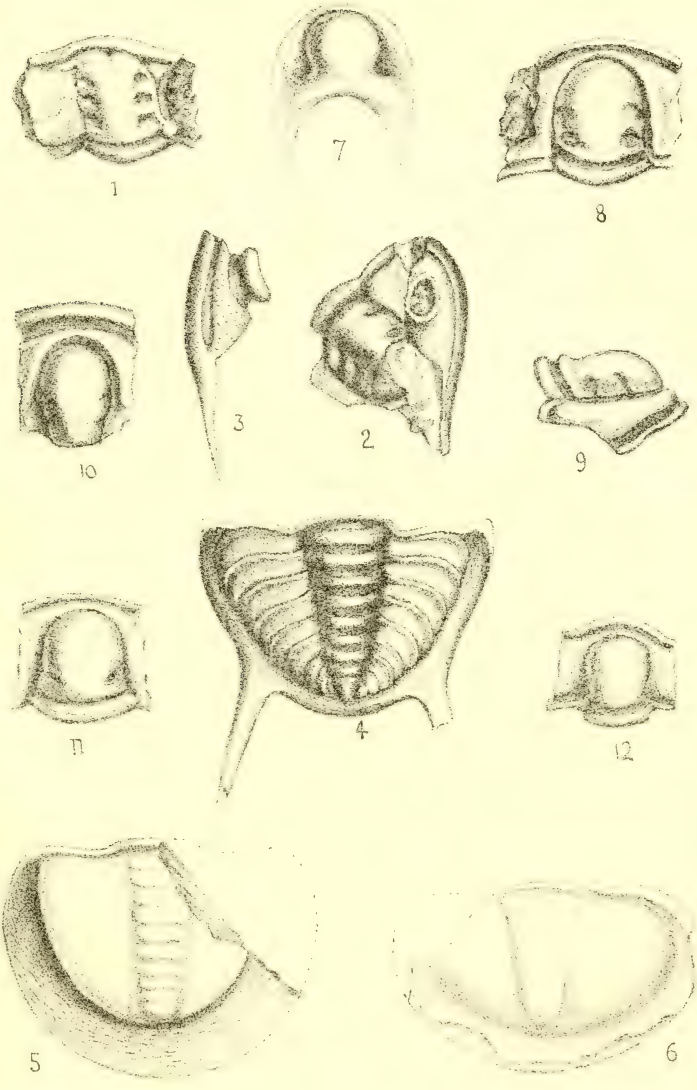
great muscles. In another specimen, only a fragment (Fig. 6), the septal cavity is again seen, and similar muscular scars. This was the first example which led me to conceive that this shell might be a *Pentamerus*, for its resemblance to one well-known cast of the May Hill Sandstone at once caught the eye.

In Pl. 2, Fig. 1, is represented a dorsal valve, in which may be seen the casts of the two septa, enclosing between them a portion of the V-shaped, or fifth chamber, so characteristic of the genus *Pentamerus*. This is again shown on a more striking scale in Fig. 5, in which we meet with the same characters as to general shape, deflected sides, and front of the shell. It is, however, on one side of the larger hand-specimens that the strong confirmation of the *Pentamerus* nature of these shells displays itself. We there observe a number scattered about possessing all the features above described, and also one shell split open with the fifth chamber exposed to view, and its sides of that glistening nature so often met with in British examples. (Pl. 2, Fig. 7 and 8.) I propose to call this shell *Pentamerus Tasmaniensis*.

A fossil, at first sight of a most remarkable nature, may be referred to here. It is an internal cast of two different shells, the *Pentamerus* just described (Pl. 2, Fig. 1), and a *Spirifer* or an *Orthis*, probably the latter, a valve of each placed in apposition as if belonging to one individual. On one side may be seen the dorsal valve of the *Spirifer* or *Orthis* (Pl. 2, Fig. 2), possessing the usual radiating ribs and a smooth medial fold. On the other is what I believe to be a modification of the *Pentamerus* (Pl. 2, Fig. 1), previously referred to. It has a smoother umbonal region, but there is the deflected front sides, the large fifth chamber, and the coarse ribbing.

On another block is a cast of a well-marked *Orthis*, a ventral valve with but few ribs, and those coarse and strong. (Pl. 2, Fig. 16). In all probability it is the opposite valve of the same species we observed accidentally in apposition with the *Pentamerus*. It is not unlike *Orthis biforata*, Schlotheim, a Middle and Upper Silurian form in Europe. Again, it resembles some varieties of *Orthis lynæ*, Eichwald, a species met with in the Trenton Group of North America. The Tasmanian shell has about seven ribs on each side the medial fold of the ventral valve.

Another piece of matrix, bearing the number six, has scattered over it numerous small casts of the forms of *Spirifera*. One is very finely striated, with a wide sulcus, and has all the appearance of the Upper Silurian *Sp. plicatella*, Linn., (Pl. 2, Fig. 9 *a* and *c*), or in some points it resembles the young of a Devonian species, *Sp. Verneuilii*. The second species, although small, possesses strong ribs, like *Sp. elevata*, Dalm., or



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perhaps *Sp. Crispa* Hisinger (Pl. 2, Fig. 9 *b*). Lastly, two small pieces of matrix (marked E) have a *Spirifer* similar to the coarsely-ribbed form just mentioned, and what I believe to be several fragmentary casts of a small *Strophomena* (Pl. 2, Fig. 11).

On opening these remarks, I alluded to a *Tentaculites*. It consists simply of impressions of the exterior, apparently representing a simple ridged form (Pl. 2, Fig. 12).

A few words may now be said as to the probable age of the blocks, or at least some of those forming the Table Cape Conglomerate. In British rocks, *Pentamerus* first makes its appearance in the Lower Llandovery, and ascends to the Aymestry Limestone. The genus is again met with in the Middle Devonian. It is, however, particularly characteristic of the Upper Llandovery beds, or May Hill Sandstone. In America it occupies very much the same stratigraphical position, and is particularly characteristic of the Niagara Group. The latter forms the base of the Upper Silurian, just as the May Hill Sandstone does in Britain. The other determinations, being open to criticism, need not have too much stress laid upon them. It may, however, be pointed out that both *Spirifera elevata* and *S. plicatella* are Upper Silurian forms, whilst *Orthis biforata* has a more extended range.

Next to the *Pentamerus* in importance are the impressions of the *Tentaculites*. This genus of Pteropod Mollusca ranges from the Caradoc upwards, but attains its maximum development in the Upper Silurian, although it does extend into the Devonian.

On the whole, it may be said, with a fair amount of probability, that at least some of the Table Cape boulders are of Upper Silurian age, the stratigraphical sub-division of the May Hill Sandstone putting in a very strong claim for recognition.

I have to express my hearty thanks to my friend, Mr. T. Davidson, F.R.S., for his assistance in the provisional determination of the foregoing species of Brachiopoda. Mr. Davidson's assistance is always the more valuable from the hearty manner in which it is rendered.

DESCRIPTION OF THE FIGURES.

Plate I.

Fig. 1. Conocephalites Stephensi. *R. Eth., Junr.* The glabella and remains of one fixed cheek; the former shows the four pit-like furrows on each side, and the central indentation in the front; across the latter is visible the ocular ridge, or eye-line.

Fig. 2. Another example of the same, with lying on it a free cheek and remains of the eye.

Fig. 3. Another free cheek, probably belonging to this

species, showing a portion of the eye, the long genal spine, and the granular surface

Fig. 4. Dikelocephalus Tasmanicus. *R. Eth., Junr.* A tail exhibiting in an exceedingly fine manner the characters of the species, including the long tail spines.

Fig. 5. Asaphus, sp. *b.* Larger portion of a pygidium or tail, with a wide limb, or border, delicately striated.

Fig. 6. Asaphus, sp. *a.* A similar, but smaller and much more oval tail.

Fig. 7. Labrum.

Fig. 8. Glabella and portion of the fixed cheeks of a Trilobite, which would perhaps fall within Hall's definition of *Conocephalites.*

Fig. 9. Side view of the same.

Fig. 10. Another form nearly allied to Fig. 8, but having a more pear-shaped glabella, and wider frontal margin.

Fig. 11. Another glabella, of a squarer form than in either of the preceding, and with only one pit-like furrow on each side.

Fig. 12. Fragmentary head-shield, with an almost quadrate glabella, and no visible furrows.

Plate II.

Fig. 1. Pentamerus Tasmaniensis, *R. Etheridge, Junr.* Internal cast of the dorsal valve, showing the cavities of the two septa, enclosing between them a portion of the V-shaped or fifth chamber.

Fig. 2. Spirifer sp., dorsal valve, perhaps, of Fig. 16.

Fig. 3. Pentamerus Tasmaniensis, an internal cast of the ventral valve, exhibiting the cavity left by the large septum.

Fig. 4. Side view of the same specimen, with the deflected sides and front of the shell.

Fig. 5. Another dorsal valve of the same species.

Fig. 6. Portion of another ventral valve, showing the septal character and muscular scars.

Fig. 7. Portion of a slab, with portions of three individuals, and part of another, in which the fifth or V-shaped chamber is exposed by fracture.

Fig. 8. The fractured portion removed from No. 7.

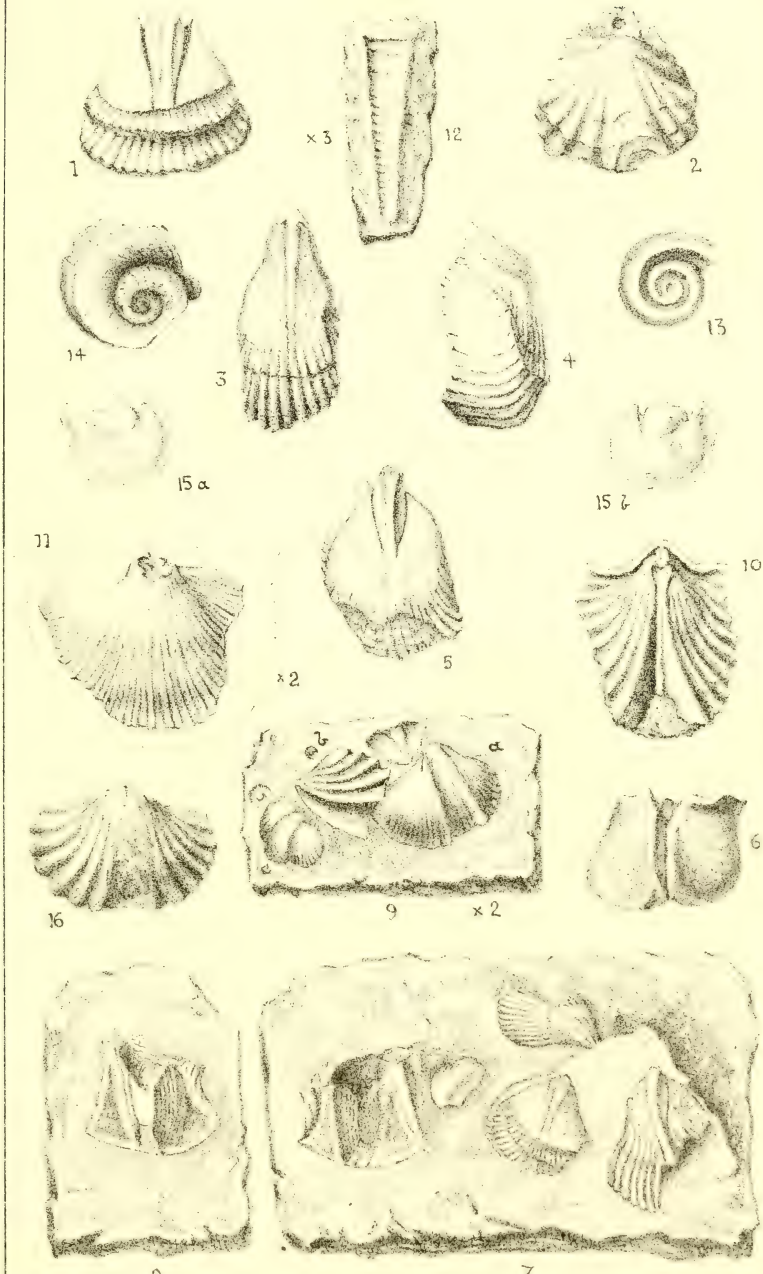
Fig. 9. Portion of a slab with *(a & c) Spirifer,* resembling *S. plicatella,* Linn. (*b*), another *Spirifer,* not unlike *S. crispa,* His. or *S. elevata.* Dalman. x 2.

Fig. 10. Portion of another form of *Spirifer* (*?*) or perhaps an *Atrypa.*

Fig. 11. Fragment of a shell, with the appearance of a *Strophomena.* x 2.

Fig. 12. Cast of a small *Tentaculites.* x 3.

Fig. 13. Small Univalve, in all probability an *Ophileta,* from a wax cast.



BERJEAU & HIGHLEY DEL. H. J. GRAHAM LITH.

TASMANIAN SILURIAN MOLLUSCA

Fig. 14. Another Univalve, a different species to the last.
Fig. 15. Internal casts of a Bivalve (?) undetermined.
Fig. 16. Orthis sp., resembling *Orthis biforata.* Schlotheim.
N.B.—The originals of Figs. 13, 14, and 15 are from the Caroline Creek beds; the remainder are from the Table Cape conglomerate.

ECONOMIC VALUE OF THE AQUATIC PLANT *TYPHA LATIFOLIA.*

By James Barnard.

[*Read* 17*th July*, 1882.]

Actuated by a philanthropic spirit, Signor C. A. de Goyzueta, Italian Consul at Melbourne, recently addressed a communication to the Government of Tasmania in reference to this aquatic plant, and dwelling upon certain valuable properties which it possesses. The following is an extract from that communication:—

"The commander of the royal transport *Europa* when in this port (Melbourne) offered the Victorian Humane Society of Melbourne a sample of the buoyant mattresses used on board the Italian vessels for their efficiency as a life-saving apparatus in maritime disasters.

"The same society tested that mattress, and found that it can easily support two persons on the water; so that, deeply convinced of their utility, they came to the decision to promote the introduction into the colony of the plant those mattresses are stuffed with.

"By direction of His Excellency the Minister of Marine, I communicated to the said society, in answer to a relative question, that this plant, known in botany by the name of Typha latifolia, is an aquatic one, spontaneously growing in marshes and other stagnant waters in the southern as well as in the northern provinces of Italy; wherefore there is ground to believe that it might be introduced under every climate. It is very far lighter than water, hygienic, and lasts not less than any other vegetable used in stuffing mattresses.

"I thought it my duty, for humanitary interests, to bring the above under notice, in the opinion that many lives would be spared were the Typha latifolia generally employed in preference to other vegetable or animal substances for the mattresses used at sea."

Duly estimating the importance of bringing under public notice a plant of this useful character, the hon. Colonial

Secretary forwarded to the Royal Society Signor Goyzueta's letter, with an inquiry, "Whether the plant referred to existed in the Society's Gardens, and whether it was considered desirable to attempt its cultivation for economic purposes?" This being referred to the Superintendent of the Gardens, Mr. Abbott reports that Typha latifolia is not to be found in the Society's Gardens, nor, he believes, in any of the colonies; but "that T. angustifolia is abundant in most of the Tasmanian marshes, and it is probable that it might be utilised for the same purposes as the other species." On the second point, Mr. Abbott has great doubt whether the introduction and cultivation of this plant would be profitable; and suggests that "attention should be first directed to the species to be found naturally in the island, especially as even this is by some botanists held to be merely a variety."

While yielding assent to the sensible proposition that we should not overlook the species to be found indigenous in Tasmania, and testing its utility, still we should not forego the opportunity which seems to be presented to us of procuring for acclimatisation the distinctive plant to which is assigned the special qualities set forth. Whether the introduction and cultivation of the right plant should be profitable or not, there are much higher than pecuniary considerations involved in its favour.

The many lamentable disasters at sea and deplorable shipwrecks, which from time to time cause a thrill of horror like an electric shock to pervade the community, demand the adoption of every possible precaution against such dire calamities; and, simple as this remedy appears, it may yet be the means of snatching many a valuable human life from otherwise inevitable destruction.

Loudon, in his *Encyclopædia of Gardening*, describes three species of Typha, upon the authority of Willdenow, viz., T. latifolia, T. minor, and T. angustifolia, or Greater, Dwarf, or Lesser Cat's Tail; the generic name is taken from τυφος, a marsh, in which all the species naturally grow. T. latifolia he describes as one of the handsomest aquatics of the reed kind; its leaves are of a bluish colour, an inch in width, and 3ft. long. The pollen of the flower is very abundant, and a light being applied to it, a flash of fire is produced. Haller says that the roots are eaten in salad, that cattle eat the leaves, and that the downy seeds serve for stuffing pillows. The leaves are sometimes used by coopers, and introduced between the staves of their casks; and they are frequently used for making mats, baskets, chair-bottoms, and sometimes for thatch. Rubens, and other Italian painters after him, have put it into the hands of our Saviour as a sceptre when He was saluted as a king in mockery by Herod's soldiers. The plant,

Mr. Loudon adds, appears to be a native of every part of the world, in ponds, ditches, and by the sides of rivers and brooks. In the *Penny Cyclopœdia* the three species of "Typha" are fully described, and "T. angustifolia" is figured. In reference to "T. latifolia" (and to this species only), the writer states that on the Continent the down of the flowers is used for stuffing pillows, etc.

In *Chambers' Encyclopœdia*, it is stated that there are two species of "Typha" found in Britain. "T. latifolia" and "T. angustifolia," and are popularly known as Cat's Tail or Reed Mace. The former species is the most common, and is sometimes called Bulrush. It grows to the height of 5 or 6ft. The root stocks are astringent and diuretic, and abound in starch. The young shoots of both species are much eaten by the Cossacks of the Don, and are sometimes used in England under the name of Cossack asparagus. "T. angustifolia" and "T. elephantina" are used in India for making mats and baskets.

Sir Joseph Hooker, in his "Flora of Tasmania," speaking of the order "Typhaceæ," etc., refers the genus "Typha" to Australia, New Zealand, and Scinde in Western India. He remarks that, "the species are not well characterised; the Tasmanian one (meaning the 'T. angustifolia') seems to be the same as the English, though larger than the common European state of the same plant," and "is common in marshes, banks of rivers," etc.

With the knowledge of the properties of this plant, hope is entertained that it may lead to the creation of a new industry, in the manufacture of sea-going mattresses. A pattern mattress could, no doubt, be readily obtained from Melbourne, with all particulars of price and profit. An experiment could then be made to test the question whether a mattress stuffed with the down of an indigenous Typha, of whatever species it may be, would fulfil the conditions claimed for the life-preserving one. If successful, there can be little doubt that but few vessels would be unprovided with them; and thus a possible means of escape from a watery grave would be afforded in many cases of shipwreck on a coast and within a moderate distance of land.

——

In the previous part of the paper I had the honour to bring before the Royal Society the subject of the economic value of the aquatic plant, Typha latifolia; and I am now enabled, through the courtesy of the honourable Colonial Secretary, to add to these notes the result of the further correspondence which has taken place between the Italian Consul and the Government.

With his communication giving further particulars, Signor

De Goyzueta transmitted a packet of the seed of the plant, and also a sample of the buoyant mattress. The former was at once sent to the Superintendent of the Royal Society's Gardens, as recommended, with the view of trying "whether the climate and soil are favourable to the propagation of the plant;" and it is believed, however, that we possess in the seed of the Tasmanian Typha, whatever be its specific distinction, an equivalent material, and distributed in abundance throughout the marshes and river banks of the island, that will equally fulfil the same purpose. Samples of each sort have been submitted to the Government Analyst, Mr. W. F. Ward, with a view of testing their respective qualities and properties, and that gentleman has pronounced their physical characters to be almost identical, there being only a minute difference in their specific gravity, the Tasmanian seed being very slightly heavier, probably to be accounted for by the Italian species having been submitted to a cleansing process previous to manufacture into mattresses whereby all the denser particles have been eliminated.

In reference to its preparation for manufacture, the Signor states "that the elasticity and flexibility of the T. latifolia is obtained by cutting off its ears, and by submitting it to the action of ventilators, in order to clean it from every heterogeneous matter." He adds also that "the Italian Government pays for such mattresses, to be delivered in Spezia by the contractor of the Royal Marine, 12·95f., or 10s. 4½d. each."

In presenting the sample mattress to the Museum of the Royal Society, with a view to its becoming open to public inspection, the hon. Mr. Moore makes the following valuable suggestion:—

"It has occurred to me that the mattress might be made more practically available in saving life if it was constructed in two portions, but joined at the upper surface, and furnished with straps and buckles at each end. It could thus be instantly made into a life-buoy."

In the records of shipwrecks, how many cases of drowning have occurred within sight of land, and where a resource of the kind proposed would have averted sorrow from many a bereaved family. Instances of this sort must occur to every one without being specified. Sailors, as a rule, are proverbially reckless of danger, and disregard even ordinary precautions for their own safety; yet, when brought face to face with actual peril, and all hopes of escape seem vain, many are at once deprived of their presence of mind and yield to despair. In such cases this would be counteracted by the knowledge that at least one possible means of extrication from drowning was open to their grasp.

It is hoped that the attention of manufacturers will be attracted to the advantage of introducing this life-saving mattress into the marine service; and that the importance of its use on board ship will be generally recognised, and lead to the establishment of the industry. Our river craft and sailing boats more especially should be provided with it; and in these the mattresses could be utilised as cushions, and so be immediately available when necessity required in case of disaster.

DESCRIPTION OF SOME NEW MARINE SHELLS OF TASMANIA.

By Lieut. C. E. Beddome, I.N.

[*Read 9th October*, 1882.]

No. 1.—Drillia Woodsi.

Shell elongately fusiform, turretted; spire longer than aperture, shining orange colour; sutures with a white line, below which is a band of white nodules; on the body whorl a row of white spots below the nodules; whorls 7; apex mamillated; aperture ovate; sinus deep; labrum thin. Long., 13 mill.; lat., 5 mill.; apert., 5 mill. Habt., Long Bay, D'Entrecasteaux Channel, 10 fms. I dedicate this species to the Rev. Tenison Woods, who has done so much for the conchology of this Island.

No. 2.—Mangelia Cancellata.

Shell small, narrowly fusiform, turretted; fulvous brown; whorls 5, sloping angulate above plicate lengthwise; interstices broadly striate, giving the whole shell a cancellated appearance; aperture narrowly oval, lip simple. Long., 4·5 mill.; lat., 1·5 mill.; apert., 2 mill. Habt., Kelso Bay, Tamar River, 17 fms.

No. 3.—Marginella Petterdi.

Shell bulbiform, shining white; spire immersed; outer lip moderately thickened; columella with four plaits. Long., 9 mill.; lat., 4 mill. Habt., Kelso Bay, Tamar River, 17 fms. I dedicate this species to Mr. W. F. Petterd, who is a naturalist that has devoted most of his time to the fauna of the Australias, and has done more for the conchology of Tasmania than any one.

No. 4.—Drillia Legrandi.

Shell turretted, broad; ribs rounded, raised; interstices striate, with fine lines, which pass over the ribs; whorls 5,

swollen; aperture oval; sinus deep; outer lip varicose. Long., 7 mill.; lat., 3·5 mill.; apert., 3 mill. Habt., off Tinder Box, D'Entrecasteaux Channel, 7 fms. I dedicate this species to Mr. W. Legrand, the veteran of Tasmanian collectors.

No. 5.—Rissoa (Alvania) Bayntoni.

Shell minute, turbinate, cancellate, brown; outer lip pallid; mouth oval, two-thirds length of spire; whorls 5; sutures deep. Long., 3 mill., lat., 2·5 mill. Habt., N. W. Bay, D'Entrecasteaux Channel. I dedicate this species to Mr. W. Baynton, who takes a lively interest in the fauna of this Island.

No. 6.—Eulima Legrandi.

Shell elongate, smooth, shining, hyaline; whorls 8, flat, highly polished; aperture pyriform; apex obtuse. Long., 3 mill.; lat., 1·5 mill.; apert., 1 mill. Habt., Kelso Bay, Tamar River, 17 fms. I dedicate this species to our veteran collector.

No. 7.—Eulima Petterdi.

Shell shining white, curved; apex rounded; whorls 10; aperture narrowly pyriform; lip scarcely reflected; columella straight. Long., 4 mill.; lat., 1 mill.; apert., 1 mill. Unlike any of our Eulimidæ. Habt., Blackman's Bay, Derwent River.

No. 8.—Modiolarea Tasmanica.

Shell trapezoidal, thin, fragile, ventricose; brown under lens; numerous lines of growth; hind margin rounded; hinge; two small oblique teeth. Long., 3 mill.; lat., 4 mill.; alt., 2·5 mill. Habt., Cloudy Bay, South Bruny Island, and off Brown's River.

No. 9.—Cyclostrema Bruniensis.

Shell small, discoid, shining brown; whorls 4, inflated; sutures deep; aperture rounded entire; umbilicus deep. Long., greatest 1·75 mill., least 1·5 mill.; lat., 1 mill. Habt., Cloudy Bay Lagoon, South Bruny Island.

No. 10.—Cyclostrema Johnstoni.

Shell minute, discoid, rounded above; whorls 4; regularly and distantly ribbed; aperture entire obicular; umbilicus open. Long., greatest 1 mill., least 0·75 mill.; lat., 0·25 mill. Habt., off Old Station, Brown's River Road, 7 fms. I dedicate this species to my friend and fellow-worker, Mr. R. M. Johnston, who is well known to all naturalists in the Australias.

No. 11.—Cemori Harrissoni.

Shell ovate, conical; surface with radiating ribs; apex sub-spiral, recurved posteriorly; perforation narrow, oval;

interior with shelly plate half covering the perforation. Long., 4 mill.; lat., 2·75 mill.; alt., 5 mill. Habt., off Old Station, Brown's River Road, 7 fms., and Bruny Island. I dedicate this species to Mr. Charles Harrisson, one of my fellow-workers.

No. 12.—Akera Tasmanica.

Shell minute, thin, ovate, cylindrical, ventricose; whorls distinct; channelled at sutures; brown, with two white bands on body; whorl aperture elongate, pyriform, rounded in front; columella excavated. Long., 2 mill.; lat., 1 mill. Habt., off Old Station, Brown's River Road, 7 fms., and Bruny Island.

No. 13.—Fissurella Crucis.

Shell oval, raised and cancellated; white or yellowish; two red lines on back forming a cross; aperture oval. Long., 9 mill.; lat., 5 mill.; alt., 2 mill. Habt., Kelso Bay, Tamar River, 17 fms.

No. 14.—New Genus, Legrandia.

Shell emarginulaform, but with an internal plate like Crypta.

Legrandia Tasmanica.

Shell oval, radiately ribbed; front edge fissured; interior with a shelly plate extending one-fourth the length of the shell. Long., 5 mill.; lat., 3 mill.; alt., ·75 mill. Habt., Kelso Bay, Tamar River, 17 fms. I dedicate this genus to our veteran collector, Mr. W. Legrand.

No. 15.—Alexia Harrissoni.

Shell oblong, ovate, imperforate, smooth, covered with a greenish-brown coloured epidermis; spire acuminate; whorls 6; aperture narrowly ovate; inner lip three plaits; outer lip one plait, and slightly reflected; aperture as long as spire. Long., 10 mill.; alt., 4 mill.; apert., 4 mill. Habt., boulder beaches near mouth of freshwater creeks on banks of Derwent River. This species was first found by Mr. Charles Harrisson; I have much pleasure in dedicating it to him.

No. 16.—Rissoa (Letia) Flamia.

Shell minute, turbinately conoid, subumbilicate, white, with red diagonal flames; whorls 5, rounded, smooth; sutures deep; aperture rounded; outer lip acute. Long., 2 mill.; lat., 1 mill. Habt., Blackman's Bay, 7 fms.

I dredged a specimen of Crosse Concinna Angus in 17 fms., off Kelso, Tamar River. Until now, I believe this species has only been found at Port Jackson, N.S.W., where it is very rare. It is interesting to be able to add this rare species to the fauna of our Island.

In the Society's Proceedings of 10th May, 1881, I described a shell as *Delphinula Johnstoni*. I now find that the Rev. J. E. Tenison Woods described the same shell as Crossed Cancellata. I was led into this error by the Rev. Tenison Woods, who described a fossil shell of the Tertiary period, of the same form, as *Delphinula tetragonostoma*.

NOTE ON CLINUS DESPICILLATUS, *RICHARDSON*, AND BOVICHTHYS VARIEGATUS, *IBID.*

By Robt. M. Johnston, F.L.S.

[*Read 9th October*, 1882.]

I recently obtained two specimens of the genus Clinus, which was known to be viviparous long before the time of the great French naturalist, Cuvier. It is stated by Dr. Gunther that Bloch verified this fact in the diagnosis of *Clinus superciliosus*. One of the two species which I have referred to was examined by me, and was found to be full of young fish, most of them having just burst the egg. Under the microscope the pulsations of the heart were distinctly visible, and all the parts seemed to be well developed, although from the specimen exhibited it will be seen that each individual is extremely minute. The eyes, relative to the size of the body, seem very large. They were of a beautiful bright blue colour when alive, and were perfectly formed. The following are the chief characteristics of the parent fish:—

B. 5. D. 3 $\frac{33}{5}$. A. $\frac{2}{24\text{-}25}$. V. $\frac{1}{3}$.

Total length, 16 inches; greatest depth, 5 inches. Although the three specimens examined by me had 5 soft rays in posterior dorsal fin, I have no hesitation in classing them as *Clinus despicillatus*, Richards.

I also obtained a specimen of *Bovichthys variegatus*, Richardson, $5\frac{1}{4}$ inches long, which is extremely rare:—

D. 8/19. A. 17. P. 15.

Body ornamented with 8 crossbars.

DESCRIPTIONS OF HITHERTO UNDESCRIBED ANTECHINI AND MURIDÆ INHABITING TASMANIA.

By Edmund Thomas Higgins, M.R.C.S. Eng., and William Frederick Petterd, C.M.Z.S.

[*Read 9th October*, 1882.]

When the late Mr. Ronald Gunn's paper on the Mammalia of this Island was published, some 30 years since, in the Transactions of the Royal Society of Tasmania, only three species of Antechinus, and three of Mus, were recorded as having been found in Tasmania.

The descriptions of the Muridæ are excessively short, but sufficient for the recognition of the species. Since then nothing has been done on the subject, until Mr. Thomas' paper describing two new Muridæ. One belonging to a new genus, Mastacomys, appeared in the June number for this year of the *Annals and Magazine of Natural History*. Knowing from observation that other species inhabiting this Island were still undescribed, we have for some time past been engaged in procuring all the small mammals we could; and have the honour of laying before the Royal Society our first paper containing descriptions of three new Antechini and four Muridæ, and hope shortly to supplement it. From the dense damp nature of the scrubs, and the peculiar hilly conformation of the country, almost every district is likely to produce distinct species. Being anxious to make our work as complete as possible, we are desirous of obtaining specimens from every part of the Island, and shall therefore take it as a special favour if the members of the Society will use their utmost endeavours to supply us with materials for this purpose.

Antechinus Rolandensis, ♂.

Ears very short, clothed with adpressed dark hairs; fur long and soft, reddish at the tips, bluish-grey at the base; paler on the posterior third of the body, with scattered black hairs; under surface dark ashy-grey; head clothed with short stiff hairs of a greyish-brown colour, slightly tinted with fulvous brown; two darker stripes extend from nose to eye; fore and hind feet clothed with short adpressed hairs of a yellow tint; under sides of feet thickly tuberculated, the tubercles transversely striated; whiskers long and black; tail short, covered with short dark-brown hair above, paler on the under side.

Length from tip of nose to root of tail ...	$7\frac{1}{2}$	inches.
„ of tail	$2\frac{5}{8}$	„
„ from nose to ear	$1\frac{1}{2}$	„

Length of ear	$\frac{5}{8}$	inches.
„ of fore feet and claws	$\frac{5}{8}$	„
„ of hind feet and claws	$1\frac{1}{8}$	„
„ of skull	$1\frac{3}{8}$	„
Width of skull	$\frac{3}{4}$	„
Length of nasal bones	$\frac{1}{16}$	„
„ of lower jaw	$1\frac{1}{8}$	„
Circumference of chest	$3\frac{1}{2}$	„

In size approaches A. Swainsonii, but differs from it in the colour of its fur, in the colour of its feet, shorter tail, and greater width and convexity of the zygomatic arches. Found in the neighbourhood of Mount Roland, by Mr. E. Higgins, of Kentishbury.

Antechinus leucogenys, ♂.

Ears moderately long, sparsely covered internally, and thickly externally with dark-brown hair; whiskers dark-brown and white, and of a moderate length; fur very long, rufous brown, interspersed with darker hairs. Hair on the head bluish-grey at the base, yellow in the middle, and dark-brown at the tips, producing a variegated appearance; lips margined with white; *chin white;* the hairs on the under surface pale yellowish-brown, the tips white; fore feet and portion of leg white; hind feet white; tail brown, with scattered dark hairs; hind feet with numerous transversely striated tubercles; form exceedingly slender.

Length from tip of nose to root of tail	$3\frac{1}{2}$	inches.
„ of tail	$3\frac{1}{4}$	„
„ from nose to ear	1	„
„ „ to eye	$\frac{5}{8}$	„
„ of ear	$\frac{1}{2}$	„
Width „	$\frac{3}{8}$	„
Length of fore feet and claws	$\frac{3}{8}$	„
„ of hind feet and claws	$\frac{5}{8}$	„
„ of skull	$1\frac{1}{16}$	„
Width „	$\frac{9}{16}$	„
Length of nasal bones	$\frac{7}{16}$	„
„ of lower jaw	$\frac{3}{4}$	„

In its measurements this species approaches to Albipes and Murina, but differs from both by its exceedingly slender form, the colour of its fur, and by the *white chin*, which is so especially characteristic in this species, which was obtained by Mr. A. Simson, of Launceston, at Ringarooma, and kindly placed at our disposal. The soles of hind feet thickly covered with small tubercles. This species therefore belongs to Gould's subgenus Podabrus.

Antechinus niger, ♀.

Form very robust; ears large and wide, internally and externally thickly covered with short, dark-brown hairs, and

having an indentation at about one-third from the lower margin; fur dense, and moderately long; on the upper surface of a very dark-brown colour, and *thickly* interspersed with long black hairs; under surface of a brownish-grey; upper surface of tail rather thickly covered with short, dark-brown, almost black hair, rather paler on the under surface; fore and hind feet covered with short, close set, brown hair, almost black; palms and soles of feet very dark; fore feet have five prominent striated tubercles, and are furnished with remarkably long claws; hind feet have six prominent transversely striated tubercles; whiskers of moderate length, and almost black.

Length from tip of nose to root of tail	$5\frac{1}{4}$	inches.
„ of tail	$3\frac{1}{8}$	„
„ from nose to ear	$1\frac{3}{8}$	„
„ „ to eye	$\frac{3}{4}$	„
„ of ear	$\frac{11}{16}$	„
Width „	$\frac{11}{16}$	„
Length of fore foot and claws	$1\frac{1}{16}$	„
„ middle claw	$\frac{11}{16}$	„
„ hind foot and claws	$\frac{7}{8}$	„
Circumference of chest	$4\frac{1}{8}$	„
Length of skull	$1\frac{1}{4}$	„
Width „	$\frac{11}{16}$	„
Length of nasal bones	$\frac{1}{2}$	„
Length of lower jaw	(Not given).	

This most interesting species differs from all its described congeners in Tasmania and Australia by its extremely robust form, the powerful build of its feet, by the extremely long claws of the fore feet, and the dark, almost black appearance of its fur. To Mr. Sultzberger, of the Upper Piper, we are greatly indebted for this beautiful Antechinus.

Mus griseocæruleus, ♂ and ♀.

Ears naked, and moderately long; whiskers $2\frac{1}{2}$ inches long, black; fur long, bluish-grey, passing at the sides into pale, ashy-grey, which colour extends over the entire under surface; feet clothed with short, yellow hairs; tail sparsely covered with short stiff hair of a black colour; scales freely showing through.

Length from tip of nose to root of tail	$7\frac{1}{5}$	inches.
„ of tail	$6\frac{3}{4}$	„
„ from nose to ear	$1\frac{1}{5}$	„
„ „ to eye	$\frac{3}{4}$	„
„ of ear	$\frac{1}{2}$	„
„ of fore foot and claws	$\frac{7}{8}$	„
„ of hind foot „	$1\frac{3}{5}$	„
„ of skull	$1\frac{5}{8}$	„
Width „	$\frac{7}{8}$	„
Length of nasal bones	$\frac{5}{8}$	„
„ lower jaw	$1\frac{1}{8}$	„

"Blue Rat" of the colonists; widely distributed over the

northern portion of the Island; has been obtained at Kentishbury, Deloraine, and Launceston. In half grown specimens the under surface is sometimes quite white; supraorbital ridge extends to occipital crest; coronoid process thin, narrower, less curved, and more acuminate than in Mus decumanus; condyloid process longer, and thin; posterior angle rounded and broad; descending ramus deeply emarginated.

Fig. 2.—Lower jaw of natural size.

2*a*.—Superior molars magnified.

Mus leucopus, ♀.

Ears long and patulous, internally sparsely, and externally thickly covered with short, dark, almost black hair; whiskers rather full, black and white hairs, $2\frac{1}{4}$ inches in length; nose grey, extreme tip nearly white; fur long, soft, dark-brown, tipped with pale fulvous brown, slightly paler at the sides, passing into dirty ashy-grey underneath; tail long, upper surface clothed with short dark hair, interspersed with paler hair; under surface covered with *white* hair, concealing the scales; fore and hind feet white.

Length from tip of nose to root of tail	$5\frac{3}{4}$	inches.
„ of tail	$3\frac{3}{4}$	„
„ from nose to ear	$1\frac{1}{2}$	„
„ „ to eye	$\frac{5}{8}$	„
„ of ear	$\frac{3}{4}$	„
Width „	$\frac{1}{2}$	„
Length of fore foot and claws	$\frac{3}{4}$	„
„ hind foot and claws	$1\frac{1}{2}$	„
„ of skull	$1\frac{3}{8}$	„
Width „	$\frac{5}{8}$	„
Length of nasal bones	$\frac{1}{2}$	„
„ of lower jaw	$\frac{15}{16}$	„
Circumference of chest	(Not given).	

Principally noticeable by the pure whiteness of entire under surface of tail; supraorbital ridge absent; coronoid process short and pointed; condyloid process pointing backwards; posterior angle short, and slightly acuminate; descending ramus moderately emarginate. Obtained by Mr. E. Higgins, of Kentishbury, near the Minnaw River.

Fig. 4.—Lower jaw, natural size.

4*a*.—Superior molars magnified.

Mus variabilis, ♂.

Ears rather large, broad, very rounded at the apices, and almost naked; whiskers dark-brown, almost black, with intermingled white hairs $2\frac{1}{2}$ inches long; fur dark bluish-grey on the back, gradually becoming paler towards the under surface; feet brownish; tail thickly covered with short, dark-brown hairs, through which the scales are visible.

♀.—Fur rather long and soft, on the back of a fawn

1

2

2 a

3

3 a

4

4 a

5

5 a

F. R. Higgins. Del.

H. J. Graham. Lith.

LIST OF FIGURES, TASMANIAN *MURIDÆ*.

Fig. 1.—Lower jaw of *Mus decumanus*.
„ 2.—Ditto of *Mus griseocæruleus*.
„ 2*a*.—Superior molars of ditto, magnified.
„ 3.—Lower jaw of *Mus variabilis*, natural size.
„ 3*a*.—Superior molars of ditto, magnified.
„ 4.—Lower jaw of *Mus leucopus*, natural size.
„ 4*a*.—Superior molars of ditto, magnified.
„ 5.—Lower jaw of *Mus Simsoni*, natural size.
„ 5*a*.—Superior molars of ditto, magnified.

colour; the base of the hairs bluish-grey, with numerous black hairs scattered throughout; the fur gradually pales to white on the entire under surface, where the hairs are perfectly white to their base; fore feet very pale fawn colour; hind feet white. In all other respects the female resembles the male.

Length from tip of nose to root of tail	8	inches.
„ of tail	8	„
„ from nose to ear	$1\frac{7}{8}$	„
„ „ to eye	1	„
„ of ear	$\frac{3}{4}$	„
Width „	$\frac{3}{4}$	„
Length of fore foot and claws	$\frac{5}{8}$	„
„ hind foot and claws	$1\frac{3}{8}$	„
„ skull	$1\frac{5}{8}$	„
Width of „	$\frac{7}{8}$	„
Length of nasal bones	$\frac{9}{16}$	„
„ lower jaw	$1\frac{1}{8}$	„

Supraorbital ridge very prominent, extending as far back as the occipital crest; palatine openings long and narrow; coronoid process rather short and acuminate; condyloid process inclined backwards; posterior angle rounded, narrow, and long; descending ramus deeply emarginate.

Fig. 3.—Lower jaw, natural size.

3*a*.—Superior molars magnified.

From Mr. Swan, of St. Leonards, to whom we are indebted for the specimens, we learn that these rats are of many colours. For this reason we have selected the specific name.

Mus Simsoni, ♀.

Ear moderately long, clothed internally and externally with short brown hairs, which are rather darker on the outer surface; whiskers moderately long, dark-brown; fur greyish-brown, interspersed with darker hairs; under surface of a paler tint; face bluish-grey; chin white; fore and hind feet clothed with short yellowish-white hairs; tail moderately clothed with pale-brown hair; scales distinctly visible; base of tail thickened.

Length from tip of nose to root of tail	$2\frac{5}{8}$	inches.
„ of tail	$2\frac{7}{8}$	„
„ from nose to ear	$\frac{5}{8}$	„
„ „ to eye	$\frac{3}{8}$	„
„ of ear	$\frac{1}{2}$	„
Width „	$\frac{3}{16}$	„
Length of fore foot and claws	$\frac{1}{4}$	„
„ hind foot and claws	$\frac{5}{8}$	„
„ of skull	$\frac{7}{8}$	„
Width „	$\frac{1}{2}$	„
Length of nasal bones	$\frac{1}{4}$	„
„ lower jaw	$\frac{1}{2}$	„

No supraorbital ridge; condyloid process very convex ante-

riorly; a deep sulcus between it and the coronoid process, which is rather short; posterior angle very short, and slightly acuminate; descending ramus deeply emarginate.

To Mr. A. Simson we are indebted for this species, which was found by him in some abundance at Ringarooma, and have pleasure in naming it after him, as a slight acknowledgment of his kindness in having so liberally given it, as well as the Antechinus leucogenys, to us.

Fig. 5.—Lower jaw, natural size.
5*a*.—Superior molars magnified.

Species of Antechini now known to inhabit Tasmania :—

Antechinus Swainsonii, Waterhouse, Ann. and Mag. Nat. Hist. 1840, p. 300.
„ minima, Temminck, Mon. de Mam, Vol. 1, p. 50.
„ leucopus Gray, Ann. and Mag. Nat. Hist., 1842, p. 261.
„ Rolandensis, Higgins and Petterd.
„ leucogenys, „ „
„ niger, „ „

Species of Muridæ :—

Mus setifer.
„ penicillatus.
„ fuscipes.
„ velutinus, Thomas, Ann. and Mag. Nat. Hist., June, 1882.
Mastacomys fuscus, Ann. and Mag. Nat. Hist., June, 1882.
Mus griseocæruleus, Higgins and Petterd.
„ leucopus, „ „
„ variabilis, „ „
„ Simsoni, „ „

DESCRIPTION OF A NEW SPECIES OF FISH, CAUGHT NEAR EMU BAY, TASMANIA.

By Robt. M. Johnston, F.L.S.

[*Read 14th November*, 1882.]

LOPHOTIDÆ.

Tænioidei, part., Cuvier.

Body elongate, strongly compressed, naked; eye lateral; cleft of the mouth narrow, with the dentition feeble; vent

situated near extremity of the tail; one dorsal fin, occupying the whole length of the back, composed of flexible rays, which do not show either articulated joints or branches; anal short; caudal in the longitudinal axis of the fish; ventrals thoracic; gill opening wide; branchiostegals six; gills four; pseudobranchiæ; muscles coherent.

1. LOPHOTES.

LOPHOTES, Giorna, Mem. Acad. Torino, IX., 1803, p. 19. Cuv. Règne An.

Head elevated into a very high crest, at the anterior extremity of which the dorsal fin commences; the vent is situated near the extremity of the tail; a small anal fin behind it; ventrals and caudal small, the former thoracic; mouth protractile, subvertical; teeth in the jaws, on the vomer, and on the palate; air bladder present.

LOPHOTES GUNTHERI (n. s.)

B. 6. D. 221·36. A. $\frac{6}{14}$. P. 14. V. $\frac{1}{5}$. C. 15.

The height of the body is contained $5\frac{2}{3}$ times in the total length, and the length of the head $8\frac{1}{3}$ times; eye very large. The first spine, in the specimen being described, had been broken off close to the anterior point of elevated soft crest, and is somewhat compressed and moderately strong. The rays of dorsal immediately over the eye are about $\frac{1}{2}$ inch in length, gradually increasing to $2\frac{1}{2}$ inches long behind the extremity of pectoral, and from thence gradually diminishing towards a point measuring $1\frac{1}{2}$ inches from extremity of caudal fin, where a second rudimentary series of about 36 rays connects the principal series with the caudal fin; caudal fin composed of 14 rays unsymmetrical, and terminals bending slightly upwards; anal fin small, measuring $\frac{3}{4}$ inch long, and $\frac{3}{4}$ inch deep; the first six rays are simple; ventral $\frac{1}{5}$, rudimentary, scarcely $\frac{1}{4}$ inch long; fins pinkish-yellow; sides uniformly silvery, with reticulated markings resembling scales—208 series longitudinally, and 65 transversely.

The above singular fish is closely allied to the ribbon fish family. It was caught recently on the North-West Coast, near Emu Bay, and subsequently presented to the Fisheries Exhibition Commission by Mr. John Swan. Dr. Gunther states that the fishes of this family are of very rare occurrence, and hitherto only known to exist in the seas of Japan and Mediterranean. Only one species, *Lophotes Cepedianus*, Giorna, is described in Dr. Gunther's Cat. of the Fishes of the British Museum. The Japanese species, *Lophotes Capellei*, Schleg., is stated by the same authority to be doubtfully distinct from *L. Cepedianus*, of the Mediterranean. It is of great interest to find a representative of this singular family

in Tasmanian waters. The specimen described was photographed while in a fresh state, and the latter will in future be serviceable for identification.

Total length	$43\frac{3}{4}$	inches.
Length of body	$42\frac{1}{2}$	„
„ head	$5\frac{1}{4}$	„
„ snout	$1\frac{1}{2}$	„
Depth behind shoulder	$7\frac{3}{4}$	„
„ near middle	7	„
„ in advance of anus	5	„
„ over anus	$1\frac{1}{2}$	„
„ at caudal	$\frac{3}{4}$	„
Length of pectoral ray	$2\frac{1}{4}$	„
Diameter of eye	2	„
Greatest thickness of body	$1\frac{5}{8}$	„

METEOROLOGY.

SUMMARY OF METEOROLOGICAL OBSERVATIONS TAKEN AT HOBART DURING PART OF THE YEAR 1882, BY COMMANDER SHORTT, R.N., GOVERNMENT OBSERVER.

Latitude, 42° 53′ 24″ S.; Longitude, 147° 20′ 7″ E. Height of Observatory above Mean Sea Level, 130 feet. Barometer corrected to 32° Fahrenheit, and reduced to Mean Sea Level.

1882.	MEAN OF BAROMETER.			MEAN SHADE TEMPERATURE OF AIR.			MEAN HUMIDITY	THERMOMETERS IN SHADE.						RAIN.		PREVAILING WINDS.		CLOUDS.	DEW POINT.	PRESSURE OF VAPOUR.
	9 A.M.	3 P.M.	9 P.M.	9 A.M.	3 P.M.	9 P.M.	Month.	Maximum.	Mean Maximum.	Minimum.	Mean Minimum.	Mean Diurnal Range	Mean Temperature of Month.	Total Fall.	No. of Days Rain fell.	Direction.	Force.	Amount.		
	Inches	Inches	Inches											Inches			0-12	0-10		
April	29·716	29·671	29·699	55·8	58·3	52·1	·814	74·8	61·5	37·0	45·2	16·3	54·4	0·9	13	West and Calm.	1·3	5	48·5	·346
May	29·704	29·641	29·655	48·4	53·7	48·6	·816	62·5	55·4	34·8	43·0	12·4	50·2	5·91	16	South and West.	1·8	5·9	43·9	·297
June	29·791	29·746	29·754	42·6	49·6	44·7	·823	58·2	50·3	33·0	38·3	12·0	45·6	2·415	13	West.	1·5	6	40·4	·251
July	29·669	29·660	29·696	44·3	50·3	43·8	·785	59·0	50·9	31·0	38·9	12·0	44·5	2·141	13	N.W. & S.W.	2·3	5·25	38·1	·230
August	29·861	29·809	29·834	46·6	51·9	45·8	·821	60·8	52·2	33·6	40·7	11·5	48·1	4·82	12	N.W. & South.	1·4	6	42·9	·276
September	29·515	29·461	29·504	51·6	56·2	49·7	·754	67·2	58·3	37·2	44·2	14·1	52·4	2·93	18	N.W.	3·4	6·6	44·8	·297
October	29·729	29·683	29·743	56·4	58·3	51·6	·732	72·0	61·0	37·5	46·3	14·7	55·5	3·79	13	N.W. & S.E.	2·5	6	47·	·323
November	29·847	29·783	29·856	63·9	63·9	53·8	·724	88·0	69·7	42 0	51·6	18·1	61·7	2·05	13	W.N.W. & E.S.E.	2·4	5·5	53·1	·404
December	29·628	29·579	29·644	64·0	64·2	57·0	·745	86·3	69·9	45·7	53·2	16·7	61·7	2·608	16	W.N.W. & E.S.E.	1·8	7	53·5	·410
Mean	29·718	29·670	29·709	52·6	56·3	49·7	·779	69·9	58·8	36·9	44·6	14·2	52·7	Total, 27·564	Total, 127	W.N.W. & S.E.	2·	5·9	45·8	·315
Mean of the three Recordings	29·699			52·9										Mean, 3·063	Mean 14					

TABLE OF RAINFALL OF TASMANIA DURING PART OF THE YEAR 1882,

Showing the Latitude and Longitude, and Distance from Sea Coast of each Station, the Number of Days Rain fell during each Month, and Total Rainfall.

Name of Station.	Latitude, South.	Longitude, East.	Distance from Sea Coast	TOTAL.		JANUARY.		FEBRUARY.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUGUST.		SEPT.		OCTOBER.		NOVEMBER.		DECEMBER.	
				Wet Days.	Rainfall.	Wet Days.	Rainfall.	Wet Days.	Rainfall.	Wet Days.	Rainfall.	Wet Days.	Rainfall.	Wet Days.	Rainfall.	Wet Days.	Rainfall.	Wet Days.	Rainfall.	Wet Days.	Rainfall.	Wet Days.	Rainfall.	Wet Days.	Rainfall.	Wet Days.	Rainfall.	Wet Days.	Rainfall.	Wet Days.	Rainfall.
	South.	East	Miles	No.	Inch.	No.	Inch.	No.	Inch.	No.	Inch.	No.	Inch.	No.	Inch.	No.	Inch.	No.	Inch.	No.	Inch.	No.	Inch.	No.	Inch.	No.	Inch.	No.	Inch.	No.	Inch.
	° ′ ″	° ′ ″																											
Hobart	42 53 24	147 20 7	10	127	27·566	—	—	—	—	—	—	13	0·90	16	5·01	13	2·415	13	2·141	12	4·82	18	2·93	13	3·79	13	2·05	16	2·61
Southport	43 26 0	147 1 0	Coast.	137	31·63	—	—	—	—	—	—	14	2·35	20	5·42	12	3·82	23	4·12	14	2·84	21	5·37	12	3·51	8	1·90	13	2·30
Falmouth	41 32 0	148 19 0	Coast.	61	12·77	—	—	—	—	—	—	—	—	—	—	4	0·76	9	1·21	17	4·91	9	1·26	7	1·68	5	1·55	10	1·40
Fingal	41 40 0	147 48 0	23	91	22·565	7	1·065	4	5·05	6	1·23	9	1·18	7	1·50	4	0·92	8	1·48	12	2·80	8	1·83	7	1·39	4	1·31	15	2·81
Killymoon, Fingal	41 35 0	148 10 0	9	105	25·29	—	—	3	5·79	8	1·60	5	1·05	8	1·44	7	1·40	11	1·17	19	5·91	13	1·26	7	1·09	8	2·35	16	2·23
Botanical Gardens, Hobart	42 [illegible] 0	147 [illegible] 0	12	[illegible]	24·62	9	1·06	4	1·01	9	0·6[illegible]	9	0·58	14	4·49	10	1·88	11	1·72	14	3·09	18	2·45	12	3·16	10	1·81	16	2·91
Oatlands	42 18 0	147 24 0	28	87	12·46	—	—	—	—	—	—	—	—	—	—	9	1·27	10	1·10	15	2·47	17	1·69	15	1·95	10	2·35	11	1·63
Low Head	41 [illegible] 0	146 [illegible] 0	Coast	[illegible]	17·[illegible]	[illegible]	[illegible]	—	[illegible]	—	[illegible]	[illegible]	[illegible]	—	—	[illegible]	1·5[illegible]	15	3·09	18	4·13	18	3·04	12	1·31	6	2·09	9	1·82
Circular Head	40 [illegible] 0	14 17 0	Coast	101	21·2[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—	[illegible]	—	—	9	1·17	19	5·82	19	4·11	23	4·54	12	2·56	9	1·39	10	1·66
Strahan, Macquarie Harbour	42 11 0	145 17 0	2	146	46·53	—	—	—	—	13	2·09	14	4·73	21	7·00	13	4·34	26	6·62	5	1·81	24	8·63	12	3·84	9	3·27	9	4·20
Mount Bischoff	41 25 0	145 34 0	28	206	74·82	—	—	[illegible]	[illegible]	15	3·34	16	5·27	26	14·55	17	5·59	25	11·53	23	4·52	29	14·30	21	6·27	15	3·53	19	5·22