I. THE SHORE FISHES OF THE HAWAIIAN ISLANDS, WITH A GENERAL ACCOUNT OF THE FISH FAUNA.

By DAVID STARR JORDAN and BARTON WARREN EVERMANN.

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HISTORICAL REVIEW.

EARLIER INVESTIGATIONS.

That group of mid-Pacific islands now known as the Hawaiian Islands was discovered January 18, 1778, by Capt. James Cook, when on his third voyage around the world in the years 1776–1779, and was called by him the Sandwich Islands, in honor of his friend and patron, the Earl of Sandwich. Captain Cook's ship, the *Resolution*, left the islands on February 2, but returned, and Mowee (Maui) was discovered November 26, 1778, and Owyhee (Hawaii) four days afterwards. The vessel then spent seven weeks cruising about and examining the coasts of the islands, and on January 17, 1779, anchored in the harbor of Karakakooa (Kealakekua), where she remained until February 4. Leaving on that date, she put back again on account of a storm on the 11th, and on February 14 Captain Cook was killed by the natives.

In the "Narrative" of Captain Cook's voyages occasional brief references to fishes are found, but they contain very little of value or interest, and there is nothing to indicate any effort to preserve and carry home collections from the different islands visited.

Captain Cook was accompanied[a] on his first voyage, however, by Joseph Banks and Dr. Daniel Solander, who evidently preserved a few fishes which were afterwards deposited in the "Museum of Banks." Among these was a specimen of a chætodont which Banks himself obtained at the Society Islands. Another specimen of the same species was obtained at the Sandwich Islands by some member of Captain Cook's third voyage and found its way into the same museum. These two specimens were described in 1782 by Broussonet in his "Ichthyologia" as *Chætodon longirostris*, a perfectly good species, which Jordan and McGregor made the type of their new genus *Forcipiger* in 1898. *Forcipiger longirostris* (Broussonet) is therefore the first species of fish ever recorded from the Hawaiian Islands.

So far as we have been able to determine, the first actual collection of fishes made at the Hawaiian Islands was that obtained by the royal French corvette *Uranie*

[a] Captain Cook was accompanied on his first voyage by "Joseph Banks, esq. (later Sir Joseph Banks, bart.) and Doctor Solander, who, in the prime of life, and the first of them at great expense to himself, quitted all the gratifications of polished society and engaged in a very tedious, fatiguing, and hazardous navigation, with the laudable views of acquiring knowledge in general, of promoting natural knowledge in particular, and of contributing something to the improvement and happiness of the rude inhabitants of the earth."

in 1819. The *Uranie* left Toulon, France, September 17, 1817, on a voyage around the world, under the command of M. Louis de Freycinet. Among those on board who merit mention in this connection were M. Jean René Constant Quoy, surgeon-general of the expedition; M. Joseph Paul Gaimard, second surgeon; M. Charles Beaupré Gaudichaud, pharmacist of the third class; M. Dominique François Jean Arago, draftsman; M. Louis Isidore Duperrey, midshipman; and M. Charles Bonnet, mate. The *Uranie* arrived at Owhyhee (Hawaii) August 15, 1819, and later visited Maui, Oahu, and perhaps other islands of the group. Whether the corvette *Physicienne*, which accompanied the *Uranie* on the voyage round the world, visited the Hawaiian Islands is not evident from the narrative. It appears, however, that the officers of the *Uranie* took the more active interest in making scientific observations and collections.

In the Zoology of the voyage of the *Uranie* and *Physicienne* Messrs. Quoy and Gaimard published (1824) an account of the collections obtained. The fishes were collected chiefly in the Pacific and Indian oceans, and the total number of species recorded is 112, of which 22 were from the Hawaiian Islands. Of these 22 species, 21 were described as new. In the following list the type locality in each case is the "Sandwich Islands" unless otherwise stated. Species described as new are indicated by italics.

Fishes recorded from the Hawaiian Islands by Quoy and Gaimard.

Nominal species.	Page.	Plate and figure.	Present identification.
Tetraodon *lacrymatus*	204		Tetraodon lacrymatus.
Balistes *angulosus*	210		Canthidermis maculatus.
Balistes *sandwichiensis*	214		Cantherines sandwichiensis.
Saurus *variegatus*	223	Pl. 48, fig. 3	Synodus varius.
Saurus *gracilis*	224		Saurida gracilis.
Salarias *gibbifrons*	253		Alticus gibbifrons.
Julis *gaimard*[a]	265	Pl. 54, fig. 1	Julis gaimard.
Julis *balteatus*	267	Pl. 56, fig. 1	Stethojulis albovittata.
Julis *duperrey*	268	Pl. 56, fig. 2	Thalassoma duperrey.
Julis *geoffroy*	270	Pl. 56, fig. 3	Macropharyngodon geoffroy.
Julis *axillaris*	272		Stethojulis axillaris.
Cheilio auratus	274	Pl. 54, fig. 2	Cheilio inermis.
Anampses *cuviera*	276	Pl. 55, fig. 1	Anampses cuvier.
Cheilinus *sinuosus*	278		Cheilinus trilobatus.
Gomphosus *tricolora*	280	Pl. 55, fig. 2	Gomphosus tricolor.
Gomphosus *pectoralis*	282		Gomphosus varius.
Xyrichthys *lecluse*	284	Pl. 65, fig. 1	Cymolutes lecluse.
Mullus *multifasciatus*	330	Pl. 59, fig. 1	Pseudupeneus multifasciatus.
Chætodon *miliaris*	380	Pl. 62, fig. 6	Chætodon miliaris.
Chætodon *lunulatus*	381		Chætodon lunula.
Glyphisodon *abdominalis*	390		Abudefduf abdominalis.
Pomacentrus *nigricans*	399		Pomacentrus jenkinsi.

[a] Type locality, Maui.

The voyage of H. M. S. *Blonde* to the Sandwich Islands was made in the years 1824–25, under the command of Capt. the Right Hon. Lord Byron, for the purpose of conveying to the islands the bodies of King Kamehameha II and his Queen, both of whom had died within a week (the queen on July 8, the king on July 14, 1824), while on a visit to England. The *Blonde* sailed from Spithead on September 29, and on May 3, 1825, came in sight of the island of Hawaii. After a stay of about ten weeks at the islands, during which Hilo, Honolulu, and various other places were visited, the vessel left for home July 18.

During the time spent at Honolulu some collecting was done by John Trembly, esq., R. N., who accompanied the expedition. The fishes obtained were presented

to the Zoological Society of London and were described by Edward Turner Bennett (1828) in the Zoological Journal. Eleven species are recorded from the Hawaiian Islands, all of them being described as new.

Fishes obtained at the Hawaiian Islands by H. M. S. Blonde in 1825.

Nominal species.	Length of type, in inches.	Page.	Present identification.
Blennius sordidus	4	34	Blennius sordidus.
Blennius marmoratus	4	35	Alticus marmoratus.
Julis flavo-vittatus	3.5	36	Julis flavovittatus.
Julis Greenovii	3	37	Julis greenovii.
Scarus dubius	4.5	37	Callyodon dubius.
Cirrhites maculosus	3.5	38	Cirrhitus marmoratus.
Cirrhites fasciatus	4	39	Paracirrhites cinctus.
Scorpæna asperella	2	40	Sebastapistes asperella.
Acanthurus flavescens	3	40	Zebrasoma flavescens.
Acanthurus strigosus	4	41	Ctenochætus strigosus.
Chætodon Fremblii	5	42	Chætodon fremblii.

In Zoological Miscellany, 1831–1842, John Edward Gray described three new species of fishes from the Hawaiian Islands, basing the descriptions upon specimens in the British Museum. The species are as follows:

Fishes from the Hawaiian Islands described by John Edward Gray.

Nominal species.	Page.	Present identification.
Holacanthus arcuatus	33	Holacanthus arcuatus.
Chætodon ornatus	33	Chætodon ornatissimus.
Chætodon 4-maculatus	33	Chætodon quadrimaculatus.

Cuvier and Valenciennes in their Histoire Naturelles des Poissons, Volumes I–XXII, 1828–1849, record 18 species from the Hawaiian Islands, 13 of which are described as new. Their specimens were from the collections made by the *Uranie*. The list is as follows:

Nominal species.	Volume.	Page.	Year.	Present identification.
Serranus *myriaster*	II	365	1828	Cephalopholis argus.
Upeneus bifasciatus	III	468	1829	Pseudupeneus bifasciatus.
Upeneus trifasciatus	III	468	1829	Pseudupeneus multifasciatus.
Zanclus cornutus	VII	102	1831	Zanclus canescens.
Acanthurus *nigroris*	X	208	1835	Hepatus matoides.
Acanthurus striatus[a]	X	229	1835	Ctenochætus striatus.
Naseus fronticornis	X	259	1835	Acanthurus unicornis.
Julis *eydouxii*	XIII	455	1839	Julis eydouxii.
Xyrichthys *microlepidotus*	XIV	52	1839	Cymolutes lecluse.
Xyrichthys *pavoninus*	XIV	63	1839	Iniistius pavoninus.
Cheilinus *bimaculatus*[b]	XIV	96	1839	Cheilinus bimaculatus.
Scarus *bennetti*	XIV	270	1839	Callyodon bennetti.
Scarus *formosus*	XIV	283	1839	Callyodon formosus.
Callyodon *sandvicensis*	XIV	295	1839	Calotomus sandvicensis.
Belone *carinata*	XVIII	437	1846	Belone platyura.
Exocœtus *simus*	XIX	105	1846	Cypsilurus simus.
Chanos *cyprinella*	XIX	198	1846	Chanos chanos.

[a] Quoted from Quoy and Gaimard, who recorded it from Guam only.

[b] Onarourow (Honolulu).

The next collection of fishes made at the Hawaiian Islands was obtained by H. M. S. *Blossom* during her voyage to the Pacific Ocean and Bering Straits in 1825–1828, in command of Capt. Frederick William Beechey, R. N., F. R. S., etc.

There were on board Lieut. Edward Belcher, Surg. Alexander Collie, and George T. Lay, naturalist. The *Blossom* left England May 19, 1825, for the Pacific by way of Cape Horn, and arrived at Woahoo (Oahu), Sandwich Islands, May 19, 1826. She left Honoruru (Honolulu) May 31 for Oneehow (Niihau), where she arrived the next day, remaining at these places only long enough to restock with water and provisions and to trade with the natives. She sailed on June 2 for the north, leaving Mr. Lay, however, at Honolulu, where he remained until the return of the vessel January 26, 1827. On March 4, 1827, the *Blossom* took final leave of the Hawaiian Islands.

During this voyage natural history observations were made by Mr. Lay and Dr. Collie, the latter performing the duties of naturalist during the illness of Mr. Lay. Lieutenant Belcher rendered valuable assistance in caring for the collections. During Mr. Lay's sojourn of a little less than a year at Honolulu, he was ill much of the time, and his observations and notes are therefore not as full as he doubtless otherwise would have made them. It is stated, however, that many species of fishes were observed at Oahu, and that Dr. Collie "here continued his experiments on the *Exocœti*, and extended his anatomical observations to a fish which is kept and reared in the Taro ponds, and esteemed very highly by the natives, especially the belly part, soaked in salt and water and eaten raw. Its native name is Ava, and it seems to be nearly allied to, if not identical with, the *Butirinus glossodonta* Cuv."[a] Mr. Lay listed many species at Honolulu, and has left a number of notes, some of which are very interesting; most of them, however, are general, and the species referred to are not identifiable.

The fishes collected during the voyage of the *Blossom* were reported on by Lay and Bennett in the "Zoology of Captain Beechey's Voyage." (Lay and Bennett 1839.) The total number of species recorded is 26, only 4 of which are credited to the Hawaiian Islands. These are from Oahu and all are described as new. The drawings illustrating the report are by William Smyth, mate, and Richard Belcher.

Following is the list of species:

Nominal species.	Page.	Plate and figure.	Present identification.
Julis *bifer*	64	Pl. XVIII, fig. 2	Novaculichthys tæniurus.
Hemirhamphus *depauperatus*	66		Hemirhamphus depauperatus.
Ophisurus *semicinctus*	66	Pl. XX, fig. 4	Leiuranus semicinctus.
Monacanthus *spilosoma*	70	Pl. XXII, fig. 1	Stephanolepis spilosomus.

The French corvette *Bonite* visited the Hawaiian Islands and collected fishes there in 1837. The vessel was under command of L. Vaillant, with M. Eydoux, surgeon-major; L. Souleyet, assistant surgeon, and Henri Marie Ducrotay de Blainville were intrusted with directing the work in zoology and reporting thereon. M. Souleyet, as assistant to M. Eydoux, assisted also in zoology, and when, near the termination of the voyage, M. Eydoux accepted a position as physician at Martinique, Souleyet continued the work and duties previously performed by M. Eydoux. M. Gaudichaud (pharmacien-professeur) joined the expedition for researches in natural history,

[a] Evidently the awa, *Chanos chanos*.

and M. Henri Gervais, aid-naturalist to M. de Blainville, assisted Souleyet in the determinations and descriptions of the mammals and birds.

The *Bonite* left Toulon February 6, 1836, to carry French consular agents to Chile, the Philippines, and elsewhere, and arrived at the bay of Karakakooa, Hawaii, October 1, 1837. She remained until October 6, and then proceeded to Honolulu, where she arrived October 8 and remained until November 24, when she sailed for Manila. During the time spent among the Hawaiian Islands 15 species of fishes were collected, 9 of which were described as new by Eydoux and Souleyet (1842) in the zoology of the voyage of the *Bonite*.

Fishes collected at the Hawaiian Islands by the French corvette Bonite in 1837.

Nominal species.	Vol.	Page.	Plate and figure.	Present identification.
Chætodon miliaris	I	163	Pl. 2, fig. 2	Chætodon miliaris.
Caranx *pinnulatus*	I	165	Pl. 3, fig. 1	Decapterus sanctæ-helenæ.
Caranx *stellatus*	I	167	Pl. 3, fig. 2	Carangus melampygus.
Acanthurus humeralis	I	169	Pl. 2, fig. 3	Hepatus olivaceus.
Mugil *chaptalii*	I	171	Pl. 4, fig. 1	Chænomugil chaptalii.
Mugil cephalotus	I	175	Pl. 4, fig. 4	Mugil cephalus.
Gobius *stamineus*	I	179	Pl. 5, fig. 5	Awaous stamineus.
Chironectes *reticulatus*	I	186	Pl. 5, fig. 2	Antennarius bigibbus.
Chironectes *leprosus*	I	187	Pl. 5, fig. 3	Antennarius leprosus.
Scarus formosus	I	191	Pl. 6, fig. 3	Callyodon formosus.
Chanos cyprinella	I	196	Pl. 7, fig. 1	Chanos chanos.
Saurus *limbatus*	I	199		Trachinocephalus myops.
Conger *marginatus*	I	201	Pl. 9, fig. 1	Leptocephalus marginatus.
Muræna *valenciennii*	I	207	Pl. 8, fig. 1	Gymnothorax undulatus.
Tetraodon stellatus	I	212	Pl. 10, fig. 2	Tetraodon hispidus (?).

In the Proceedings of the Boston Society of Natural History at the meeting of October 25, 1858, Agassiz established the new genus *Goniobatis* for a new skate from the Hawaiian Islands, which he called *Goniobatis meleagris* (= *Stoasodon narinari*).

In the various volumes of Günther's Catalogue of Fishes in the British Museum (Volumes I–VIII, 1859–1870) 45 species are recorded from the Hawaiian Islands, as follows:

Fishes in the British Museum recorded from the Hawaiian Islands.

Nominal species.	Volume.	Page.	Present identification.
Serranus guttatus	I	119	Cephalopholis argus.
Chætodon quadrimaculatus	II	13	Chætodon quadrimaculatus.
Chætodon ornatissimus	II	15	Chætodon ornatissimus.
Chætodon fremblii	II	16	Chætodon fremblii.
Chætodon *humeralis* [a]	II	19	Chætodon humeralis. [a]
Chætodon miliaris	II	31	Chætodon miliaris.
Holacanthus arcuatus	II	43	Holacanthus arcuatus.
Cirrhites *cinctus*	II	73	Paracirrhites cinctus.
Cirrhitichthys maculatus	II	74	Cirrhitus marmoratus.
Caranx stellatus	II	436	Carangus melampygus.
Zanclus cornutus	II	493	Zanclus canescens.
Sicydium stimpsoni [b]	III	93	Sicydium stimpsoni.
Lentipes concolor	III	96	Lentipes concolor.
Antennarius multiocellatus var. leprosa	III	194	Antennarius leprosus.
Antennarius bigibbus	III	199	Antennarius bigibbus.
Blennius sordidus	III	220	Blennius sordidus.
Blennius *brevipinnis* [a]	III	226	Hypsoblennius brevipinnis.
Salarias marmoratus	III	248	Alticus marmoratus.
Acanthurus triostegus	III	327	Hepatus sandvicensis.
Acanthurus strigosus	III	342	Ctenochætus strigosus.
Acanthurus rhombeus	III	342	Zebrasoma flavescens.
Acronurus argenteus	III	346	Hepatus dussumieri.
Dascyllus albisella	IV	13	Dascyllus albisella.
Pomacentrus nigricans	IV	34	Pomacentrus jenkinsi.
Glyphidodon cœlestinus	IV	38	Abudefduf abdominalis.

[a] Both valid species, but they came from the coast of Mexico. [b] Hilo, Hawaii.

Fishes in the British Museum recorded from the Hawaiian Islands—Continued.

Nominal species.	Volume.	Page.	Present identification.
Cossyphus albotæniatus	IV	105	Lepidaplois albotæniatus.
Cheilinus bimaculatus	IV	131	Cheilinus bimaculatus.
Anampses cuvieri	IV	136	Anampses cuvier.
Platyglossus geoffroyii	IV	145	Macropharyngodon geoffroyii.
Novacula pavo	IV	175	Iniistius pavoninus.
Gomphosus sandvicensis	IV	194	Gomphosus tricolor.
Coris gaimardi	IV	200	Julis gaimard.
Coris greenoughii	IV	204	Julis greenovii.
Coris flavovittata	IV	205	Julis flavovittata.
Cymolutes leclusii	IV	207	Cymolutes lecluse.
Pseudoscarus dubius	IV	229	Callyodon dubius.
Saurida nebulosa	V	399	Saurida gracilis.
Belone carinata	VI	236	Belone platyura.
Exoccetus rostratus	VI	280	Evolantia rostrata.
Muræna undulata	VIII	110	Gymnothorax undulatus.
Muræna acutirostris	VIII	110	Eurymyctera acutirostris.
Balistes bursa	VIII	219	Balistes bursa.
Balistes buniva	VIII	227	Melichthys radula.
Monacanthus spilosoma	VIII	243	Stephanolepis spilosomus.
Diodon *maculatus*	VIII	307	Diodon holacanthus.

In 1860 Dr. Theo. Gill, in the Proceedings of the Philadelphia Academy, described 2 new species from the Hawaiian Islands, from specimens collected by William Stimpson in a fresh-water stream at Hilo:

Nominal species.	Page.	Present identification.
Sicydium *stimpsoni*	101	Sicydium stimpsoni.
Sicyogaster *concolor*	102	Lentipes concolor.

In the same volume Dr. Charles C. Abbott described 4 new species from the Hawaiian Islands, the specimens having been collected by Dr. J. K. Townsend, who presented them to the museum of the Philadelphia Academy:

Nominal species.	Page.	Present identification.
Pisoodonophis *magnifica*	476	Myrichthys magnificus.
Muræna *acutirostris*	476	Eurymyctera acutirostris.
Thrysoidea *kaupii*	477	Gymnothorax undulatus.
Thrysoidea *eurosta*	478	Gymnothorax eurostus.

Three species from the Hawaiian Islands, one of them being described as new, were recorded by Doctor Gill in 1862 in the same Proceedings, from specimens collected by Rev. W. H. Pease:

Nominal species.	Page.	Present identification.
Cirrhitus arcatus	107	Paracirrhites arcatus.
Cirrhitus fasciatus	107	Paracirrhites cinctus.
Cirrhitus *alternatus*	122	Cirrhitus marmoratus.

In his catalogue of fishes of Lower California (1862), in a foot-note on page 149, Dr. Gill describes *Dascyllus albisella* from specimens collected by Rev. W. H. Pease at the Sandwich Islands.

Andrew Garrett, in the Proceedings of the California Academy for 1863, described 3 new species from the Hawaiian Islands, as follows:

Nominal species.	Page.	Present identification.
Julis *ornatissimus*	63	Halichœres ornatissimus.
Chironectes rubrofuscus	64	Antennarius leprosus.
Chætodon multicinctus	65	Chætodon punctatofasciatus.

The next year, in the same Proceedings, Mr. Garrett described 5 additional species:

Nominal species.	Page.	Present identification.
Cheilodactylus *vittatus*	103	Cheilodactylus vittatus.
Apogon *maculiferus*	105	Amia maculifera.
Scorpæna *parvipinnis*	105	Sebastopsis parvipinnis.
Crenilabrus *modestus*	106	Lepidaplois modestus.
Chironectes *niger*	107	Antennarius commersoni.

Several collections, made at various times by different individuals in the Lesser Antilles, were reported upon by Dr. Edward D. Copè (1870), and scattered through this paper, in footnotes, are descriptions of many species from different parts of the world. Two of them were collected about 1835 by Dr. John K. Townsend at the Sandwich Islands, and one, *Tetrodon florealis* (*Spheroides florealis*), was described as new. *Cantherines sandvicensis* also is recorded from this place.

In the Proceedings of the Zoological Society of London for 1871, page 663, Dr. Albert Günther records *Peristethus engyceras* (=*Peristedion engyceras*) from the Hawaiian Islands.

Günther's "Fische der Südsee," the most important of the earlier papers on the fish fauna of the Hawaiian Islands, was published in 1873–1881.[a] Although never completed, it contains descriptions or mention of no fewer than 439 species of fishes, 78 of which are credited to the Hawaiian Islands. In the following tabular statement are given the name and our identification of each species recorded in this work by Günther from the Hawaiian Islands, with page and plate reference. New genera and new species are indicated by italics.

[a] According to the Zoological Record, the dates upon which the various parts of this work appeared are as follows:

Band I.

Heft I, pp. 1–24, Pls. I–XX	1873
Hefts II and III, pp. 25–96, Pls. XXI–LX	1874
Heft IV, pp. 97–128, Pls. LXI–LXXXIII	1875

Band II.

Heft V, pp. 129–168, Pls. LXXXIV–C	1876
Heft VI, pp. 169–216, Pls. CI–CXIX	1877
Heft VII, pp. 217–256, Pls. CXX–CXL	1881

Fishes from the Hawaiian Islands recorded in Günther's Fische der Südsee.

Nominal species.	Page.	Plate and figure.	Present identification.
Apogon frenatus	19	XIX, A	Amia snyderi.
Apogon maculiferus	20	XX, C	Amia maculifera.
Dules marginatus	24		Kuhlia malo.
Chætodon setifer	36	XXVI, B	Chætodon setifer.
Chætodon ornatissimus	38	XXX, B	Chætodon ornatissimus.
Chætodon fremblii	39	XXIX, B	Chætodon fremblii.
Chætodon humeralis[c]	40		Chætodon humeralis.[c]
Chætodon lunula	42	XXXIII	Chætodon lunula.
Chætodon multicinctus	44	XXXIV, B	Chætodon punctatofasciatus.
Chætodon lineolatus	45	XXXIV, A	Chætodon lineolatus.
Chætodon miliaris	46	XXXV, A	Chætodon miliaris.
Chætodon strigatus	47		Microcanthus strigatus.
Chelmo longirostris	48		Forcipiger longirostris.
Holacanthus arcuatus	50	XXXII, C	Holacanthus arcuatus.
Holacanthus bispinosus	51	LVI, C	Holacanthus bispinosus.
Holacanthus bicolor	51	XXXIX, B	Holacanthus bicolor.
Upeneus trifasciatus	59	XLIV, B and C	Pseudupeneus multifasciatus.
Sphærodon grandoculis	67		Monotaxis grandoculis.
Pimelepterus fuscus	68		Kyphosus fuscus.
Cirrhitus forsteri	69	XLIX, A	Paracirrhites forsteri.
Cirrhitus maculatus	71	LI, A	Cirrhitus marmoratus.
Cirrhitus cinctus	72	LII, A and B	Paracirrhites cinctus.
Chilodactylus vittatus	73	LI, B	Cheilodactylus vittatus.
Scorpæna parvipinnis	75	LII, D	Sebastopsis parvipinnis.
Scorpæna *cookii*	78	LV	Sebastopsis cacopsis.
Scorpæna asperella	80		Sebastapistes asperella.
Tænianotus *garretti*	83	LVII, C	Tænianotus garretti.
Micropus unipinna	86		Caracanthus unipinna.
Micropus maculatus	86		Caracanthus maculatus.
Myripristis murdjan	92	LXI and LXII	Myripristis murdjan.
Myripristis (Holotrachys) lima	93	LXIII, A	Holotrachys lima.
Holocentrum diadema	97		Holocentrus diadema.
Holocentrum microstoma	98	LXIV, B	Holocentrus microstomus.
Holocentrum erythræum	99	LXIII, B	Holocentrus erythræus.
Gempylus serpens	106	LXVIII, B	Gempylus serpens.
Acanthurus triostegus	108		Hepatus sandvicensis.
Acanthurus guttatus	109	LXIX, A	Hepatus guttatus.
Acanthurus nigros	110		Hepatus elongatus.
Acanthurus dussumieri	112	LXXII	Hepatus dussumieri.
Acanthurus olivaceus	113		Hepatus olivaceus.
Acanthurus strigosus	116	LXXIX, B and C	Ctenochætus strigosus.
Acanthurus flavescens	116	LXXVI	Zebrasoma flavescens.
Naseus unicornis	118	LXXVIII	*Acanthurus unicornis.*
Naseus lituratus	124	LXXXII	Callicanthus lituratus.
Caranx sanctæ-helenæ	130		Decapterus pinnulatus.
Caranx crumenophthalmus	131		Trachurops crumenophthalma.
Caranx ferdau	134	LXXXVII and LXXXVIII	Carangoides ferdau.
Caranx gallus	135		Alectis ciliaris.
Caranx ciliaris	135	LXXXIX	Alectis ciliaris.
Seriola dumerilii	136	XC, A	Seriola purpurascens.
Zanclus cornutus	142	XCII	Zanclus canescens.
Coryphæna equisetis	147	XCIII, A	Coryphæna equisetis.
Malacanthus hœdtii	160	XCVIII, B	Malacanthus parvipinnis.
Antennarius commersonii	163	CIII, B; CVI, B	Antennarius commersonii.
Antennarius bigibbus	165	CV, B	Antennarius bigibbus.
Dactylopterus orientalis	169		Cephalacanthus orientalis.
Gobius genivittatus	170	CX, C	Awaous genivittatus.
Gobius albopunctatus	172	CX, A	Mapo fuscus.
Sicydium stimpsoni[a]	183		*Sicydium stimpsoni.*
Sicydium *albotæniatum*	183	CX, D	Sicydium albotæniatum.
Lentipes concolor[a]	184		Lentipes concolor.
Blennius sordidus	193	CXIII, D	Blennius sordidus.
Blennius brevipinnis[c]	194		Hypsoblennius brevipinnis.[c]
Salarias marmoratus	204	CXVI, B	Alticus marmoratus.
Salarias gibbifrons	205	CXIV, C	Alticus gibbifrons.
Mugil dobula	214	CXX, A	Mugil cephalus.
Aulostoma chinense	221	CXXIII, B and C	Aulostomus valentini.
Glyphidodon saxatilis	229	CXXVI	Abudefduf abdominalis.
Dascyllus trimaculatus	236		Dascyllus albisella.
Dascyllus albisella	236		*Dascyllus albisella.*
Cossyphis bilunulatus	240	CXXX	Lepidaplois albotæniatus.
Cossyphis modestus[b]	241	CXXIX, B	Lepidaplois modestus.
Labroides dimidiatus	243		Labroides dimidiatus.
Chilinus bimaculatus[b]	246		Cheilinus bimaculatus.
Anampses cuvieri	251	CXXXVI, A	Anampses cuvier.
Anampses *godeffroyi*	252	CXL	Anampses godeffroyi.
Stethojulis axillaris	254	CXXXVI, C	Stethojulis axillaris.
Stethojulis albovittata	256	CXLI, B	Stethojulis albovittata.

[a] Hilo, Hawaii. [b] Honolulu. [c] Not from Hawaii but from Mexico.

In 1875 Vaillant and Sauvage published descriptions of 19 species of fishes from the Hawaiian Islands which they regarded as new. The specimens upon which the descriptions were based formed a portion of a collection comprising 180 species, obtained, presumably at Honolulu, by M. Ballieu, at that time French consul to the Hawaiian Islands. The descriptions are, for the most part, unsatisfactory, and certain identification of several of the species seems impossible. Of the 19 species described from the Hawaiian Islands 3 are credited to Sauvage, the others to Valliant and Sauvage.

Fishes described from the Hawaiian Islands by Vaillant and Sauvage in 1875.

Nominal species.	Page.	Present identification.
Scorpæna *ballieui*	278	Sebastapistes ballieui.
Cottus *filamentosus*	279	Gymnocanthus intermedius.[a]
Glyphisodon *imparipennis*	279	Abudefduf imparipennis.
Gobius *homocyanus*	280	Mapo fuscus.
Eleotris *sandwicensis*	280	Eleotris sandwicensis.
Salarias *zebra*	281	Scartichthys zebra.
Mugil *trichilus*	281	Chænomugil chaptali.
Congrogadus *marginatus*	282	Congrogadus marginatus.
Brotula *multicirrata*	282	Brotula multicirrata.
Acanthurus *virgatus*	283	Zebrasoma flavescens.
Malacanthus *parvipinnis*	283	Malacanthus parvipinnis.
Novacula (Novacula) *microlepis*	284	Cymolutes lecluse.
Julis *ballieui*	284	Thalassoma ballieui.
Coris (Hemicoris) *venusta*	285	Coris venusta.
Coris (Hemicoris) *ballieui*	285	Coris ballieui.
Coris (Hemicoris) *rosea*	286	Coris rosea.
Tetraodon (Anosmius) *janthinus*	286	Canthigaster janthinus.
Tetraodon (Anosmius) *coronatus*	286	Canthigaster valentini.
Pœcilophis *tritor*	287	Echidna leihala.

[a] A Japanese species not seen in Hawaii.

The U. S. S. *Portsmouth*, Commander Joseph S. Skerrett commanding, while engaged in a survey of the islands of the North Pacific Ocean, visited the Hawaiian and Fanning islands in 1873–74, and considerable collections of fishes were made by the medical officers on board—Surg. William H. Jones, U. S. Navy, and Passed Asst. Surg. Thomas H. Streets, U. S. Navy. These collections were reported upon by Dr. Streets (Streets, 1877), who states that the fish fauna of Honolulu Harbor is very well represented in the collection, but that inadequate means for the preservation of specimens while at the Fanning Islands prevented the making of extensive collections at that group. Thirty-six species are recorded from the Fanning group and 38 from the Hawaiian Islands, nearly all from the harbor at Honolulu or at other places on Oahu Island. Of these 38 species one (*Acanthurus triostegus sandvicensis*) is described as a new subspecies.

Fishes obtained at the Hawaiian Islands by U. S. S. Portsmouth in 1873–74.

Nominal species.	Page.	Locality.	Present identification.
Tetrodon implutus	56	Honolulu Harbor, Oahu	Tetraodon hispidus.
Balistes buniva	57	do	Melichthys radula.
Balistes vidua	57	do	Balistes vidua.
Rhomboidichthys pantherinus	57	do	Platophrys pantherinus.
Culius fuscus	57	Fresh water streams, Oahu	Eleotris sandvicensis.
Brachyeleotris cyanostigma	58	Coral reefs at Oahu	Asterropteryx semipunctatus.
Sicyopterus stimpsoni	59	Fresh water streams, Oahu	Sicydium stimpsoni.
Awaous crassilabris	59	do	Awaous stamineus.
Acentrogobius ophthalmotænia	60	Coral reefs at Oahu	Gnatholepis knighti.
Glossogobius giuris	60	do	Mapo fuscus.
Sebastapistes strongia	62	Honolulu, Oahu	Sebastapistes gibbosa.
Pseudochellinus hexatænia	63	do	Pseudochellinus octotænia.

Fishes obtained at the Hawaiian Islands by U. S. S. Portsmouth in 1873–74—Continued.

Nominal species.	Page.	Locality.	Present identification.
Stethojulis axillaris	65	Honolulu, Oahu	Stethojulis axillaris.
Cheilio inermis	65	do	Cheilio inermis.
Julis melanoptera	66	do	Thalassoma duperrey.
Glyphidodon saxatilis	66	do	Abudefduf abdominalis.
Acanthurus triostegus, var. *sandvicensis*	67	Honolulu Harbor, Oahu	Hepatus sandvicensis.
Acanthurus blochi	68	do	Hepatus guntheri.
Naseus unicornis	68	Honolulu, Oahu	Acanthurus unicornis.
Trachurops mauritianus	68	Honolulu Harbor, Oahu	Trachurops crumenopthalma.
Carangus melampygus	69	Honolulu, Oahu	Carangus melampygus.
Carangus chrysos	70	do	Carangus crysos.
Chorinemus sanctipetri	70	do	Scomberoides sancti-petri.
Upeneus trifasciatus	71	do	Pseudupeneus multifasciatus.
Upeneoides vittatus	71	do	Upeneus arge.
Moronopsis marginatus	71	Waialua, Oahu	Kuhlia malo.
Apogon auritus	72	*Honolulu, Oahu*	*Foa brachygramma.*
Priacanthus carolinus	72	Honolulu Harbor	Priacanthus cruentatus.
Cirrhites forsteri	73	Honolulu, Oahu	Paracirrhites forsteri.
Mugil cephalotus	73	Honolulu Harbor	Mugil cephalus.
Aulostoma chinense	74	*Honolulu, Oahu*	Aulostomus valentini.
Fistularia serrata	74	Honolulu Harbor	Fistularia serrata.
Belone platyura	75	do	Belone platyura.
Exocœtus speculiger	75	Hawaiian Islands	Exocœtus volitans.
Exocœtus brachypterus	75	do	Parexocœtus brachypterus.
Saurida nebulosa	76	Honolulu, Oahu	Saurida gracilis.
Albula conorhynchus	76	do	Albula vulpes.
Muræna undulata	77	Coral reefs, Honolulu, Oahu	Gymnothorax undulatus.

Steindachner (1876) in his Ichthyologische Beiträge (V) records as new two species from the Hawaiian Islands, *Moronopsis argenteus* var. *sandvicensis* (=*Kuhlia malo*), and *Aprion microdon* (=*Apsilus microdon*). Three years later (1879) the same author, in his "Über einige Scariden aus Polynesien," describes *Scarus* (*Scarus*) *perspicillatus* (= *Callyodon perspicillatus*) from the same islands.

The *Challenger*, during her memorable voyage, stayed a fortnight at Honolulu and five days at Hilo, at which places 27 species of fishes were secured. These were recorded by Dr. Günther (1880), in his report on the shore fishes of the voyage of the *Challenger*. The list is as follows:

Fishes collected at the Hawaiian Islands by H. M. S. Challenger.

Nominal species.	Volume.	Page.	Plate and figure.	Locality.	Present identification.
Zygæna malleus	I, pt. VI	59		Honolulu	Sphyrna zygæna.
Dules marginatus	I, pt. VI	59		Hilo and Honolulu.	Kuhlia malo.
Scorpæna nuchalis	I, pt. VI	59		Honolulu	Sebastapistes nuchalis.
Cirrhites arcatus	I, pt. VI	59		do	Paracirrhites arcatus.
Cirrhitichthys maculatus	I, pt. VI	59		do	Cirrhitus marmoratus.
Caranx crumenopthalmus	I, pt. VI	59		do	Trachurops crumenopthalma.
Caranx hippos	I, pt. VI	59		Hilo	Carangus forsteri.
Acanthurus blochi	I, pt. VI	59		Honolulu	Hepatus guntheri.
Upeneus trifasciatus	I, pt. VI	59		do	Pseudupeneus multifasciatus.
Polynemus sexfilis	I, pt. VI	50		Hilo	Polydactylus sexfilis.
Gobius stamineus	I, pt. VI	59		Honolulu	Awaous stamineus.
Gobius *sandvicensis*	I, pt. VI	60		do	*Mapo fuscus.*
Eleotris fusca	I, pt. VI	60		do	Eleotris sandwicensis.
Sicydium *nigrescens*	I, pt. VI	60	XXVI, C	do	Sicydium stimpsoni.
Lentipes concolor	I, pt. VI	61		Hawaii	Lentipes concolor.
Lentipes *seminudus*	I, pt. VI	61		Honolulu	Lentipes seminudus.
Mugil dobula	I, pt. VI	61		Hilo	Mugil cephalus.
Dascyllus albisella	I, pt. VI	61		Honolulu	Dascyllus albiselia.
Julis *obscura*	I, pt. VI	61	XXVI, figs. A and B	do	Thalassoma ballieui.
Rhomboidichthys pantherinus	I, pt. VI	61		do	Platophrys pantherinus.
Chanos salmoneus	I, pt. VI	61		do	Chanos chanos.
Albula conorhynchus	I, pt. VI	61		Hilo	Albula vulpes.
Muræna *flavo-marginata*	I, pt. VI	61		Honolulu	Gymnothorax flavimarginatus.
Muræna (?) sp	I, pt. VI	61		do	(?)
Doryichthys *pleurotænia*	I, pt. VI	62	XXVI, fig. D	do	Doryrhamphus pleurotænia.
Balistes buniva	I, pt. VI	62		do	Melichthys radula.

Steindachner, in 1878, described one new species, *Myxus* (*Neomyxus*) *sclateri* (= *Chænomugil chaptali*) from the Hawaiian Islands, and Garman (1880) described *Trygon lata* (= *Dasyatis lata*) from the same place, the specimen having been collected by Andrew Garrett. Two years later Smith and Swain (1882) published in the Proceedings of the U. S. National Museum a report on a collection of fishes from Johnston Island. This collection was made in 1880 by the captain of a vessel belonging to the North Pacific Guano Company at the instance of Dr. Jordan, who supplied the vessel with a can of alcohol for preserving the specimens. The collection contained 27 nominal species, 5 of which were described as new by Smith and Swain. The list is as follows:

Fishes collected at Johnston Island by a vessel of the North Pacific Guano Company in 1880.

Nominal species.	Page.	Present identification.
Ophichthys (Pisodontophis) *stypurus*	120	Myrichthys stypurus.
Gymnomuræna tigrina	121	Scuticaria tigrina.
Aulostomus chinensis	121	Aulostomus valentini.
Polynemus kuru	122	Polydactylus sexfilis.
Scombroides sancti-petri	124	Scomberoides sancti-petri.
Caranx gymnostethoides	125	Carangoides gymnostethoides.
Holocentrus leo	125	Holocentrus spinifer.
Holocentrus erythræus	127	Holocentrus erythræus.
Kuhlia tæniura	128	Kuhlia tæniura.
Upeneus crassilabris	129	Pseudupeneus crassilabris.
Upeneus *velifer*	130	Pseudupeneus multifasciatus.
Upeneus (Mulloides) vanicolensis	131	Mulloides vanicolensis.
Upeneus (Mulloides) *preorbitalis*	132	Mulloides preorbitalis.
Chilinus digrammus	133	Cheilinus hexagonatus.
Scarus perspicillatus	134	Callyodon perspicillatus.
Julis *verticalis*	135	Thalassoma ballieui.
Julis *clepsydralis*	136	Thalassoma duperrey.
Harpe bilunulata	136	Lepidaplois albotæniatus.
Chætodon setifer	137	Chætodon setifer.
Acanthurus triostegus	138	Hepatus sandvicensis.
Naseus lituratus	139	Callicanthus lituratus.
Balistes aculeatus	139	Balistapus aculeatus.
Balistes buniva	140	Melichthys radula.
Ostracion punctatum	140	Ostracion lentiginosum.
Tetrodon meleagris	141	Tetraodon lacrymatus.
Diodon hystrix	141	Diodon hystrix.
Platophrys mancus	142	Platophrys mancus.

Steindachner, in 1887, raised to specific rank *Moronopsis argenteus sandvicensis* (= *Kuhlia malo*), from these islands; and in 1893 he described *Myripristis pillwaxii* from Honolulu. Jenkins (1895), in the Proceedings of the California Academy, described as new *Ranzania makua*, from a specimen forwarded to Stanford University by Mr. Charles B. Wilson, of Honolulu, the fish having been captured at Pearl Harbor January 25, 1892, by Mr. Hiel Kapu.

The next important contribution to our knowledge of the ichthyology of the Hawaiian Islands is the paper by Gilbert and Cramer (1897). While engaged in surveying a cable route between California and Honolulu in December, 1891, the *Albatross* made eight hauls with the beam trawl in Kaiwi Channel. Of the 28 species (by error given as 26 in the introduction to the report), 23 were thought to be new by Gilbert and Cramer. Three new genera also were based upon this collection.

Fishes collected at the Hawaiian Islands by the Albatross in 1891.

Nominal species.	Page.	Plate and figure.	No. of Albatross station.	Type No. U. S. N. M.	Present identification.
Promyllantor *alcocki*	405	XXXVI, fig. 1	3472	47724	Promyllantor alcocki.
Congermuræna *æquorea*	405	XXXVII	3474	47696	Congrellus æquoreus.
Chlorophthalmus *proridens*	406	XXXVI, fig. 2	3475 3476	47715	Chlorophthalmus proridens.
Diaphus *urolampus*	408	XXXVIII, fig. 1	3467 3472	47709	Diaphus urolampus.
Diaphus *chrysorhynchus*	409	XXXVIII, fig. 2	286 (surface tow net).	47710	Diaphus chrysorhynchus.
Myctophum *fibulatum*	411	XXXVIII, fig. 3	3467	47711	Myctophum fibulatum.
Dasyscopelus *pristilepis*	412	XXXIX, fig. 1	286 (surface tow net).	47737	Dasyscopelus pristilepis.
Neoscopelus macrolepidotus	414		3470 3474		Neoscopelus alcocki.
Argyripnus ephippiatus	414	XXXIX, fig. 2	3472	47708	Argyripnus ephippiatus.
Polyipnus spinosus	416		3476		Polyipnus nuttingii.
Melanostoma *argyreum*	416	XXXIX, fig. 3	3476 3472	47732	Synagrops argyrea.
Sternoptyx diaphana	416		3473		Sternoptyx diaphana.
Scorpæna *remigera*	418	XL	3476	47726	Setarches remiger.
Peristedion *hians*	419	XLI, figs. 1, 2	3470–3472 3476	47730	Peristedion hians.
Cœlorhynchus parallelus	421		3473		Cœlorhynchus parallelus.
Cœlorhynchus *gladius*	421	XLI, 3	3472	47706	Cœlorhynchus gladius.
Cœlocephalus acipenserinus	422	XLII, fig. 1	3470–3476	47721	Mateocephalus acipenserinus.
Macrourus *ectenes*	423	XLIV, fig. 1	3473	47718	Macrourus ectenes.
Macrourus *propinquus*	424	XLII, fig. 2	3473 3475	47741	Macrourus propinquus.
Macrourus *holocentrus*	425	XLIII	3474 3475	47734	Macrourus holocentrus.
Macrourus *gibber*	426	XLIV, fig. 2	3474 3475	47733	Macrourus gibber.
Hymenocephalus *antræus*	428	XLVI, fig. 2	3467 3470 3471 3476	47735	Hymenocephalus antræus.
Trachonurus *sentipellis*	429	XLV, fig. 1	3474	47980	Trachonurus sentipellis.
Chalinura *ctenomelas*	430	XLV, fig. 2	3470 3472	47704	Chalinura ctenomelas.
Optonurus *atherodon*	431	XLVI, fig. 1	3470 3471 3474 3475 3476	47729	Optonurus atherodon.
Malacocephalus lævis	432		3470 3472 3475 3476		Malacocephalus lævis.
Pelecanichthys crumenalis	433	XLVII	3472 3476	48738	Pelecanichthys crumenalis.
Malthopsis *mitriger*	434	XLVIII, figs. 1, 2	3467 3472 3476	47700	Malthopsis mitriger.

In 1896 and 1897 Dr. Schauinsland, director of the Bremen Museum, during a voyage in the Pacific Ocean, made collections of fishes at various places. He obtained about 160 species, 117 of which were from the Hawaiian Islands (Oahu and Laysan). The collections were reported upon by Dr. Franz Steindachner (1900), who described 9 of the species from the Hawaiian Islands as new.

Fishes obtained at the Hawaiian Islands by Dr. Schauinsland in 1896 and 1897.

Nominal species.	Page.	Plate and figure.	Locality.	Present identification.
Kuhlia malo	483		Laysan and Honolulu	Kuhlia malo.
Priacanthus hamrur	484		do	Priacanthus meeki.
Apogon (Pristiapogon) frenatus	484		Honolulu	Amia snyderi.
Apogon maculiferus	484		Laysan	Amia maculifera.
Aprion virescens	484		Honolulu	Amia virescens.
Mulloides pflügeri	485	III, 4	do	Mulloides pflugeri.
Mulloides erythrinus	485		Laysan	Mulloides erythrinus.
Mulloides auriflamma	485		Laysan and Honolulu	Mulloides auriflamma.
Parupeneus cyclostomus	486		Honolulu	Pseudupeneus chryserydros.
Parupeneus pleurostigma	486		Laysan	Pseudupeneus pleurostigma.
Parupeneus dispilurus	486		Honolulu	Pseudupeneus fraterculus.
Parupeneus trifasciatus	486		do	Pseudupeneus multifasciatus.
Upeneoides tæniopterus	487		do	*Upeneus tæniopterus.*
Sphærodon grandoculis	487		do	Monotaxis grandoculis.
Chætodon auriga	488		do	Chætodon setifer.
Chætodon fremblii	488		Laysan	Chætodon fremblii.
Chætodon quadrimaculatus	489		Honolulu and Laysan	Chætodon quadrimaculatus.
Chætodon lunula	489		Honolulu	Chætodon lunula.
Chætodon lineolatus	489		do	Chætodon lineolatus.
Chætodon miliaris	489		Honolulu and Laysan	Chætodon miliaris.
Chelmo (Forcipiger) longirostris	489		Honolulu	Forcipiger longirostris.
Zanclus cornutus	489		do	Zanclus canescens.
Pimelepterus fuscus	489		Honolulu and Laysan	Kyphosus fuscus.
Cirrhites (Amblycirrhites) arcatus	490		Honolulu	*Paracirrhites arcatus.*
Cirrhites forsteri	490		do	Paracirrhites forsteri.
Cirrhites (Cirrhitichthys) maculatus	490		Honolulu and Laysan	Cirrhitus marmoratus.
Cirrhites cinctus	490		Honolulu	Paracirrhites cinctus.
Chilodactylus vittatus	490		do	Chilodactylus vittatus.
Scorpæna gibbosa	491		do	Scorpænopsis gibbosa.
Holocentrum argenteum	492		Honolulu and Laysan	Holocentrus scythrops.
Holocentrum diadema	492		do	Holocentrus diadema.
Myripristis murdjan	492		Honolulu	Myripristis murdjan.
Myripristis (Holotrachis) lima	492		do	Holotrachys lima.
Polynemus sexfilis	492		do	Polydactylus sexfilis.
Acanthurus dussumieri	493		do	Hepatus dussumieri.
Acanthurus flavescens	493		do	Zebrasoma flavescens.
Acanthurus olivaceus	493		do	Hepatus olivaceus.
Acanthurus lineolatus	493		do	Hepatus atramentatus.
Acanthurus triostegus	493		Honoluluand Laysan	Hepatus sandvicensis.
Acanthurus achilles	493		Honolulu	Hepatus achilles.
Acanthurus bipunctatus	494		do	Hepatus elongatus.
Acanthurus (Harpurus) hypselopterus	494	IV, 1	do	Zebrasoma veliferum.
Acanthurus (Ctenodon) strigosus	494		do	Ctenochætus strigosus.
Naseus unicornis	495		Honoluluand Laysan	Acanthurus unicornis.
Naseus litturatus	495		Honolulu	Callicanthus lituratus.
Caranx (Hypocaranx) speciosus	495		Oahu, Pearl Harbor	Caranx speciosus.
Caranx ignobilis	495		Honoluluand Laysan	Carangus ignobilis.
Caranx (Selar) affinis	495		Honolulu	Carangus affinis.
Caranx crumenophthalmus	495		do	Trachurops crumenophthalma.
Caranx ferdau	495		do	Carangoides ferdau.
Decapterus sanctæ-helenæ	495		do	Decapterus pinnulatus.
Chorinemus moadetta	495		do	Scomberoides tolooparah.
Chorinemus sancti-petri	496		do	Scomberoides sancti-petri.
Percis *schauinslandii*	496	III, 5	do	Osurus schauinslandi.
Malacanthus hœdtii	497		do	Malacanthus parvipinnis.
Antennarius commersonii	497		Laysan	Antennarius commersonii.
Dactylopterus orientalis	498		Honolulu	Cephalacanthus orientalis.
Salarias edentulus	499		Laysan	Salarias edentulus.
Sphyræna agam	500		Honolulu	Sphyræna commersonii.
Myxus *pacificus*	500		Laysan	Myxus pacificus.
Mugil dobula	501		Honolulu	Mugil cephalus.
Aulostoma chinense	502		Honolulu and Laysan	Aulostomus valentini.
Heliastes *ovalis*	502		Honolulu	Chromis ovalis.
Glyphidodon saxatilis	502		Honolulu and Laysan	Abudefduf abdominalis.
Glyphidodon (Paraglyphidodon) melas	502		Laysan	Abudefduf sordidus.
Dascyllus trimaculatus	503		Honolulu	Dascyllus albisella.
Harpe bilunulata	503		do	Lepidaplois albotæniatus.
Chilinus radiatus	504		do	Cheilinus diagrammus.
Chilinus bimaculatus	504		do	Cheilinus bimaculatus.
Stethojulis albovittata	504		do	Stethojulis albovittata.
Novacula vanicolensis	504		do	Novaculichthys tæniurus.
Novacula (Iniistius) pavo	505		do	Iniistius pavoninus.
Novacula (Iniistius) nigra	505	IV, 2	do	Iniistius niger.
Novacula (Iniistius) tetrazona	505		do	Iniistius pavoninus.
Julis duperrei	506		Honolulu and Laysan	Thalassoma duperrey.
Julis umbrostigma	506		do	Thalassoma umbrostigma.
Julis purpureus	506		do	Thalassoma purpureum.
Julis ruppellii	506		Laysan	Thalassoma fuscum.
Julis obscura	506		Honolulu and Laysan	Thalassoma ballieui.
Gomphosus tricolor	506		Honolulu	Gomphosus tricolor.
Gomphosus varius	507		do	Gomphosus varius.
Chilio inermis	507		do	Cheilio inermis.
Coris multicolor	507	V, 2	Honolulu and Laysan	Coris venusta.
Coris pulcherrima	507		Honolulu	Julis pulcherrima.

Fishes obtained at the Hawaiian Islands by Dr. Schauinsland in 1896 and 1897—Continued.

Nominal species.	Page.	Plate and figure.	Locality.	Present identification.
Coris *argenteo-striata*	507	III, 1	Honolulu	Coris rosea.
Coris *schauinslandii*	508	V, 1	do	Coris ballieui.
Pseudoscarus troschelii	508		Laysan	Callyodon troscheli.
Pseudoscarus bataviensis	508		Honolulu	Callyodon bataviensis.
Pseudoscarus sumbawensis	509		Laysan	Callyodon erythrodon.
Callyodon genistratus	509		Honolulu	Cryptotomus sp.
Callyodon spinidens	509		Laysan	Cryptotomus sp.
Platophrys pavo	510		Honolulu	Platophrys sp.
Platophrys pantherinus	511		do	Platophrys pantherinus.
Hemirhamphus *pacificus*	511		Laysan	Hyporhamphus pacificus.
Belone annulata	512		Honolulu	Tylosurus giganteus.
Belone platyura	512		Laysan	Belone platyura.
Exocœtus brachypterus	512		Honolulu and Laysan	Parexocœtus brachypterus.
Exocœtus bahiensis	512		Honolulu	Cypsilurus bahiensis.
Exocœtus neglectus	512		do	*Cypsilurus simus.*
Synodus varius	513		Honolulu and Laysan	Synodus varius.
Albula glossodonta	513		Honolulu	Albula vulpes.
Elops saurus	513		do	Elops saurus.
Chanos chanos	514		do	Chanos chanos.
Conger marginatus	514		Laysan	*Leptocephalus marginatus.*
Muræna flavimarginata	514	VI, 3		Gymnothorax steindachneri, in part.
Muræna laysana	515	VI, 1, 2	Laysan	Gymnothorax laysanus.
Balistes vidua	516		Honolulu	Balistes vidua.
Balistes aculeatus	517		Laysan	Balistapus aculeatus.
Balistes rectangulus	517		Honolulu	Balistapus rectangulus.
Balistes (Melanichthys) buniva	517		Honolulu and Laysan	Melichthys radula.
Balistes (Parabalistes) ringens	517		Laysan	Melichthys radula.
Balistes (Linrus) aureolus	517		do	Canthidermis aureolus.
Monacanthus spilosoma	517		do	Stephanolepis spilosomus.
Monacanthus pardalis	517		Honolulu	Cantherines sandwichiensis.
Ostracion punctatus	517		do	Ostracion lentiginosum.
Ostracion diaphanus	517		Laysan and Hawaii	Lactoria galeodon.
Tetrodon margaritatus	518		Laysan	Canthigaster jactator.
Tetrodon caudofasciatus	518	III, 3	do	Canthigaster bitæniatus.
Diodon maculatus	518		do	Diodon holacanthus.
Carcharias (Prionodon) gangeticus	519		do	Carcharias nesiotes.
Galeus vulgaris	519		do	Galeus japonicus.
Aetobatis narinari	519		do	Stoasodon narinari.

A number of fishes were obtained by the distinguished ornithologists, Dr. John K. Townsend and Mr. Thomas Nuttall, during a trip to the Hawaiian Islands in 1835, and by Dr. Townsend alone in 1836. Later, Dr. William H. Jones, U. S. Navy, collected some specimens, and later still (October and November, 1893) Dr. Benjamin Sharp made a small collection at Honolulu. All of these collections found their way to the Philadelphia Academy and were reported upon by Mr. Henry W. Fowler (1900). Of a total of 101 species, 6 were regarded as new and 8 were too badly preserved for positive identification. The list is as follows:

Fishes recorded from the Hawaiian Islands by Henry W. Fowler in 1900.

Nominal species.	Page.	Plate and figure.	Present identification.
Leiuranus semicinctus	494		Leiuranus semicinctus.
Myrichthys magnificus	494	XVIII, 3	Myrichthys magnificus.
Lycodontis eurosta	494	XVIII, 4	Gymnothorax eurostus.
Lycodontis acutirostris	494	XVIII, 5	Eurymyctera acutirostris.
Lycodontis kaupi	494	XVIII, 6	Gymnothorax undulatus.
Lycodontis pseudothyrsoidea	494		Gymnothorax undulatus.
Lycodontis *parvibranchialis*	494	XVIII, 1	Gymnothorax laysanus.
Echidna zonata	495	XVIII, 2	Echidna zonata.
Echidna polyzona	496		Echidna zonata.
Elops saurus	496		Elops saurus.
Stolephorus purpureus	497	XIX, 1	Anchovia purpurea.
Synodus *sharpi*	497	XIX, 2	Synodus varius.
Saurida tumbil	498		Saurida gracilis.
Rhinoscopelus coruscans	498		Centrobranchus chærocephalus.
Hemiramphus depauperatus	499	XIX, 3	Hemiramphus depauperatus.
Parexocœtus mesogaster	500		Parexocœtus brachypterus.
Exocœtus volitans	500		Exocœtus volitans.
Aulostomus chinensis	500		Aulostomus valentini.

Fishes recorded from the Hawaiian Islands by Henry W. Fowler in 1900—Continued.

Nominal species.	Page.	Plate and figure.	Present identification.
Mugil kelaartii	500		Mugil cephalus.
Sphyræna commersonii	501		Sphyræna commersonii.
Polydactylus pfeifferi	501		Polydactylus sexfilis.
Myripristis murdjan	501		Myripristis murdjan.
Holocentrus diadema	501		Holocentrus diadema.
Holocentrus diploxiphus	501		Holocentrus diploxiphus.
Trachurops crumenophthalmus	501		Trachurops crumenophthalma.
Caranx latus	501		Carangus forsteri.
Kulia malo	502		Kuhlia malo.
Epinephelus fuscoguttatus	502		Epinephelus quernus.
Aprion microlepis	502		Apsilus microdon.
Sparosomus unicolor	502		Monotaxis grandoculis?
Cirrhites forsteri	502		Paracirrhites forsteri.
Tetradrachmum trimaculatum	503		Dascyllus albisella
Eupomacentrus nigricans	503		Pomacentrus jenkinsi.
Abudefduf sordidus	504		Abudefduf sordidus.
Abudefduf sexfasciatus	504		Abudefduf abdominalis.
Abudefduf limbatus	504		Abudefduf imparipinnis.[a]
Anampses cæruleopunctatus	506		Anampses cuvier.
Anampses cuvieri	506		Do.
Stethojulis albovittata	508		Stethojulis albovittata.
Stethojulis axillaris	508		Stethojulis axillaris.
Macropharyngodon geoffroyi	508		Macropharyngodon geoffroy.
Hemipteronotus *copei*	508	XX, 1	Hemipteronotus copei.
Thalassoma aneitensis	510		Thalassoma aneitense.
Thalassoma hebraica	510		Thalassoma duperrey.
Thalassoma purpurea	510		Thalassoma purpureum.
Gomphosus tricolor	510		Gomphosus tricolor.
Gomphosus varius	510		Gomphosus varius.
Coris gaimardi	510		Julis gaimard.
Coris aygula	510		Coris aygula.[a]
Coris flavovittata	511		Julis eydouxii.
Cheilio inermis	511		Cheilio inermis.
Scartichthys auritus	511		Scartichthys sauritus.[a]
Cryptotomus sandwicensis	512		Calotomus sandvicensis.
Scarus oviceps	512		Callyodon oviceps.[a]
Forcipiger longirostris	512		Forcipiger longirostris.
Chætodon miliaris	512		Chætodon miliaris.
Chætodon setifer	512		Chætodon setifer.
Chætodon biocellatus	512		Chætodon lunula.
Chætodon unimaculatus	512		Chætodon unimaculatus.
Chætodon quadrimaculatus	512		Chætodon quadrimaculatus.
Chætodon ornatissimus	513		Chætodon ornatissimus.
Chætodon tau-nigrum	513		Chætodon lunula.
Zanclus cornutus	513		Zanclus canescens.
Monoceros unicornis	513		Acanthurus unicornis.
Teuthis triostegus	513		Hepatus sandvicensis.
Teuthis guttatus	513		Hepatus guttatus.
Teuthis annularis	513		Hepatus matoides.
Teuthis achilles	513		Hepatus achilles.
Balistapus bursa	514		Balistes bursa.
Balistapus rectangulus	514		Balistapus rectangulus.
Canthidermis oculatus	514		Canthidermis angulosus.
Cantherines sandwichiensis	514		Cantherines sandwichiensis.
Monacanthus spilosoma	514		Stephanolepis spilosomus.
Spheroides florealis	514	XX, 4	Spheroides florealis.
Ranzania makua	514		Ranzania makua.
Sebastopsis guamensis	515		Sebastopsis kelloggi.
Sebastapistes strongia	515		Sebastapistes gibbosa.
Scorpænopsis diabolus	515		Scorpænopsis gibbosa.
Caracanthus maculatus	515	XX, 5	Caracanthus maculatus.
Cephalacanthus orientalis	516		Cephalacanthus orientalis.
Eleotris fuscus	516		Eleotris sandwiciensis.
Gobius albopunctatus	517		Mapo fuscus.
Gobius papuensis	517		Awaous stamineus.
Awaous genivittatus	517		Awaous genivittatus.
Awaous crassilabris	517		Awaous stamineus.
Remora albescens	517		Echeneis remora.
Petroskirtes filamentosus	517		Petroscirtes sp.[a]
Salarias edentulus	517		Salarias edentulus.
Salarias gibbifrons	517		Alticus gibbifrons.
Salarias variolosus	518		Alticus variolosus.
Salarias brevis	518		Alticus brevis.
Brotula *townsendi*	518	XX, 3	Brotula multicirrata.
Antennarius commersonii	519		Antennarius commersonii.

[a] Probably not Hawaiian.

By far the most important studies of the fishes of the Hawaiian Islands that had been made previous to the present investigations were those carried on by Dr. Oliver Peebles Jenkins. In the summer of 1889, Dr. Jenkins, then professor of biology in De Pauw University, now professor of physiology in Stanford University, fitted out an expedition to make collections of the fishes of the Hawaiian Islands. He was accompanied by Mr. George C. Price, now associate professor of zoology in Stanford University, and Mr. Oscar Vaught, then students of De Pauw University. The expenses of the expedition were shared by De Pauw University, Indiana University, and Dr. Jenkins himself, the former institution paying the major part. Several weeks were spent at Honolulu by Dr. Jenkins and his students, and a brief trip was made to Hilo. The collection obtained was vastly larger than any previously made, and contained no fewer than 140 genera and 238 species, of which 7 genera and 78 species have been described by Dr. Jenkins as new. While engaged in studying his own large collection, several smaller lots of Hawaiian fishes came into Doctor Jenkins's hands, viz: Sixteen species of shore fishes obtained at Honolulu by the U. S. Fish Commission Steamer *Albatross* in 1891 while making the Hawaiian cable survey; 18 species secured by Dr. Jordan at Honolulu in 1896, when the *Albatross* stopped at that place while on the fur-seal investigation; a small collection made at Honolulu in 1898 by Dr. Thomas D. Wood, then of Stanford University; another small collection obtained by Dr. Wood in 1899; a single example of *Ranzania makua* sent to Stanford University by Mr. C. B. Wilson, of Honolulu; a few species obtained at Honolulu by Dr. Jordan and Mr. John O. Snyder when returning from their expedition to Japan in 1900; and lastly, a small collection made in 1900 at various places among the Hawaiian Islands by Mr. Richard C. McGregor. These, added to the collections made by Dr. Jenkins, make a total of 147 genera and 254 species, of which 7 genera and 94 species were thought by Dr. Jenkins to be new. Besides the 94 species regarded as new, 62 other species were for the first time recorded from the Hawaiian Islands, making a total of 155 species added to the fish fauna, which up to that time consisted of but 99 known species. Four papers have resulted from Dr. Jenkins's studies of these collections—three preliminary (1895, 1900, and 1901), and a final paper (1903), giving a full account of all the species represented. Following is a list of the new species and new genera described in these various papers:

New species of fishes from the Hawaiian Islands, in various collections, reported on by Dr. O. P. Jenkins.

Nominal species.	Page and figure.	Type number.	Present identification.
1895.		*L. S. Jr. U. M.*	
Ranzania makua	779, frontispiece		Ranzania makua.
1900.			
Macropharyngodon aquilolo	46, fig. 1	6130	Macropharyngodon geoffroy.
Halichœres iridescens	47, fig. 2	6131	Halichœres ornatissimus.
Halichœres lao	48, fig. 3	6132	Halichœres lao.
Coris lepomis	48, fig. 4	12141	Julis lepomis.
Hemicoris remedius	49, fig. 5	6133	Coris venusta.
Hemicoris keleipionis	51, fig. 6	6049	Coris rosea.
Thalassoma pyrrhovinctum	51, fig. 7	6138	Thalassoma duperrey.
Novaculichthys woodi	52, fig. 8	6029	Novaculichthys woodi.
Novaculichthys entargyreus	53, fig. 9	5984	Do.
Hemipteronotus umbrilatus	53, fig. 10	6135	Hemipteronotus umbrilatus.
Iniistius leucozonus	54, fig. 11	6137	Iniistius pavoninus.
Iniistius verater	55, fig. 12	5990	Iniistius niger.
Cheilinus zonurus	56, fig. 13	6134	Cheilinus hexagonatus.
Anampses evermanni	57, fig. 14	6136	Anampses evermanni.
Calotomus irradians	58, fig. 15	12142	Calotomus irradians.
Scarus brunneus	59, fig. 16	6139	Callyodon brunneus.

New species of fishes from the Hawaiian Islands, in various collections, etc.—Continued.

Normal species.	Page and figure.	Type number.	Present identification.
1900.		*L. S. Jr. U. M.*	
Scarus gilberti	59, fig. 17	6140	Callyodon gilberti.
Scarus paluca	60, fig. 18	6141	Callyodon paluca.
Scarus ahula	61, fig. 19	6142	Callyodon ahula.
Scarus miniatus	62, fig. 20	12144	Callyodon miniatus.
Pseudoscarus jordani	63, fig. 21	12143	Callyodon jordani.
Pseudocheilinus octotænia	64, fig. 22	6122	Pseudocheilinus octotænia.
1901.		*U. S. N. M.*	
Sphyræna helleri	387, fig. 1	49692	Sphyræna helleri.
Sphyræna snodgrassi	388, fig. 2	49693	Sphyræna commersonii.
Anthias fuscipinnis	389, fig. 3	49695	Pseudanthias fuscipinnis.
Aphareus flavivultus	390, fig. 4	49691	Aphareus flavivultus.
Eupomacentrus marginatus	391, fig. 5	49700	Pomacentrus jenkinsi.
Chromis velox	393, fig. 6	49698	Chromis ovalis.
Chætodon mantelliger	394, fig. 7	49699	Chætodon miliaris.
Chætodon sphenospilus	395, fig. 8	49705	Chætodon unimaculatus.
Ostracion camurum	396, fig. 9	49697	Ostracion sebæ.
Ovoides latifrons	398, fig. 10	49696	Tetraodon lacrymatus.
Tropidichthys jactator	399, fig. 11	49703	Canthigaster jactator.
Eumycterias bitæniatus	400, fig. 12	49702	Canthigaster bitæniatus.
Scorpænopsis cacopsis	401, figs. 13 and 14	49690	Scorpænopsis cacopsis.
Parapercis pterostigma	402, fig. 15	49701	Osurus schauinslandii.
Brotula marginalis	403, fig. 16	49694	Brotula marginalis.
1903.			
Dasyatis hawaiensis	420, Pl. I		Dasyatis hawaiiensis.
Dasyatis sciera	421, Pl. I		Dasyatis sciera.
Congrellus bowersi	422, fig. 1	50689	Congrellus bowersi.
Microdonophis macgregori	422, fig. 2	50721	Microdonophis macgregori.
Muræna lampra	423, fig. 3	50680	Muræna kailuæ.
Muræna kaulla	424, fig. 4	50684	Muræna kailuæ.
Gymnothorax leucostictus	425, fig. 5	50681	Gymnothorax leucostictus.
Gymnorhorax gracilicauda	426, fig. 6	50679	Gymnothorax gracilicauda.
Gymnothorax thalassopterus	427, Pl. II	50619	Gymnothorax flavimarginatus.
Gymnothorax leucacme	427, fig. 7	50682	Gymnothorax petelli.
Gymnothorax ercodes	428, fig. 8	50843	Gymnothorax ercodes.
Echidna leihala	428, fig. 9	50844	Echidna leihala.
Echidna vincta	429, fig. 10	50687	Echidna zonata.
Echidna obscura	430, fig. 11	50686	Echidna obscura.
Echidna psalion	431, fig. 12	50685	Echidna psalion.
Cypsilurus atrisignis	436, Pl. III	50713	Cypsilurus atrisignis.
Myripristis sealei	439, fig. 13	50708	Myripristis sealei.
Seriola sparna	442, fig. 14	50845	Seriola sparna.
Decapterus canonoides	442, Pl. IV	50846	Decapterus pinnulatus.
Carangus hippoides	443, fig. 15	50710	Carangus ignobilis.
Carangus rhabdotus	444, fig. 16	50711	Carangus rhabdotus.
Carangus politus	445, fig. 17	50709	Carangus politus.
Fowleria brachygrammus	447, fig. 18	50699	Foa brachygramma.
Apogon menesemus	449, fig. 19	50700	Amia menesemus.
Priacanthus meeki	450, fig. 20	50847	Priacanthus meeki.
Etelis carbunculus	452, fig. 21	50714	Etelis marshi.
Pseudupeneus porphyreus	454, fig. 22	50705	Pseudupeneus porphyreus.
Chromis elaphrus	457, fig. 23	50703	Chromis elaphrus.
Calotomus cyclurus	465, fig. 24	50849	Calotomus cyclurus.
Calotomus snyderi	467, fig. 25	50850	Calotomus snyderi.
Scaridea zonarcha	468, fig. 26	50851	Scaridea zonarcha.
Scaridea balia	469, fig. 27	50852	Scaridea balia.
Teuthis leucopareius	476, fig. 28	50712	Hepatus leucoparæus.
Teuthis umbra	477	50841	Hepatus umbra.
Teuthis güntheri	477, fig. 29	50842	Hepatus guntheri.
Acanthurus incipiens	480, fig. 30	50707	Acanthurus incipiens.
Callicanthus metoposophron	481, fig. 31	50706	Callicanthus metoposophron.
Tropidichthys oahuensis	485, fig. 32	50690	Canthigaster oahuensis.
Tropidichthys epilamprus	485, fig. 33	50853	Canthigaster epilamprus.
Lactoria galeodon	487, fig. 34	50717	Lactoria galeodon.
Diodon nudifrons	488, fig. 35	50854	Diodon nudifrons.
Cirrhitoidea bimacula	489, fig. 36	50702	Cirrhitoidea bimacula.
Sebastopsis kelloggi	492, fig. 37	50694	Sebastopsis kelloggi.
Sebastapistes corallicola	493, fig. 38	50691	Sebastapistes corallicola.
Sebastapistes coniorta	495, fig. 39	50693	Sebastapistes coniorta.
Sebastapistes galactacma	496, fig. 40	50692	Sebastapistes galactacma.
Dendrochirus chloreus	498, fig. 41	50701	Dendrochirus chloreus.
Eviota epiphanes	501, fig. 42	50720	Eviota epiphanes.
Chlamydes laticeps	503, fig. 43	50716	Chlamydes laticeps.
Gobionellus lonchotus	503, fig. 44	50698	Oxyurichthys lonchotus.
Enypnias oligolepis	504, fig. 45	50715	Enypnias oligolepis.
Tripterygion atriceps	505, fig. 46	50719	Enneapterygius atriceps.
Salarias cypho	506, fig. 47	50697	Scartichthys zebra.
Salarias saltans	508, fig. 48	50690	Alticus gibbifrons.
Salarias rutilus	509, fig. 49	50695	Alticus gibbifrons.
Aspidontus brunneolus	510, fig. 50	50718	Enchelyurus ater.

In 1901 Mr. Alvin Seale, curator of fishes in the Bernice Pauahi Bishop Museum, at Honolulu, published a short paper on Hawaiian fishes. This paper contains descriptions of 7 species, 6 of which were regarded as new. The list follows:

Nominal species.	Page.	Figure.	Type number, Bishop Museum.	Identification.
Epinephelus *quernus*	3	1	481	Epinephelus quernus.
Novaculichthys *tattoo*	5	2	611	Novaculichthys woodi.
Serranus *brighami*	7	3	625	Apsilus brighami.
Balistes *fuscolineatus*	9	4	664	Balistes fuscolineatus.
Scorpænopsis cocopsis	11	5	.....	Scorpænopsis cacopsis.
Monacanthus *albopunctatus*	13	6	667	Stephanolepis albopunctatus.
Thalassoma *berendti*	15	7	681	Thalassoma purpureum.

INVESTIGATIONS BY THE U. S. FISH COMMISSION IN 1901-2.

The foregoing is a brief summary of the ichthyological work that had been done on the Hawaiian fauna previous to 1901. In that year the U. S. Fish Commission undertook a somewhat comprehensive investigation and study of the aquatic resources of the Islands. The plan adopted contemplated field investigations extending over two seasons, the first (1901) to be devoted to the shore fishes and the fresh-water species, and the second (1902) to be given primarily to the deeper water fauna.

The general direction of all the investigations was placed in the hands of the present writers, and the first field party arrived at Honolulu June 5, 1901. This party consisted of Dr. David Starr Jordan, president of Stanford University; Dr. Barton Warren Evermann, ichthyologist of the U. S. Fish Commission; Mr. Edmund L. Goldsborough and Mr. John N. Cobb, of the U. S. Fish Commission; Mr. Albertus H. Baldwin and Capt. Charles B. Hudson, artists; Mr. Michitaro Sindo, of Stanford University; Master Knight Starr Jordan, volunteer assistant, and Dr. William H. Ashmead, of the U. S. National Museum. Mr. Cobb was assigned to the study of the statistics and methods of the fisheries; Messrs. Baldwin and Hudson gave their time to securing paintings in life colors of such species as could be obtained and kept alive in aquariums long enough to be painted. Dr. Ashmead directed his efforts to making collections of insects in the interest of the U. S. National Museum. On July 17 Dr. O. P. Jenkins joined the party at Honolulu and remained until September.

Most of the collecting was done at Honolulu, though visits were made to Hilo, Lahaina (Maui Island), Kailua, Molokai, and other places. The excellent market at Honolulu, through the market inspector, Mr. E. Louis Berndt, furnished the richest and largest part of the collection, while great numbers of specimens were obtained by ourselves in shallow water and on the coral reefs about Honolulu and Waikiki; also at Moana Lua, Waianae, Waialua, Waimea, and Heeia. Kailua and Honuapo, Hawaii, which were visited by Messrs. Jordan, Goldsborough, and Sindo, also afforded excellent collecting.

In March, 1902, the Fish Commission steamer *Albatross* was sent to the Hawaiian Islands to continue the investigations by paying special attention to the deeper-water fauna. The vessel was in command of Capt. Chauncey Thomas, U. S. Navy, and the scientific staff consisted of Dr. Charles H. Gilbert, Stanford University; Dr. Charles

C. Nutting, University of Iowa; Mr. Fred. M. Chamberlain, assistant naturalist, and Mr. A. B. Alexander, fishery expert, steamer *Albatross;* Prof. John O. Snyder and Mr. Walter K. Fisher, Stanford University. The *Albatross* devoted the entire spring and summer to the investigations, running many lines of dredgings, developing fishing banks about the islands, and collecting in favorable localities, including Laysan, Bird, and Necker islands, some 800 miles to the northwest. The vessel returned to San Francisco September 1.

The collections made during the investigations carried on during these two seasons are doubtless the largest and most important ever made in the Pacific. They embrace many thousand specimens of fishes and even greater numbers of crustaceans, mollusks, and other invertebrates. The various groups have been assigned to specialists for study, and a number of reports have already been received. The early publication of all in the Bulletin of this Commission is contemplated. Those so far issued include a general report by the present writers (1902), a statistical report by John N. Cobb (1902), two papers giving descriptions of new genera and species (1903) by the present writers, a report on the shore fishes collected by the *Albatross*, by John O. Snyder (1904), several papers on the birds of Laysan Island, by Walter K. Fisher (1903) and Dr. C. C. Nutting (1903), and a short paper by Jordan and Snyder (1904) on a small collection sent in by Mr. Max Schlemmer, from Laysan Island; also a short paper by Henry W. Fowler (1904), containing references to a number of Hawaiian fishes and descriptions of a few species thought by him to be new.

The preparation of the final report on the immense collection of fishes has involved an enormous amount of work, including a critical examination and study of all literature pertaining directly or indirectly to the ichthyology of the Pacific. Not only were the thousands of specimens of the Hawaiian collections examined critically and the characters of each carefully determined and tabulated, but advantage was taken of the possession of the very large collection of fishes made in Samoa in 1902 by Doctor Jordan. The study of that collection has thrown much light on many questions previously obscure and has contributed greatly toward a proper understanding of the Hawaiian fish-fauna. Similar use was made of the very extensive collections made by Jordan and Snyder in Japan in 1900.

In the examination of the specimens and in various matters connected with the preparation of this report, the writers have been assisted greatly by Messrs. Edmund Lee Goldsborough and Clarence Hamilton Kennedy of the United States Bureau of Fisheries, and by Mr. Henry Weed Fowler of the Philadelphia Academy of Sciences. Mr. Fowler and Mr. Goldsborough spent several months at Stanford University making comparative measurements of specimens. Mr. Kennedy and Mr. Goldsborough rendered valuable assistance in verifying descriptions and references in synonymy. Dr. William Converse Kendall and Mr. Thomas E. B. Pope of the Bureau of Fisheries also assisted in the verification of descriptions and the preparation of tables. To all these gentlemen we take pleasure in expressing our indebtedness. And we wish again to express our deep obligations to Mr. E. Louis Berndt, the efficient inspector of the fish market at Honolulu, for his keen interest in our work. His knowledge of the fishes of the region enabled him to add many species to our collections which we otherwise would not have secured.

In the first paper published by the present writers in 1903 are given descriptions of 57 new species and 6 new genera, as follows:

Fishes from the Hawaiian Islands previously described by the present writers.

Carcharias phorcys.
Microdonophis fowleri.
Muræna kailuæ.
Gymnothorax vinolentus (=Enchelynassa vinolentus).
Gymnothorax steindachneri.
Gymnothorax goldsboroughi.
Gymnothorax hilonis.
Echidna zonophæa.
Rhinoscopelus oceanicus.
Hippocampus fisheri.
Hippocampus hilonis.
Atherina insularum.
Myripristis berndti.
Myripristis chryseres.
Myripristis argyromus.
Myripristis symmetricus.
Flammeo scythrops.
Holocentrus xantherythrus.
Holocentrus ensifer.
Carangus elacate.
Pikea aurora.
Anthias kelloggi.
Apogonichthys waikiki.
Apogon snyderi.
Fowleria, new genus.
Priacanthus alalaua.
Bowersia, new genus.
Bowersia violescens.
Bowersia ulaula.
Etelis evurus.
Sectator azureus.
Mulloides flammeus.
Pseudupeneus chrysonemus.
Upeneus arge.
Abudefduf sindonis.
Pomacentrus jenkinsi.
Lepidaplois strophodes.
Verriculus, new genus.
Verriculus sanguineus.
Pseudocheilinus evanidus.
Hemipteronotus baldwini.
Xyrichthys nivcilatus.
Scarus jenkinsi.
Scarus lauia.
Scarus borborus.
Teuthis atramentatus.
Pachynathus nycteris.
Lagocephalus oceanicus.
Ostracion oahuensis.
Pterois sphex.
Scorpænopsis catocala.
Dendrochirus hudsoni.
Quisquilius, new genus.
Quisquilius eugenius.
Gnatholepis knighti.
Gobiopterus farcimen.
Vitraria, new genus.
Vitraria clarescens.
Osurus, new genus.
Jordanicus umbratilis.
Engyprosopon hawaiiensis.
Engyprosopon arenicola.
Antennarius drombus.

In a paper by Jordan and Fowler on Japanese fishes (1902) the present writers describe as new *Antigonia steindachneri*, basing the description on specimens taken at Hilo, Hawaii.

In 1903 (Jordan and Evermann 1903a) one new genus (*Iracundus*) and two new species (*Tropidichthys psegma* and *Iracundus signifer*) were described.

Snyder (1904) gives a list of 227 shore species obtained by the *Albatross* among the Hawaiian Islands during the investigations of 1902. Of these, 25 species and 2 genera were thought by him to be new. The new names are as follows:

Veternio, new genus of Leptocephalidæ.
Collybus, new genus of Bramidæ.
Carcharias insularum.
Carcharias nesiotes.
Veternio verrens.
Sphagebranchus flavicaudus.
Callechelys luteus.
Moringua hawaiiensis.
Gymnothorax nuttingi.
Gymnothorax berndti.
Gymnothorax mucifer.
Gymnothorax xanthostomus.
Gymnothorax waialuæ.
Uropterygius leucurus.
Exonautes gilberti.
Carangus cheilio.
Carangoides ajax.
Collybus drachme.
Apogon erythrinus.
Cirrhilabrus jordani.
Pseudojulis cerasina.
Hemipteronotus jenkinsi.
Chætodon corallicola.
Holacanthus fisheri.
Stephanolepis pricei.
Antennarius nexilis.
Antennarius duescus.

A short paper by Jordan and Snyder (1904) lists the specimens received from Mr. Max Schlemmer, Mr. E. L. Berndt, and Mr. H. W. Henshaw, recording 37 species, of which 4 (*Brachysomophis henshawi*, *Ariomma lurida*, *Lactoria schlemmeri*, and *Antennarius laysanius*) are described as new. In a later paper the same authors describe, also as new, *Amia evermanni*, from Honolulu.

In a paper by Fowler (1904) are recorded 3 species of fishes collected by Dr. J. K. Townsend at the Hawaiian Islands many years ago and now contained in the Museum of the Philadelphia Academy, one of them (*Holocentrus gracilispinis*) being described as new. Mention is also made of a number of other Hawaiian species, examples of which were donated to the Philadelphia Academy by the Fish Commission, all duplicate specimens of species upon which the present writers had not yet reported.

LIST OF SPECIES OF FISHES DESCRIBED AS NEW FROM THE HAWAIIAN ISLANDS.

In the present report on the fishes of the Hawaiian Islands we have included not only the Hawaiian Islands proper, but Laysan and the other small islands known as the Leeward Islands, which extend some 800 miles northwestward from the main group; we also include Johnston Island, lying about the same distance southwest from Hawaii. The region thus limited constitutes a definite faunistic unit, the species being largely distinct from those of the South Seas.

Following is a list in chronologic order of all the nominal species of fishes that have been described from the Hawaiian Islands. In this tabular statement are given (1) the name under which each species was described and the authority for it, (2) the present identification, (3) the type locality, and (4) the year when the description was published. Names not now tenable are in italics. From this table it appears that a total of 355 species have been described from Hawaiian type localities. Of this number 78 are now regarded as synonyms, which leaves 277 tenable species originally described from the Hawaiian Islands. Adding to these 168 species known to occur at those islands, but originally described from elsewhere, a total of 447 species is obtained, constituting the known fish-fauna of that group, exclusive of the deep-sea fishes described by Doctor Gilbert in Section II of this work.

Complete list of fishes described as new from the Hawaiian Islands.

Nominal species.	Present identification.	Type locality.	Year.
Chætodon longirostris Broussonet	Forcipiger longirostris	Sandwich Islands	1782
Salarias gibbifrons Quoy & Gaimard	Entomacrodus gibbifrons	do	1824
Tetraodon lacrymatus Quoy & Gaimard	Tetraodon lacrymatus	do	1824
Balistes sandwichensis Quoy & Gaimard	Cantherines sandwichensis	do	1824
Chætodon *miliaris* Quoy & Gaimard	Chætodon miliaris	do	1824
Xyrichthys lecluse Quoy & Gaimard	Cymolutes lecluse	Hawaii	1824
Cheilinus *sinuosus* Quoy & Gaimard	Cheilinus trilobatus	Sandwich Islands	1824
Julis gaimard Quoy & Gaimard	Julis gaimard	do	1824
Julis duperrey Quoy & Gaimard	Thalassoma duperrey	do	1824
Anampses cuvier Quoy & Gaimard	Anampses cuvier	Maui	1824
Gomphosus tricolor Quoy & Gaimard	Gomphosus tricolor	do	1824
Gomphosus *pectoralis* Quoy & Gaimard	Gomphosus varius	Maui; Hawaii	1824
Julis geoffroy Quoy & Gaimard	Macropharyngodon geoffroy	do	1824
Julis *balteatus* Quoy & Gaimard	Stethojulis albovittata	do	1824
Julis axillaris Quoy & Gaimard	Stethojulis axillaris	Hawaiian Islands	1824
Mullus multifasciatus Quoy & Gaimard	Pseudupeneus multifasciatus	Oahu; Maui	1824
Saurus *variegatus* Quoy & Gaimard	Synodus varius	Maui	1824
Saurus gracilis Quoy & Gaimard	Saurida gracilis	Sandwich Islands	1824
Chætodon *lunulatus* Quoy & Gaimard	Chætodon lunula	do	1824
Balistes *angulosus* Quoy & Gaimard	Canthidermis angulosus	do	1824
Glyphisodon abdominalis Quoy & Gaimard	Abudefduf abdominalis	do	1824
Pomacentrus *nigricans* Quoy & Gaimard	Pomacentrus jenkinsi	do	1824
Acanthurus flavescens Bennett	Zebrasoma flavescens	Oahu	1828
Acanthurus strigosus Bennett	Ctenochætus strigosus	Honolulu	1828
Blennius marmoratus Bennett	Alticus marmoratus	Oahu	1828
Blennius sordidus Bennett	Blennius sordidus	Sandwich Islands	1828
Cirrhites *fasciatus* Bennett	Paracirrhites cinctus	Oahu	1828
Scarus dubius Bennett	Callyodon dubius	do	1828
Scorpæna asperella Bennett	Sebastapistes asperella	Sandwich Islands	1828
Serranus *myriaster* Cuvier & Valenciennes	Cephalopholis argus	do	1828
Cirrhites *maculosus* Bennett	Cirrhitus marmoratus	do	1829
Julis flavovittatus Bennett	Julis flavovittata	do	1829
Julis greenovii Bennett	Julis greenovii	do	1829
Chætodon fremblii Bennett	Chætodon fremblii	do	1829
Chætodon *ornatus* Gray	Chætodon ornatissimus	do	1831
Chætodon quadrimaculatus Gray	Chætodon quadrimaculatus	do	1831
Holocanthus arcuatus Gray	Holocanthus arcuatus	do	1831
Acanthurus *nigroris* Cuvier & Valenciennes	Hepatus elongatus	do	1835
Callyodon sandvicensis Cuvier & Valenciennes	Calotomus sandvicensis	do	1839
Xyrichthys pavoninus Cuvier & Valenciennes	Iniistius pavoninus	do	1839
Scarus bennetti Cuvier & Valenciennes	*Callyodon bennetti*	do	1839
Julis eydouxii Cuvier & Valenciennes	Julis eydouxii	do	1839
Scarus formosus Cuvier & Valenciennes	Callyodon formosus	do	1839
Xyrichthys *microlepidotus* Cuvier & Valenciennes.	Cymolutes lecluse	Owhyee (Hawaii)	1839

Complete list of fishes described as new from the Hawaiian Islands—Continued.

Nominal species.	Present identification.	Type locality.	Year.
Cheilinus bimaculatus Cuvier & Valenciennes..	Cheilinus bimaculatus	Onarourou (Honolulu)	1839
Monacanthus spilosoma Lay & Bennett	Stephanolepis spilosomus	Hawaiian Islands about Oahu.	1839
Ophisurus semicinctus Lay & Bennett	Leiuranus semicinctus	Oahu	1839
Hemiramphus depauperatus Lay & Bennett	Hemiramphus depauperatus	do	1839
Julis *bifer* Lay & Bennett	Novaculichthys tæniurus	do	1839
Caranx *pinnulatus* Eydoux & Souleyet	Decapterus pinnulatus	Hawaiian Islands	1841
Caranx *stellatus* Eydoux & Souleyet	Carangus melampygus	do	1841
Mugil chaptali Eydoux & Souleyet	Chænomugil chaptali	do	1841
Gobius stamineus Eydoux & Souleyet	Awaous stamineus	Sandwich Islands	1841
Chironectes *reticulatus* Eydoux & Souleyet	Antennarius bigibbus	do	1841
Chironectes leprosus Eydoux & Souleyet	Antennarius leprosus	do	1841
Muræna *valenciennii* Eydoux & Souleyet	Gymnothorax undulatus	do	1841
Saurus *limbatus* Eydoux & Souleyet	Trachinocephalus myops	Hawaii	1841
Conger marginatus Valenciennes	Leptocephalus marginatus	Sandwich Islands	1841
Chanos *cyprinella* Cuvier & Valenciennes	Chanos chanos	Honolulu	1846
Belone *carinata* Cuvier & Valenciennes	Belone platyura	Hawaiian Islands	1846
Exocœtus simus Cuvier & Valenciennes	Cypsilurus simus	do	1846
Solenostomus cyanopterum Bleeker[a]	Solenostomus cyanopterus	Hawaii	1854
Goniobatus *meleagris* Agassiz	Stoasodon narinari	Hawaiian Islands	1858
Cirrhites cinctus Günther	Paracirrhites cinctus	Sandwich Islands	1860
Sicydium stimpsoni Gill	Sicydium stimpsoni	Hilo, Hawaii	1860
Sicyogaster concolor Gill	Lentipes concolor	do	1860
Pisoodonophis magnifica Abbott	Myrichthys magnificus	Hawaiian Islands	1860
Muræna acutirostris Abbott	Eurymyctera acutirostris	do	1860
Thyrsoidea *kaupii* Abbott	Gymnothorax undulatus	do	1860
Thyrsoidea eurosta Abbott	Gymnothorax eurostus	do	1860
Cirrhites *alternatus* Gill	Cirrhitus marmoratus	do	1862
Dascyllus albisella Gill	Dascyllus albisella	Sandwich Islands	1862
Julis ornatissimus Garrett	Halichœres ornatissimus	do	1863
Chætodon *multicinctus* Garrett	Chætodon punctatofasciatus	do	1863
Cheilodactylus vittatus Garrett	Cheilodactylus vittatus	Hawaiian Islands	1864
Apogon maculiferus Garrett	Amia maculifera	do	1864
Scorpæna parvipinnis Garrett	Sebastopsis parvipinnis	do	1864
Crenilabrus modestus Garrett	Lepidaplois modestus	Sandwich Islands	1864
Exocœtus rostratus Günther	Evolantia rostrata	do	1866
Chironectes rubrofuscus Garrett	Antennarius rubrofuscus	do	1868
Chironectes *niger* Garrett	Antennarius commersoni	do	1868
Diodon *maculatus* Günther	Diodon holacanthus	do	1870
Peristedion engyceros Günther	Peristedion engyceros	do	1871
Tetrodon florealis Cope	Spheroides florealis	Hawaiian Islands	1871
Tænianotus garretti Günther	Tænianotus garretti	Sandwich Islands	1874
Scorpæna ballieui Sauvage	Sebastapistes ballieui	do	1875
Cottus *filamentosus* Sauvage	Gymnocanthus intermedius[b]	do	1875
Gobius *homocyanus* Vaillant & Sauvage	*Mapo soporator*	do	1875
Eleotris sandwicensis Vaillant & Sauvage	Eleotris sandwichensis	do	1875
Salarias zebra Vaillant & Sauvage	Alticus zebra	do	1875
Congrogadus marginatus Vaillant & Sauvage	Congrogadus marginatus	do	1875
Acanthurus *virgatus* Vaillant & Sauvage	Zebrasoma flavescens	do	1875
Malacanthus parvipinnis Vaillant & Sauvage	Malacanthus parvipinnis	do	1875
Julis ballieui Vaillant & Sauvage	Thalassoma ballieui	do	1875
Coris venusta Vaillant & Sauvage	Coris venusta	do	1875
Coris ballieui Vaillant & Sauvage	Coris ballieui	do	1875
Coris (*Hemicoris*) rosea Vaillant & Sauvage	Coris rosea	do	1875
Tetraodon (Anosmius) janthinus Vaillant & Sauvage.	Canthigaster janthinus	do	1875
Tetraodon (Anosmius) *cornatus* Vaillant & Sauvage.	Canthigaster valentini	do	1875
Pœciliophis *tritor* Vaillant & Sauvage	Echidna leihala	do	1875
Glyphisodon imparipennis Sauvage	Abudefduf imparipennis	do	1875
Mugil *trichilus* Vaillant & Sauvage	Chænomugil chaptali	do	1875
Brotula multicirrata Vaillant & Sauvage	Brotula multicirrata	do	1875
Novacula (Novacula) *microlepis* Vaillant & Sauvage.	Cymolutes lecluse	do	1875
Aprion microdon Steindachner	Apsilus microdon	do	1876
Moronopsis *argenteus*, var. *sandvicensis* Steindachner.	Kuhlia malo	do	1876
Acanthurus triostegus, var. sandvicensis Günther	Hepatus sandvicensis	Honolulu Harbor, Oahu	1877
Sicydium albotæniatum Günther	Sicydium albotæniatus	Sandwich Islands	1877
Myxus (Neomyxus) *sclateri* Steindachner	Chænomugil chaptali	Hawaiian Islands	1878
Scarus (Scarus) perspicillatus Steindachner	Callyodon perspicillatus	Sandwich Islands	1879
Doryichthys pleurotænia Günther	Doryrhamphus pleurotænia	Off Honolulu	1880
Lentipes seminudus Günther	Lentipes seminudus	Honolulu	1880
Gobius *sandvicensis* Günther	Mapo fuscus	do	1880
Julis *obscura* Günther	Thalassoma ballieui	do	1880
Sicydium *nigrescens* Günther	Sicydium stimpsoni	Hawaii	1880
Trygon lata Garman	Dasyatis lata	Sandwich Islands	1880
Anampses godeffroyi Günther	Anampses godeffroyi	do	1881
Julis *clepsydralis* Smith & Swain	Thalassoma duperrey	Johnston Island	1882
Julis *verticalis* Smith & Swain	Thalassoma ballieui	do	1882

[a] It is doubtful if this species really came from Hawaii.

[b] A Japanese species never seen at Hawaii. *Chætodon humeralis* Günther, *Blennius brevipinnis* Günther (=*Hypsoblennius brevipinnis*), and *Arius dasycephalus* Günther are Mexican species wrongly credited to Hawaii by Dr. Günther.

Complete list of fishes described as new from the Hawaiian Islands—Continued.

Nominal species.	Present identification.	Type locality.	Year.
Ophichthys stypurus Smith & Swain	Myrichthys stypurus	Johnston Island	1882
Upeneus preorbitalis Smith & Swain	Pseudupeneus preorbitalis	do	1882
Upeneus *velifer* Smith & Swain	Pseudupeneus multifasciatus	do	1882
Moronopsis *sandvicensis* Steindachner	Kuhlia malo	Sandwich Islands	1887
Branchiostoma pelagicum Günther	Amphioxides pelagicus	Lat. 23° 3′ N. Long. 156° 6′ W.	1888
Myripristis pillwaxi Steindachner	Ostichthys pillwaxi	Honolulu	1893
Ranzania makua Jenkins	Ranzania makua	Pearl Harbor, near Honolulu.	1895
Melanostoma argyreum Gilbert & Cramer	Synagrops argyrea	Albatross stations 3472 and 3476.	1897
Malthopsis mitriger Gilbert & Cramer	Malthopsis mitrigera	Albatross stations 3467, 3472, and 3476.	1897
Pelecanichthys crumenalis Gilbert & Cramer	Pelecanichthys crumenalis	Albatross stations 3472 and 3476.	1897
Peristedion hians Gilbert & Cramer	Peristedion hians	Albatross stations 3470, 3472, and 3476.	1897
Congermuræna æquorea Gilbert & Cramer	Congrellus æquoreus	Albatross station 3474	1897
Promyllantor alcocki Gilbert & Cramer	Promyllantor alcocki	Albatross station 3472	1897
Chloropthalmus proridens Gilbert & Cramer	Chloropthalmus proridens	Albatross stations 3475 and 3476.	1897
Diaphus urolampus Gilbert & Cramer	Diaphus urolampus	Albatross stations 3467 and 3472.	1897
Diaphus chrysorhynchus Gilbert & Cramer	Diaphus chrysorhynchus	Albatross station 286 (surface tow net).	1897
Myctophum fibulatum Gilbert & Cramer	Myctophum fibulatum	Albatross station 3467	1897
Dasyscopelus pristilepis Gilbert & Cramer	Dasyscopelus pristilepis	Albatross station 286 (surface tow net).	1897
Argyripnus ephippiatus Gilbert & Cramer	Argyripnus ephippiatus	Albatross station 3472	1897
Scorpæna remigera Gilbert & Cramer	Setarches remiger	Albatross station 3476	1897
Cœlorhynchus gladius Gilbert & Cramer	Cœlorhynchus gladius	Albatross station 3472	1897
Cœlocephalus acipenserinus Gilbert & Cramer	Matcocephalus acipenserinus	Albatross station 3470 and 3476.	1897
Macrourus ectenes Gilbert & Cramer	Macrourus ectenes	Albatross station 3473	1897
Macrourus propinquus Gilbert & Cramer	Macrourus propinquus	Albatross station 3473 and 3475.	1897
Macrourus holocentrus Gilbert & Cramer	Macrourus holocentrus	Albatross stations 3474 and 3475.	1897
Macrourus gibber Gilbert & Cramer	Macrourus gibber	do	1897
Hymenocephalus antræus Gilbert & Cramer	Hymenocephalus antræus	Albatross stations 3467, 3470, 3471, and 3476.	1897
Trachonurus sentipellis Gilbert & Cramer	Trachonurus sentipellis	Albatross station 3474	1897
Chalinura ctenomelas Gilbert & Cramer	Chalinura ctenomelas	Albatross stations 3470 and 3472.	1897
Optonurus atherodon Gilbert & Cramer	Optonurus atherodon	Albatross stations 3470, 3471, 3474, 3475, and 3476.	1897
Brotula *townsendi* Fowler	Brotula multicirrata	Sandwich Islands	1900
Percis schauinslandi Steindachner	Osurus schauinslandi	Honolulu	1900
Mulloides pflügeri Steindachner	Mulloides pflugeri	do	1900
Myxus pacificus Steindachner	Myxus pacificus	Laysan	1900
Heliastes ovalis Steindachner	Chromis ovalis	Honolulu	1900
Novacula (Iniistius) nigra Steindachner	Iniistius niger	do	1900
Coris *argenteo-striatus* Steindachner	Coris rosea	do	1900
Coris *schauinslandii* Steindachner	Coris ballieui	do	1900
Hemirhamphus pacificus Steindachner	Hyporhamphus pacificus	Laysan	1900
Muræna laysana Steindachner	Gymnothorax laysanus	Laysan Island	1900
Lycodontis *parvibranchialis* Fowler	Gymnothorax laysanus	Sandwich Islands	1900
Echidna zonata Fowler	Echidna zonata	do	1900
Stolephorus purpureus Fowler	Anchovia purpurea	do	1900
Synodus *sharpi* Fowler	Synodus varius	do	1900
Hemipteronotus copei Fowler	Hemipteronotus copei	Oahu	1900
Macropharyngodon *aquilolo* Jenkins	Macropharyngodon geoffroy	Honolulu	1900
Halichœres *iridescens* Jenkins	Halichœres ornatissimus	do	1900
Halichœres lao Jenkins	Halichœres lao	do	1900
Coris lepomis Jenkins	Julis lepomis	do	1900
Hemicoris *remedius* Jenkins	Coris venusta	do	1900
Hemicoris *keleipionis* Jenkins	Coris rosea	do	1900
Thalassoma *pyrrhovinctum* Jenkins	Thalassoma duperrey	do	1900
Novaculichthys woodi Jenkins	Novaculichthys woodi	do	1900
Novaculichthys *entargyreus* Jenkins	Novaculichthys woodi	do	1900
Hemipteronotus umbrilatus Jenkins	Hemipteronotus umbrilatus	do	1900
Iniistius *leucozonus* Jenkins	Iniistius pavoninus	do	1900
Iniistius *verater* Jenkins	Iniistius niger	do	1900
Cheilinus *zonurus* Jenkins	Cheilinus hexagonatus	do	1900
Anampses evermanni Jenkins	Anampses evermanni	do	1900
Calotomus irradians Jenkins	Calotomus irradians	do	1900
Scarus brunneus Jenkins	Callyodon brunneus	do	1900
Scarus gilberti Jenkins	Callyodon gilberti	do	1900
Scarus paluca Jenkins	Callyodon paluca	do	1900
Scarus ahula Jenkins	Callyodon ahula	do	1900
Scarus miniatus Jenkins	Callyodon miniatus	do	1900
Pseudoscarus jordani Jenkins	Callyodon jordani	do	1900
Pseudocheilinus octotænia Jenkins	Pseudocheilinus octotænia	do	1900
Sphyræna helleri Jenkins	Sphyræna helleri	do	1901
Sphyræna *snodgrassi* Jenkins	Sphyræna commersonii	do	1901
Anthias fuscipinnis Jenkins	Pseudanthias fuscipinnis	do	1901

Complete list of fishes described as new from the Hawaiian Islands—Continued.

Nominal species.	Present identification.	Type locality.	Year.
Aphareus flavivultus Jenkins	Aphareus flavivultus	Honolulu	1901
Eupomacentrus *marginatus* Jenkins	Pomacentrus jenkinsi	do	1901
Chromis *velox* Jenkins	Chromis ovalis	do	1901
Chætodon *mantelliger* Jenkins	Chætodon miliaris	do	1901
Chætodon *sphenospilus* Jenkins	Chætodon unimaculatus	do	1901
Ostracion *camurum* Jenkins	Ostracion sebæ	do	1901
Ovoides *latifrons* Jenkins	Tetraodon lacrymatus	do	1901
Tropidichthys jactator Jenkins	Canthigaster jactator	do	1901
Eumycterias bitæniatus Jenkins	Canthigaster bitæniatus	do	1901
Scorpænopsis cacopsis Jenkins	Scorpænopsis cacopsis	do	1901
Parapercis *pterostigma* Jenkins	Osurus schauinslandii	do	1901
Brotula marginalis Jenkins	Brotula marginalis	do	1901
Epinephelus quernus Seale	Epinephelus quernus	do	1901
Novaculichthys *tattoo* Seale	Novaculichthys woodi	do	1901
Serranus brighami Seale	Apsilus brighami	do	1901
Balistes fuscolineatus Seale	Balistes fuscolineatus	do	1901
Monacanthus albopunctatus Seale	Cantherines albopunctatus	do	1901
Thalassoma *berendti* Seale	Thalassoma purpureum	do	1901
Antigonia steindachneri Jordan & Evermann	Antigonia steindachneri	Kailua	1903
Carcharias phorcys Jordan & Evermann	Carcharias phorcys	do	1903
Microdonophis fowleri Jordan & Evermann	Microdonophis fowleri	do	1903
Muræna kailuæ Jordan & Evermann	Muræna kailuæ	Kailua, Hawaii	1903
Gymnothorax vinolentus Jordan & Evermann	Enchelynassa vinolentus	do	1903
Gymnothorax steindachneri Jordan & Evermann	Gymnothorax steindachneri	Honolulu	1903
Gymnothorax goldsboroughi Jordan & Evermann	Gymnothorax goldsboroughi	do	1903
Gymnothorax hilonis Jordan & Evermann	Gymnothorax hilonis	Hilo	1903
Echidna zonophæa Jordan & Evermann	Echidna zonophæa	Honolulu	1903
Rhinoscopelus oceanicus Jordan & Evermann	Rhinoscopelus oceanicus	137° 35′ W., 10° 57′ N	1903
Hippocampus fisheri Jordan & Evermann	Hippocampus fisheri	Kailua	1903
Hippocampus hilonis Jordan & Evermann	Hippocampus hilonis	Hilo	1903
Atherina insularum Jordan & Evermann	Atherina insularum	Honolulu	1903
Myripristis berndti Jordan & Evermann	Myripristis berndti	do	1903
Myripristis chryseres Jordan & Evermann	Myripristis chryseres	Hilo	1903
Myripristis argyromus Jordan & Evermann	Myripristis argyromus	do	1903
Myripristis symmetricus Jordan & Evermann	Myripristis symmetricus	do	1903
Flammeo scythrops Jordan & Evermann	Flammeo scythrops	Honolulu	1903
Holocentrus xantherythrus Jordan & Evermann	Holocentrus xantherythrus	do	1903
Holocentrus ensifer Jordan & Evermann	Holocentrus ensifer	do	1903
Carangus elecate Jordan & Evermann	Carangus elecate	do	1903
Pikea aurora Jordan & Evermann	Pikea aurora	Hilo	1903
Anthias kelloggi Jordan & Evermann	Pseudanthias kelloggi	Kailua	1903
Apogonichthys waikiki Jordan & Evermann	Mionorus waikiki	Waikiki, Oahu Island	1903
Apogon snyderi Jordan & Evermann	Amia snyderi	Honolulu	1903
Priacanthus alalaua Jordan & Evermann	Priacanthus alalaua	do	1903
Bowersia violescens Jordan & Evermann	Bowersia violescens	do	1903
Bowersia ulaula Jordan & Evermann	Bowersia ulaula	Hilo	1903
Etelis evurus Jordan & Evermann	Etelis evurus	do	1903
Sectator azureus Jordan & Evermann	Sectator azureus	Heeia, Oahu	1903
Mulloides flammeus Jordan & Evermann	Mulloides flammeus	Kailua	1903
Pseudupeneus chrysonemus Jordan & Evermann	Pseudupeneus chrysonemus	Hilo	1903
Upeneus arge Jordan & Evermann	Upeneus arge	Honolulu	1903
Glyphisodon sindonis Jordan & Evermann	Abudefduf sindonis	do	1903
Pomacentrus jenkinsi Jordan & Evermann	Pomacentrus jenkinsi	do	1903
Lepidaplois strophodes Jordan & Evermann	Lepidaplois strophodes	do	1903
Verriculus sanguineus Jordan & Evermann	Verriculus sanguineus	Hilo	1903
Pseudocheilinus evanidus Jordan & Evermann	Pseudocheilinus evanidus	do	1903
Hemipteronotus baldwini Jordan & Evermann	Hemipteronotus baldwini	Honolulu	1903
Xyrichthys nivellatus Jordan & Evermann	Xyrichthys nivellatus	do	1903
Scarus jenkinsi Jordan & Evermann	Callyodon jenkinsi	do	1903
Scarus laula Jordan & Evermann	Callyodon laula	Hilo	1903
Scarus barborus Jordan & Evermann	Callyodon borborus	Honolulu	1903
Teuthis atrimentatus Jordan & Evermann	Hepatus atramentatus	do	1903
Pachynathus nycteris Jordan & Evermann	Balistes nycteris	do	1903
Lagocephalus oceanicus Jordan & Evermann	Lagocephalus oceanicus	do	1903
Ostracion oahuensis Jordan & Evermann	Ostracion oahuensis	do	1903
Pterois sphex Jordan & Evermann	Pterois sphex	do	1903
Scorpænopsis catocala Jordan & Evermann	Scorpænopsis gibbosa	do	1903
Dendrochirus *hudsoni* Jordan & Evermann	Dendrochirus barberi	Waikiki, Oahu	1903
Quisquilius eugenius Jordan & Evermann	Gobiomorphus eugenius	do	1903
Gnatholepis knighti Jordan & Evermann	Gnatholepis knighti	Hilo	1903
Gobiopterus farcimen Jordan & Evermann	Gobiopterus farcimen	do	1903
Vitraria clarescens Jordan & Evermann	Vitraria clarescens	do	1903
Fierasfer umbratilis Jordan & Evermann	Jordanicus umbratilis	do	1903
Engyprosopon hawaiiensis Jordan & Evermann	Engyprosopon hawaiiensis	do	1903
Engyprosopon arenicola Jordan & Evermann	Engyprosopon arenicola	do	1903
Antennarius drombus Jordan & Evermann	Antennarius drombus	Waikiki	1903
Tropidichthys psegma Jordan & Evermann	Canthigaster psegma	Honolulu	1903
Iracundus signifer Jordan & Evermann	Iracundus signifer	do	1903
Dasyatis hawaiiensis Jenkins	Dasyatis hawaiiensis	do	1903
Dasyatis sciera Jenkins	Dasyatis sciera	do	1903
Congrellus bowersi Jenkins	Congrellus bowersi	do	1903
Microdonophis macgregori Jenkins	Microdonophis macgregori	Lahaina, Maui	1903
Muræna *lampra* Jenkins	Muræna kailuæ	Honolulu	1903
Muræna *kauila* Jenkins	Muræna kailuæ	do	1903
Gymnothorax leucostictus Jenkins	Gymnothorax leucostictus	do	1903

Complete list of fishes described as new from the Hawaiian Islands—Continued.

Nominal species.	Present identification.	Type locality.	Year.
Gymnothorax gracilicauda Jenkins	Gymnothorax gracilicauda	Honolulu	1903
Gymnothorax *thalassopterus* Jenkins	Gymnothorax flavimarginatus	do	1903
Gymnothorax leucacme Jenkins	Gymnothorax leucacme	do	1903
Gymnothorax ercodes Jenkins	Gymnothorax ercodes	do	1903
Echidna leihala Jenkins	Echidna leihala	do	1903
Echidna *vincta* Jenkins	Echidna zonata	do	1903
Echidna obscura Jenkins	Echidna obscura	do	1903
Echidna psalion Jenkins	Echidna psalion	do	1903
Cypsilurus atrisignis Jenkins	Cypsilurus atrisignis	do	1903
Myripristis sealei Jenkins	Myripristis sealei	do	1903
Seriola sparna Jenkins	Seriola sparna	do	1903
Decapterus *canonoides* Jenkins	Decapterus pinnulatus	do	1903
Carangus *hippoides* Jenkins	Carangus ignobilis	do	1903
Carangus rhabdotus Jenkins	Carangus rhabdotus	do	1903
Carangus politus Jenkins	Carangus politus	do	1903
Fowleria brachygrammus Jenkins	Foa brachygramma	do	1903
Apogon menesemus Jenkins	Amia menesemus	do	1903
Priacanthus meeki Jenkins	Priacanthus meeki	do	1903
Eteliscus marshi Jenkins	Etelis marshi	do	1903
Pseudupeneus porphyreus Jenkins	*Pseudupeneus porphyreus*	do	1903
Chromis elaphrus Jenkins	Chromis elaphrus	do	1903
Calotomus cyclurus Jenkins	Calotomus cyclurus	do	1903
Calotomus snyderi Jenkins	Calotomus snyderi	do	1903
Scaridea zonarcha Jenkins	Scaridea zonarcha	do	1903
Scaridea balia Jenkins	Scaridea balia	do	1903
Teuthis leucopareius Jenkins	Hepatus leucopareius	do	1903
Teuthis umbra Jenkins	Hepatus umbra	do	1903
Teuthis guntheri Jenkins	Hepatus guntheri	do	1903
Acanthurus incipiens Jenkins	Acanthurus incipiens	do	1903
Callicanthus metoposophron Jenkins	Callicanthus metoposophron	do	1903
Tropidichthys oahuensis Jenkins	Canthigaster oahuensis	do	1903
Tropidichthys epilamprus Jenkins	Canthigaster epilamprus	Kihei, Maui	1903
Lactoria galeodon Jenkins	Lactoria galeodon	Honolulu	1903
Diodon nudifrons Jenkins	Diodon nudifrons	do	1903
Cirrhitoidea bimacula Jenkins	Cirrhitoidea bimacula	do	1903
Sebastopsis kelloggi Jenkins	Sebastopsis kelloggi	do	1903
Sebastapistes corallicola Jenkins	Sebastapistes corallicola	do	1903
Sebastapistes coniorta Jenkins	Sebastapistes coniorta	do	1903
Sebastapistes galactacma Jenkins	Sebastapistes galactacma	do	1903
Dendrochirus chloreus Jenkins	Dendrochirus chloreus	do	1903
Eviota epiphanes Jenkins	Eviota epiphanes	do	1903
Chlamydes laticeps Jenkins	Chlamydes laticeps	do	1903
Gobionellus lonchotus Jenkins	Goblichthys lonchotus	do	1903
Enypnias oligolepis Jenkins	Kelloggella oligolepis	do	1903
Tripterygion atriceps Jenkins	Enneapterygius atriceps	do	1903
Salarias *cypho* Jenkins	Alticus zebra	do	1903
Salarias *saltans* Jenkins	Alticus gibbifrons	do	1903
Salarias *rutilus* Jenkins	Alticus gibbifrons	do	1903
Aspidontus *brunneolus* Jenkins	Enchelyurus ater	do	1903
Centrobranchus chœrocephalus Fowler	Centrobranchus chœrocephalus	Sandwich Islands	1904
Carcharias insularum Snyder	Carcharias insularum	Off Diamond Head (4032), Oahu Island.	1904
Carcharias nesiotes Snyder	Carcharias nesiotes	French Frigate Shoals	1904
Veternio verrens Snyder	Veternio verrens	Honolulu	1904
Sphagebranchus flavicaudus Snyder	Sphagebranchus flavicaudus	Albatross station 3874	1904
Callechelys luteus Snyder	Callechelys luteus	Albatross station 3821	1904
Moringua hawaiiensis Snyder	Moringua hawaiiensis	Honolulu	1904
Gymnothorax nuttingi Snyder	Gymnothorax nuttingi	do	1904
Gymnothorax berndti Snyder	Gymnothorax berndti	do	1904
Gymnothorax mucifer Snyder	Gymnothorax mucifer	do	1904
Gymnothorax xanthostomus Snyder	Gymnothorax xanthostomus	do	1904
Gymnothorax waialuæ Snyder	Gymnothorax waialuæ	Waialua Bay, Oahu	1904
Uropterygius leucurus Snyder	Uropterygius leucurus	Albatross station 3874	1904
Exonautes gilberti Snyder	Exonautes gilberti	Between stations 3799 and 3800.	1904
Carangus cheilio Snyder	Carangus cheilio	Honolulu	1904
Carangoides ajax Snyder	Carangoides ajax	do	1904
Collybus drachme Snyder	Collybus drachme	Albatross station 4176	1904
Apogon erythrinus Snyder	Amia erythrinus	Puako Bay, Hawaii	1904
Pseudojulis cerasina Snyder	Pseudojulis cerasina	Honolulu	1904
Cirrhilabrus jordani Snyder	Cirrhilabrus jordani	Albatross station 3876	1904
Hemipteronotus *jenkinsi* Snyder	Hemipteronotus baldwini	Puako Bay, Hawaii	1904
Chætodon corallicola Snyder	Chætodon corallicola	Albatross station 4032, Oahu.	1904
Holacanthus fisheri Snyder	Holacanthus fisheri	Albatross station 4032, off Diamond Head, Oahu.	1904
Stephanolepis pricei Snyder	Stephanolepis pricei	Albatross station 4021	1904
Antennarius nexilis Snyder	*Antennarius nexilis*	Honolulu	1904
Antennarius duescus Snyder	Antennarius duescus	Albatross station 3872	1904
Brachysomophis henshawi Jordan & Snyder	Brachysomophis henshawi	Honolulu	1904
Ariomma lurida Jordan & Snyder	Ariomma lurida	do	1904
Lactoria schlemmeri Jordan & Snyder	Lactoria schlemmeri	Laysan Island	1904
Antennarius laysanius Jordan & Snyder	Antennarius laysanius	do	1904
Holocenthrus *gracilispinis* Fowler	Holocentrus diploxiphus	Honolulu	1904
Apogon evermanni Jordan & Snyder	Amia evermanni	do	1904

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DESCRIPTIVE CATALOGUE OF SHORE FISHES.

INTRODUCTION.

In the following pages we have attempted to present with sufficient completeness and detail a statement of our present knowledge of the fish-fauna of the Hawaiian Islands. Keys and descriptions are given by means of which all the species of shore fishes known from the islands may be identified. All the species of deep-water fishes are described by Dr. Charles H. Gilbert in Section II of this volume. As some families contain both shore and deep-water species, all the families are described in the present part. The keys for the identification of the species are necessarily to some extent artificial, but characters of real taxomomic significance are made use of in most instances. The keys are dichotomously arranged, that is, if the statements under a given letter do not apply to the specimen in hand, those under the multiple or double of that letter will be true.

The synonymy given includes all Hawaiian references which we have been able to find and references to all other faunal works of importance mentioning Hawaiian species. The type locality is given as a part of each original reference and is printed in heavy-faced type. All locality references not type localities are printed in ordinary type and inclosed in parentheses.

The name of the authority for the specific name, in accordance with the rule of the American Ornithologists' Union, is not preceded by a comma, but the name of an author quoting a scientific name is separated from the specific name by a comma. In sequence and arrangement of species we follow with some modifications our Fishes of North and Middle America. The common or local Hawaiian names which we have been able to identify with particular species are printed in italics and inclosed in quotation marks. For the verification of the spelling of these names we are indebted to the kindly interest and assistance of Mr. W. E. Safford, of the Bureau of Plant Industry, U. S. Department of Agriculture. But few English names of fishes have, as yet, come into use in Hawaii, and they are practically limited to species of wide distribution.

Special attention is called to the illustrations in this volume. The colored paintings, representing 73 species, were made by Mr. Albertus H. Baldwin (51), Capt. Charles Bradford Hudson (12), and Mr. Kako Morita (10). Messrs. Baldwin and Hudson painted from life, the specimen in each case having been placed alive in a specially constructed aquarium and the work completed before the colors materially changed. Those by Mr. Baldwin were done in water colors, those by Capt. Hudson in oil. The paintings by Mr. Morita are from life color sketches made by Dr. Jordan at Samoa or by Mr. Walter K. Fisher at Laysan Island in 1902. The black and white drawings were made by Messrs. Baldwin, Hudson, William Sacketon Atkinson, Robert Logan Hudson, and Sekko Shimada, and Mrs. Chloe Lesley Starks. About 50 of the text figures are from photographs of illustrations which have appeared in previous publications, chiefly in Günther's Fische der Südsee or in Steindachner's Fische aus dem Stillen Ocean. For the map of the Hawaiian Islands accompanying this report we are indebted to the General Land Office, Department of the Interior.

CHARACTER OF THE HAWAIIAN FISH FAUNA.

The fish fauna of the shores of the Hawaiian Islands is frankly and entirely tropical, all the species belonging to genera characteristic of the tropical Pacific; but while the families and genera are those of the South Seas, the species are in a large degree distinct from the species of Samoa and Tahiti. This fact is evidently connected with the relative isolation of this group as compared with Polynesia, which is connected with the East Indies by an almost continuous chain of islands and atolls.

It is perhaps true that the isolation of Hawaii is due in part to the direction of the marine currents. These do not much influence free-swimming fishes like the mackerels, but they may serve to transport young fishes from one place to another. It is known that the young of shore fishes are often borne out to deep water, so that each island becomes the center of a "sphere of influence" so far as its species are concerned. Many young fishes are borne along in the Gulf Stream of our Atlantic coast and in the corresponding Kuro Shiwo of Japan. It is likely that the currents of the eastern central Pacific have a similar influence.

One of these currents, originating to the northward of the Philippines, passes eastward between Melanesia and Micronesia, thence along the north shores of Fiji, Tonga, Samoa, and Tahiti. Approaching the shores of America, it turns to the northward, touching the Revillagigedo and other offshore islands, leaving there a few Polynesian species, then returns westward via Hawaii toward the shores of Japan. This current may help to give the Polynesian Islands their identical fauna. Since it is inadequate to carry these species to Hawaii, the long separation of these latter islands has given them a fauna, practically distinct, although made up entirely of tropical elements. What these elements are is shown in the following table:

Total number of species of shore fishes found in Hawaii	441
Number of species confined to Hawaii	232
Number of species common to Hawaii and Polynesia (Samoa, Tahiti, Fiji)	142
Number of species common to Hawaii and Japan	53
Number of species common to Hawaii and Mexico	34

ANALYSIS OF THE CLASSES OF FISH-LIKE VERTEBRATES.[a]

a. Acraniata: Anterior end of the central nervous axis not dilated into a brain and not surrounded by a protective capsule or skull.

b. Notochord perfect, persistent, extending throughout the body, included in a membranous sheath, as is the cord-like nervous axis above it; body elongate, lanceolate, not worm-like, nor enveloped in a tunic; walls of the body with muscular myotomes; middle line of body with rudimentary fins; no proboscis; the mouth slit-like, fringed with cirri; heart a longitudinal tubular vessel giving off branchial tubes which unite in an aorta; gill-slits inclosed externally by a fold in the integument, which incloses a chamber (atrium), which opens below; vent remote from mouth ..... Leptocardii, I.

aa. Craniata: Anterior end of nervous axis dilated into a brain, which is contained within a protective capsule, the skull; notochord not continued forward beyond the pituitary body; heart developed and divided at least into two parts.

c. Skull well developed and with jaws; shoulder-girdle and pelvis more or less developed; nostrils not median; gills not purse-shaped; limbs, if present, developed as rayed fins, never with fingers and toes like those of the higher vertebrates; gills persistent through life ..... Pisces, II.

Class I. LEPTOCARDII.—The Lancelets.

Skeleton membrano-cartilaginous; notochord persistent and extending to the anterior end of the head, inclosed in a membranous sheath as is the cord-like axis above it; heart a longitudinal tubular vessel giving off branchial vessels which unite in an aorta; end of the nervous axis not dilated into a brain, and not surrounded by a protective capsule or skull; blood colorless; respiratory cavity confluent

[a] In this, as well as in all other analytic keys in this work, only the Hawaiian fish-fauna is considered.

with the cavity of the abdomen; gill-slits in great number, the water being expelled through an abdominal pore in front of the vent; jaws none, the mouth a longitudinal fissure with cirri on each side; body lanceolate in form, more or less fish-like, and not enveloped in a tunic; dorsal fin present, low; anal fin usually more or less developed.

Small marine animals, highly interesting to the zoologist as exhibiting the lowest degree of development of the vertebrate type. The class includes but the single order, *Amphioxi* or *Cirrostomi*.

Order A. AMPHIOXI.—The Cirrostomes.

This order is equivalent to the family *Branchiostomidæ*.

Family I. BRANCHIOSTOMIDÆ.—The Lancelets.

Body elongate, lanceolate, compressed, naked, colorless; fins represented by a low fold extending along back, with usually a rudimentary fold below, which passes by the vent to the abdominal pore; mouth inferior, appearing as a longitudinal fissure, surrounded by conspicuous, rather stiff cirri; eye rudimentary; liver reduced to a blind sac of the simple intestine.

Small, translucent creatures, found embedded in sand on warm coasts throughout the world. Eight species are now recognized, referable to two or three genera, all very similar in appearance and habits. Only one genus represented in the Hawaiian fauna.

Genus 1. AMPHIOXIDES Gill

"Branchiostomids with bilateral (?) gonads, no rayed sympodium (?), low dorsal fin, expanded caudal membranes, and oral cirri aborted (?)." (Gill.)

As the species on which this genus is based really lacks oral tentacles, it should stand as a distinct genus. To say that this trait is due to its pelagic habit, as Tattersall suggests, is not to discredit its generic value.

Amphioxides Gill, Genera of Branchiostomidæ, Am. Nat., vol. xxix, May, 1895, 458 (*pelagicum*).

1. Amphioxides pelagicus (Günther). Fig. 1.

Buccal tentacles absent;[a] gonads not fully developed, extending from the first to the twenty-sixth myocomma and forming 2 series in the middle; atrial cavity extending somewhat behind the supposed position of the atrial pore; anterior end of the notochord enveloped in a very strong sheath;

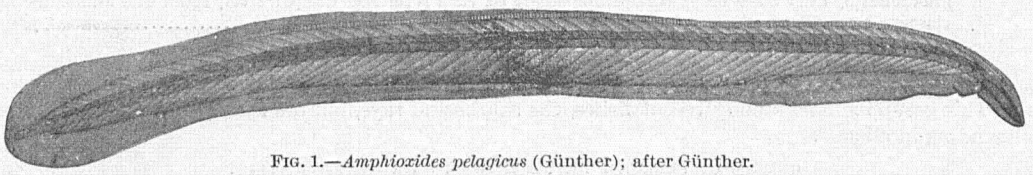


FIG. 1.—*Amphioxides pelagicus* (Günther); after Günther.

the posterior (½ mm.) not covered by the myocommas, which lean off abruptly, and extending right to the hind margin of the caudal fin; eye distinct; nerve-cord with minute pigment-spots arranged intracentrally with regard to the myocommas; dorsal fin-rays low, but very distinct, about five to each myocomma; dorsal fin-fringe becoming distinct about the twenty-seventh myocomma, gradually becoming somewhat higher behind, its rise more abrupt where it passes into the caudal fin, which is paddle-shaped and bilaterally symmetrical with regard to the notochord; lower half of caudal passing uninterruptedly into the ventral, in which no rays are developed, this fin seeming to be continued forward as a low fringe for some distance beyond the supposed position of the atrial pore; nearly the whole of this fringe showing a minute vertical striation, especially in its higher portions; myocommas 27, of which 15 belong to the tail; how many should be attributed to the portion between vent and atrial pore is uncertain on account of the difficulty in ascertaining the position of the latter. This pore could not be made out, and its position is supposed to be opposite to the thirty-sixth myocomma only from analogy or comparison with other species, and from a slight contraction of the muscular layer at this point.

[a] This can not be due to the age of the individual, as they are clearly developed in specimens of *Branchiostoma belcheri* (?) of only half the size of this specimen.

One specimen 2 inches long was taken by the *Challenger* on July 26, 1875, in latitude 23° 3′ N., longitude 156° 6′ W., a few degrees north of Honolulu. (Günther.) Other specimens were secured by the *Albatross* in 1902. The species is supposed to differ from other lancelets in living toward the surface in deep water instead of burying itself in the sand at small depths. There is considerable doubt as to this, however, and as to some of the characters ascribed to the species.

Branchiostoma pelagicum Günther, Pelagic Fishes, Challenger Rept., Zoology, XXXI, part II, 43, pl. VI, fig. B, 1888 (1889), lat. 23° 3′ N., long. 156° 6′ W.
Amphioxides pelagicus, Gill, Am. Nat., vol. xxix, May, 1895, 458 (after Günther).

Class II. PISCES.—The Fishes.

The Pisces, or fishes, may be defined as cold-blooded vertebrates adapted for life in the water, breathing by means of gills which are attached to bony or cartilaginous gill-arches, the gills persistent throughout life; having the skull well developed and provided with a lower jaw; the limbs present and developed as fins, rarely wanting through atrophy; shoulder-girdle present, furcula-shaped, curved forward below, rarely obsolete or represented by cartilage; pelvic bones present; exoskeleton developed as scales, bony plates, or horny appendages, or sometimes entirely wanting; and with the median line of the body provided with one or more fins composed of cartilaginous rays connected by membrane, the fins rarely atrophied.

SUBCLASSES OF PISCES REPRESENTED IN HAWAIIAN WATERS.

a. Skull without system of membrane bones (opercles, etc.).
b. Suspensorium of the mandible present; gills not free, being attached by the outer margin to the skin; eggs few and large, impregnated and sometimes developed internally, covered with a thick leathery skin when developed externally; embryo with deciduous external gills; no membrane bones about the head; upper jaw formed of palatine and pterygoid elements without maxillary or premaxillary; skeleton cartilaginous; skull without sutures; tail heterocercal; ventral fins abdominal; male with large intromittent organs or claskers attached to the ventral fins, these complex in structure in existing species; shoulder-girdle not attached to the skull; skin naked or covered with small rough scales, spines, or bony bucklers; no air-bladder; arterial bulb with 3 series of valves; optic nerves with a chiasma; cerebral hemispheres united; gill-openings slit-like, 5 to 7 in number; jaw distinct from the skull, joined to it by suspensory bones; teeth distinct; (Sharks and Skates) ..... *Selachii*, p. 34.
bb. Suspensorium of the mandible wanting; no maxillary arch; ventral fins with claspers; gill-opening single, leading to 4 gill-slits; jaws coalescent with the skull; teeth united in the form of bony plates; (*Chimæras*). *Holocephali*, p. 51.
aa. Skull with a well-developed system of membrane bones (opercles, suborbital ring, etc.); gills free, attached to the gill-arches by their bases only; gill-opening single on each side; eggs comparatively small and numerous; no claspers; a maxillary arch; cerebral hemispheres not united; (True Fishes) ..... *Teleostomi*, p. 52.

Subclass SELACHII.—The Sharks and Skates.

This group includes among recent fishes, the sharks and rays, marine fishes, mostly of large size, abounding in all seas.

ORDERS OF SELACHII REPRESENTED IN HAWAIIAN WATERS.

a. Gill-openings 5; vertebral column well segmented, each segment forming a neural arch and one centrum.
b. Vertebræ each with the internal calcareous lamellæ radiating from the central ring; anal fin present. *Asterospondyli*, B, p. 34.
bb. Vertebræ with the internal calcareous lamellæ not radiating, but arranged in one or more concentric circles or series around the central ring; no anal fin; palato-quadrate arch not articulated to the skull.
c. Gill-openings lateral; dorsal fins 2 ..... *Tectospondyli*, C, p. 44.
cc. Gill-openings ventral; dorsal fins small and posterior, or wanting; body and pectoral fins forming a depressed disk. *Batoidei*, D, p. 46.

Order B. ASTEROSPONDYLI.

The essential character of this order is the structure of the vertebræ. The calcareous lamellæ within each vertebra radiate from the central ring. The group contains the great body of living sharks, including all of those with 5 gill-openings, 2 dorsals, and an anal fin.

Suborder GALEI.—THE TRUE SHARKS.

Asterospondylous sharks with the palato-quadrate apparatus not articulated with the skull; gill-openings always 5 and always lateral; dorsal fins 2, well developed, each without spines. This suborder contains most of the living sharks.

In the following key we give only those families known to be represented in Hawaiian waters:

a. First dorsal fin over or behind the ventrals; spiracles present; no nictitating membrane .....II. *Scylliorhinidæ*, p. 35.
aa. First dorsal fin inserted more or less in advance of the ventrals.
b. Caudal fin not lunate, its upper lobe two or more times the length of the lower, with a notch below toward its tip; sides of tail not keeled.
c. Tail moderately developed, forming less than one-third the total length; eyes with nictitating membrane.
d. Dorsal fins without spines.
e. Head normally formed .....III. *Carchariidæ*, p. 35.
ee. Head hammer-shaped or kidney-shaped by the extension of its sides.....IV. *Sphyrnidæ*, p. 41.
cc. Tail exceedingly long, forming about one-half the total length; eyes without nictitating membrane.
V. *Alopiidæ*, p. 42.
bb. Caudal fin lunate; caudal peduncle with a keel on each side; last gill-opening entirely in front of pectorals; teeth large and sharp; size large .....VI. *Lamnidæ*, p. 43.

Family II. SCYLLIORHINIDÆ.—The Cat Sharks.

Dorsal fins 2, both rather small, without spines, the first more or less behind ventrals; anal fin present, usually before the second dorsal; caudal fin rather long, usually with a basal lobe; tail not keeled, and not bent upward. Spiracles present; no nictitating membrane; gill-openings small, the last one above the root of the pectorals. Mouth usually broad, with small teeth, several series being in junction; teeth each with a median cusp and 1 to 4 small cusps on each side; nostrils near mouth, sometimes confluent with it, sometimes provided with cirri. Mucous pores about head numerous, especially on lower side of snout. Egg cases large, quadrate, with prehensile tubes at angles.

Genus 2. CATULUS Smith.

As here understood, this genus is very close to the European genus *Scylliorhinus*, from which it is distinguished by the separate nasal valves. Gill has further divided the group into *Catulus*, having the nasal valves provided with lobes or grooves, *Halælurus* having the nasal valves simple, and *Cephaloscyllium*, which has a very broad head and the stomach inflatable. The latter group, with possibly *Halælurus*, is perhaps generically distinct. *Catulus* differs from *Pristiurus* in having the scales on the upper edge of the tail not much, if at all, enlarged and usually not differentiated from the others. The prickles on the body are usually much coarser in *Catulus* than in *Scylliorhinus* or *Pristiurus*. Species numerous, usually in rather deep water. The single species known from Hawaiian waters is described in Section II of this volume.

Catulus Andrew Smith, Proc. Zool. Soc. Lond. 1837, 85 (*canicula*).
Poroderma Smith, l. c. (*africanus*).
Halælurus Gill, Ann. Lyc. Nat. Hist. N. Y. 1861, 407 (*burgeri*).

Family III. CARCHARIIDÆ.—The Typical Sharks; Manos.

Sharks with 2 dorsal fins, the first short and high, entirely before the ventrals, the second comparatively small, opposite the anal; no spines; gill-openings moderate, the last above the base of the pectoral; tail more or less bent upward from base of caudal fin; sides of tail not keeled; eyes with nictitating membranes; head not hammer-shaped, the snout being longitudinally produced, as usual among sharks; spiracles small or obsolete. Ovoviviparous.

A large family found in all seas. The species are often closely related and difficult of determination.

a. Carcharinae: Spiracles present; teeth more or less depressed, with entire or serrate sharp edges.
b. Root of tail without pit; caudal fin with a single notch.....*Galeus*, p. 35
bb. Root of tail with conspicuous pit above; caudal fin with a double notch .....*Galeocerdo*, p. 36
aa. Spiracles obsolete; lower teeth narrower than the upper.
c. First dorsal fin inserted posteriorly, nearer ventrals than pectorals.....*Prionace*, p. 37
cc. First dorsal inserted anteriorly, nearer pectorals than ventrals.
d. Teeth all serrate more or less, entire in the very young .....*Carcharias*, p. 38

Genus 3. GALEUS Rafinesque.

First dorsal opposite the space between the pectorals and ventrals; mouth crescent-shaped with teeth alike in both jaws, oblique, notched and serrated; spiracles present, small; nictitating membrane present; no pit at base of caudal; caudal fin with a single notch. Tropical seas.

Galeus Rafinesque, Caratteri Alcuni Nuovi Generi, 13, 1810; in part (*galeus*, etc., although that species is not explicitly mentioned, the first species mentioned being a species of *Pristiurus*, *P. melastomus*).
Galeorhinus Blainville, Bull. Sci. Philom. 1816, 121 (*galeus*).
Galeus Cuvier, Règne Animal, Ed. I, 127, 1817 (*galeus*).
Eugaleus Gill, Proc. Ac. Nat. Sci. Phila. 1864, 148 (*galeus*).

2. Galeus japonicus Müller & Henle. Fig. 2.

Spiracles small; a short labial fold on each jaw; second dorsal fin not much smaller than the first, and slightly in advance of the anal; length of caudal fin rather less than distance between the 2 dorsals (Müller & Henle).

This species was not obtained by us, the only Hawaiian reference being that of Dr. Steindachner, based upon a single specimen more than 5 feet long, from Laysan. It is more likely to be the Japanese

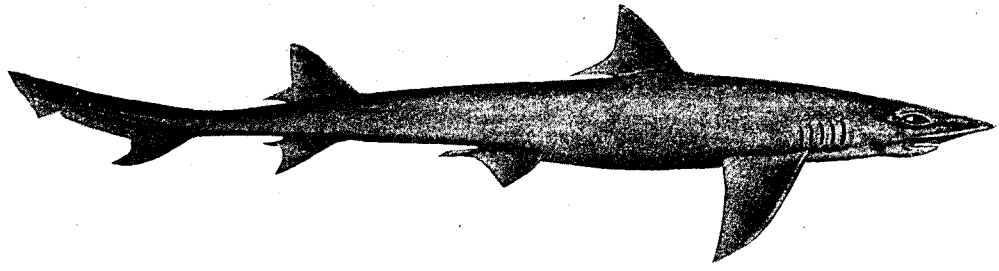


FIG. 2.—*Galeus japonicus* Müller & Henle; after Müller and Henl

species, *Galeus japonicus*, than the Californian, *Galeus zyopterus*. Neither of these differs much from the European *Galeus galeus*.

Galeus japonicus Müller & Henle, Plagiostomen, 58, pl. 22, 1841, Japan; Günther, Cat., VIII, 380, 1870 (copied); Bleeker, Nat. Verh. Kon. Ak. Amsterdam, XVIII, 1879, 3 (name only); Jordan & Fowler, Proc. U. S. Nat. Mus., XXVI, 1903, 611 (Onomichi, Hiroshima, and Nagasaki, Japan).
Galeus vulgaris, Steindachner, Denks. Ak. Wiss. Wien 1900, 519 (Laysan); not of Cuvier.

Genus 4. GALEOCERDO Müller & Henle.

Mouth crescent-shaped; teeth alike in both jaws, large, oblique, coarsely serrated on both margins, with a deep notch on outer margin; spiracles present; caudal fin with a double notch; a pit on the tail above and below at base of caudal fin; first dorsal opposite the space between pectorals and ventrals.

Large sharks found in most warm seas. Only one species known from Hawaiian or American waters.

Galeocerdo Müller & Henle, Plagiostomen, 59, 1838 (*tigrinus*).
Boreogaleus Gill, Ann. Lyc. Nat. Hist. N. Y., VII, 1861, 411 (*arcticus*).

3. Galeocerdo tigrinus Müller & Henle. *Tiger Shark.*

Head 7.25 in length; depth about 10; snout 3.33 in head; interorbital space 1.33; width of mouth at corners about 1.6; eye 5.66 in the interorbital space; space between nostrils 2.

Body elongate, tapering to caudal; head very much broader than deep, depressed; eyes small, lateral, nearer snout than gill-opening; snout broad, short, rounded; mouth very broad, rounded; teeth numerous, rather large, compressed, with several basal cusps, and with edges more or less serrated; a labial fold at corners of mouth; nostrils large, inferior, about midway between tip of snout and eye; interorbital space very broad, flat; spiracles very small, behind eye; gill-openings large, posteriorly above base of pectoral. Body very finely roughened. First dorsal beginning about first fourth of interspace between origin of pectoral and that of ventral; second dorsal small, a little nearer origin of first dorsal than tip of caudal; anal small, beginning behind origin of second dorsal; pectoral rather long; ventrals very much nearer anal than pectorals; caudal very long, lower lobe produced; caudal peduncle rather short.

Color brown above, whitish or pale below, upper surface with blackish markings, mostly in the form of dark crossbars.

This shark is known from the East Indies northward to Japan, whence Günther recorded a small example. Jordan and Snyder also record it from Japan, having examined the dried skin of a young

male from Nagasaki. A good specimen was sent to us from Honolulu by Mr. E. L. Berndt. The species differs from *G. maculatus* of the Atlantic in having dark cross-bands instead of dark brown spots on the upper surface.

Galeocerdo tigrinus Müller & Henle, Plagiostomen, 59, 1838, **Pondicherry**; Günther, Cat., VIII, 378, 1870 (Japan); Duméril, Elasmobranches, I, 393, 1870 (Pondicherry); Jordan & Fowler, Proc. U. S. Nat. Mus., XXVI, 1903, 612 (Nagasaki); Jordan & Snyder, Proc. U. S. Nat. Mus., XXVII, 1904, 940 (Oahu).

Galeocerdo rayneri Macdonald & Barron, Proc. Zool. Soc. Lond. 1868, 368, pl. 32, **Australia.**

Genus 5. PRIONACE Cantor. *Blue Sharks.*

Large sharks with the body and head slender; no spiracles; the teeth in both jaws strongly serrated in the adult, those in the upper jaw broad, those below narrower, straight, and claviform; first dorsal large, inserted midway between axils of pectorals and ventrals; second dorsal much smaller, usually not larger than anal; embryo not attached to the uterus by a placenta. Species rather few; large, slender, swift, voracious sharks of the warm seas. The groups called *Prionace*, *Hypoprion*, *Aprionodon*, and *Scoliodon* are usually placed as subgenera under *Carcharhinus* or *Carcharias*, as the group has been commonly called. Their retention as distinct genera is apparently justified on the ground of convenience.

Prionodon Müller & Henle, Plagiostomen, 35, 1841 (*glaucus*, etc.); name preoccupied.

Prionace Cantor, Malayan Fishes, 399, 1850; substitute for *Prionodon*.

Cynocephalus (Klein) Gill, Ann. Lyc. Nat. Hist. N. Y. 1861, 400 (*glaucus*).

4. Prionace glauca (Linnæus). Fig. 3.

Snout very long; nostrils rather nearer to mouth than to extremity of snout; no labial fold except a groove at angle of mouth; teeth of upper jaw oblique, scarcely constricted near base; lower teeth slender, triangular in young examples, lanceolate, with a broad base, in old ones; pectoral fin long, falciform, extending to dorsal, which is nearer ventrals than root of pectorals. Color light bluish gray above, paler below.

A large shark of the warm seas, occasionally taken in Europe and on the coasts of Japan and California. A mounted specimen from off Misaki is in the Imperial Museum of Tokyo, and in the

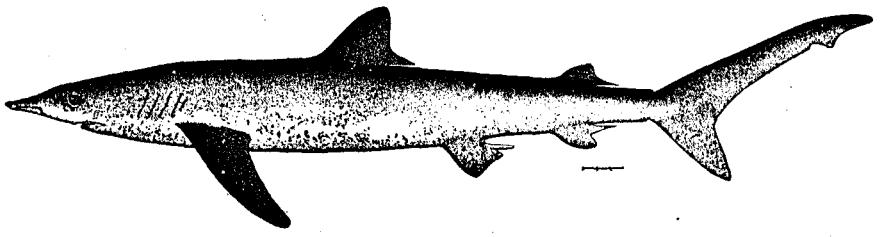


FIG. 3.—*Prionace glauca* (Linnæus); after Jordan and Evermann.

Imperial University is a photograph of a large specimen secured at the same place. A female, taken with a hand line at *Albatross* Station 3801, 28° 31′ N., 141° 47′ W., contained 47 embryos, each measuring 15.3 inches in length. The following measurements of the adult were taken: Tip of snout to end of caudal lobe 274 cm., to dorsal fin 110; to eye 23; to first gill-opening 55; to pectoral 65; length of gill-area 18; height of first gill-slit 5; of second and third 7.5; of fourth 7; of fifth 5; length of pectoral 62; base of pectoral 23; free edge of pectoral 56; axil to ventral 77; anterior margin of ventral 17.5; free margin of ventral 20.5; base of ventral 16.5; axil of ventral to front of anal 24; base of anal 13.5; anterior margin of anal 17; anal to caudal pit 22; base of dorsal 23; anterior margin of dorsal 30.5; free edge of dorsal 28; posterior edge of first dorsal to second dorsal 63.5; base of second dorsal 13; front margin of second dorsal 13.5; posterior end of second dorsal to caudal pit 21.5; upper lobe of caudal 58.5; spread of caudal 67; lower caudal lobe 37; girth at front of ventral 76; girth at front of pectorals 91.

Whether this species is really identical with the European *P. glauca* is uncertain.

Squalus glaucus Linnæus, Syst. Nat., Ed. X, 235, 1758, **seas of Europe.**

Carcharias glaucus, Günther, Cat., VIII, 364, 1870 (England; St. Helena; Pondicherry; and Port Arthur, Australia).

Prionace glauca, Jordan & Evermann, Fishes North and Mid. Amer., I, 33, 1896 (San Francisco; Monterey); Jordan & Fowler, Proc. U. S. Nat. Mus., XXVI, 1903, 613 (Misaki); Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 515 (Albatross Station 3801).

Genus 6. CARCHARIAS Rafinesque.

Body rather robust, the head broad and depressed; mouth inferior, with the teeth in both jaws strongly serrated in the adult, less so or entire in the young, those in the upper jaw broad or narrow, those below narrow, straight, and nearly erect; no spiracles; first dorsal large, placed not far behind pectoral; pectoral falcate; second dorsal small. Embryos attached by placenta to the uterus. Species very numerous and difficult of separation. Voracious sharks of the warm seas.

Carcharias Rafinesque, Caratteri Alcuni Nuovi Generi, 10, 1810 (in intention).
Carcharhinus Blainville, Journ. Phys. 1816, 264 (*commersoni*); a name based on Lacépède's figure of "*Squalus carcharias;*" it apparently represents *Carcharhinus lamia.*
Carcharias Cuvier, Règne Animal, Ed. 1, 125, 1817 (*carcharias*).
Eulamia Gill, Ann. Lyc. Nat. Hist. N. Y. 1861, 401 (*lamia*).
Platypodon Gill, l. c., 401 (*menisorrah*).
Isogomphodon Gill, l. c., 401 (*oxyrhynchus*).
Lamiopsis Gill, l. c., 401 (*temminckl*).

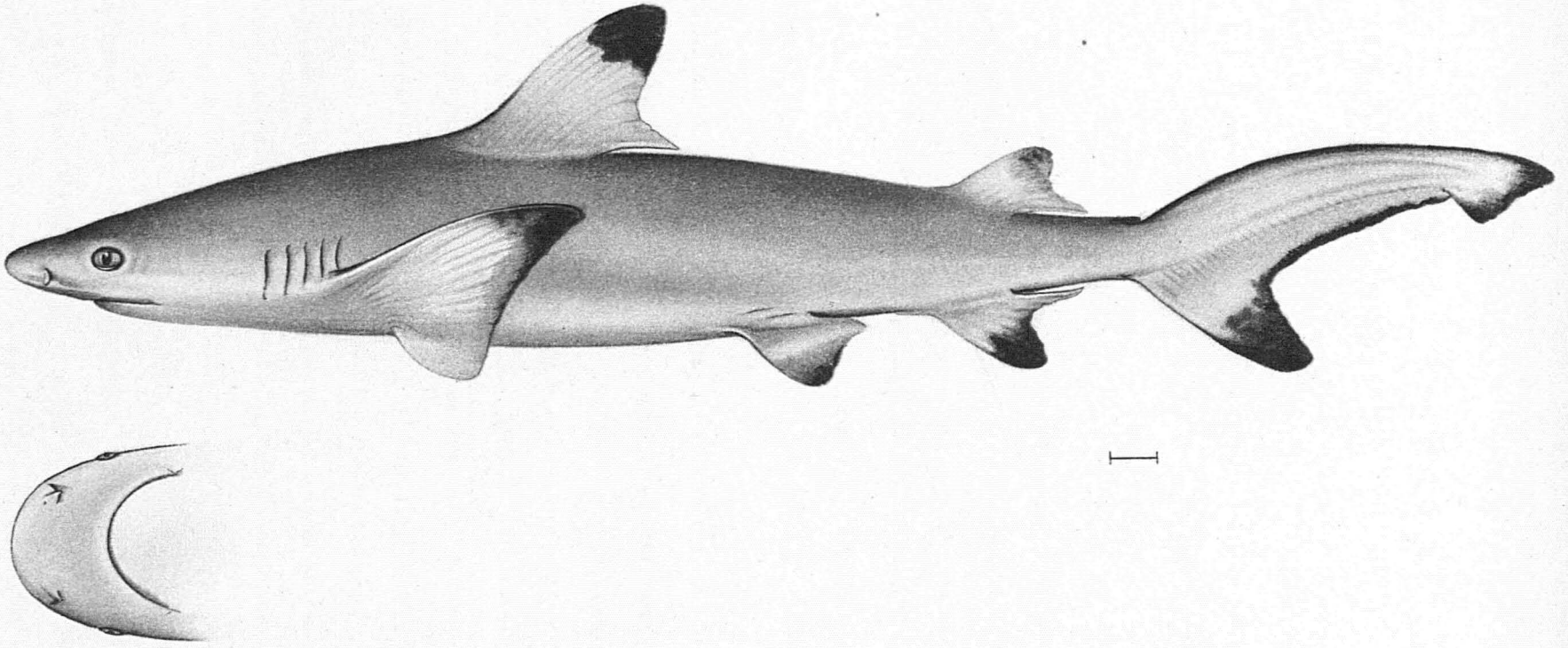
a. Tips of fins abruptly jet black.
b. Head very broad and depressed; snout very broad, rounded, and appearing pointed when viewed laterally. *melanopterus*, p. 38.
bb. Head elongate, somewhat narrow and depressed; snout long and narrowly pointed when viewed from above. *phorcys*, p. 39.
aa. Tips of fins merely dusky.
c. Snout less than one-third distance to first gill-opening.....*insularum*, p. 40.
cc. Snout exceeding one-third distance to first gill-opening.....*nesiotes*, p. 40.

5. Carcharias melanopterus Quoy & Gaimard. Plate 1.

Head about 5.85 in length; depth about 7.67; width of head 1.25 in its length; depth of head nearly 2; snout about 3 in head; interorbital space 1.5; space between tip of snout and front of mouth 2.6; width of mouth 2; eye 5 in interorbital space; internasal space 2; least depth of caudal peduncle 3; caudal 3.5 in body; pectoral 5.5.

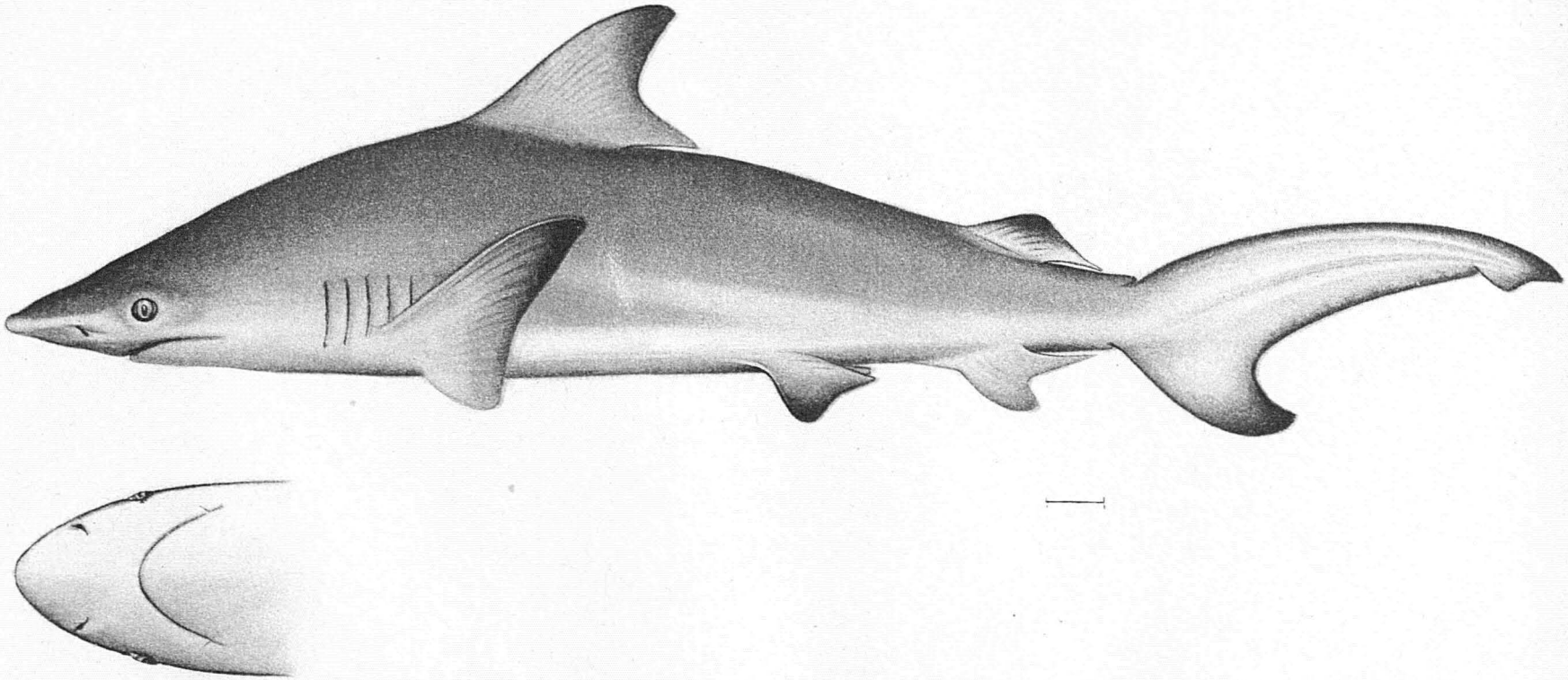
Body elongate, rather robust, the trunk and tail compressed; head very broad and depressed; snout very broad, rounded, appearing pointed when viewed laterally; eyes small, their posterior margins about midway between tip of snout and first gill-opening; nictitating membrane well developed; mouth large, very convex, so that the anterior margin of the mandible is below front rim of orbit; teeth in upper jaw broad, compressed, sharply pointed, the edges serrate and with 4 or 5 basal cusps behind; teeth in mandible rather long, pointed, the compressed edges smooth, without any serratures; nostril with a small flap, inferior, about midway in length of snout; interorbital space very broad, more or less convex, especially in the center, behind which the top of the head rises more or less gradually to back of neck; gill-openings of moderate length, close together, the posterior above base of pectoral; peritoneum silvery.

Body very finely roughened when stroked forward; first dorsal with its length about equal to depth of body, its origin midway between that of the second dorsal and tip of snout; origin of second dorsal nearer origin of first dorsal than tip of caudal; anal similar to second dorsal, and below it, the origins of the 2 fins at the same point; caudal rather long, with a notch near its tip; length of lower lobe 2.2 in entire length of fin; pectoral large, margin of fin nearly straight or only very slightly concave; ventrals small, their origin a little nearer origin of first dorsal than that of second, or nearly midway between; back in front of first dorsal slightly keeled, and between first and second dorsals with a shallow groove; base of caudal, above and below, with pit. Another example, a female, gave the following measurements, recorded in centimeters: Total length 156; tip of snout to dorsal 52; to eye 12.8; to first gill-opening 30.5; to pectoral 36.2; length of gill-area 7.7; height of first, second, third, and fourth gill-slits 6.3; fifth 5.6; anterior margin of pectoral 28; base of pectoral 10.8; posterior margin of pectoral 27.3; axil of pectoral to ventral 36.8; anterior margin of ventral 12; free margin of ventral 10; base of ventral 10; axil of ventral to front of anal 13.3; base of anal 8.3; anterior margin of anal 10; base of anal to caudal pit 9; base of dorsal 11; anterior margin of dorsal 19.5; free edge of dorsal 15.3; distance between dorsals 38; base of second dorsal 7.6; second dorsal to caudal pit 10; upper lobe of caudal 38; spread of caudal 35.5; lower lobe of caudal 19; width of mouth 17; preoral length of snout 9.5; girth behind pectorals 63.5; girth at front of ventrals 53.



CARCHARIAS MELANOPTERUS QUOY & GAIMARD.

JULIUS BIEN & CO. LITH. N.Y.



CARCHARIAS PHORCYS JORDAN & EVERMANN. TYPE.

JULIUS BIEN & CO. LITH. N.Y.

Color in life (field No. 03535), upper parts of body and head light brown, lower parts white; fins tipped with black; upper and lower borders of caudal also black. Another example, 4.5 feet long and similarly marked, was seen in the market of Honolulu.

Color in alcohol, pale brown above, the lower portions white; a brown longitudinal band along side from below front of first dorsal backward over base of ventral; upper surface of pectorals and ventrals brown like the back; upper extremity of dorsal, broadly and abruptly blotched with black; margins of caudal narrowly black, the greater part or outer half of the lower lobe black; outer portion of anal black; lower tip of pectoral blackish, the upper edge or marginal portion also blackish or dusky, and the lower tip of ventrals broadly blackish. Description from a male 31 inches long taken at Honolulu.

This shark is a common form throughout Polynesia. We have a number of examples from Honolulu, three of which were collected in 1889 by Dr. Jenkins. The species was also found at Samoa by Jordan and Kellogg. It may be known at once by the inky black tips to its fins.

Carcharias melanopterus Quoy & Gaimard, Voyage de l'Uranie, Zool., 194, pl. 43, figs. 1 and 2, 1824, **Vaigiou Island**; Günther, Cat., VIII, 369, 1870 (South Africa; Amboyna); Streets, Bull. U. S. Nat. Mus., No. 7, 94, 1877 (Christmas and Washington islands); Snyder, Bull. U. S. Fish Commission, XXII, 1902 (Jan. 19, 1904), 513 (Honolulu).

Carcharias (Prionodon) melanopterus, Müller & Henle, Plagiost., 43, pl. 19, fig. 5, 1841 (teeth); Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 519 (South Seas).

Carcharias (Prionace) melanopterus, Cantor, Cat. Malay. Fish., 400, 1850 (Straits of Malacca); Fowler, Proc. Ac. Nat. Sci. Phila. 1901, 325 (Thornton Island).

? *Carcharias (Prionodon) henlei* Bleeker, Nat. Tyds. Ned. Ind., IV, 507, 1853, **Batavia.**

? *Carcharias (Prionodon) brachyrhynchos* Bleeker, Enum. Sp. Arch. Ind., 206, 1859, **East Indies.**

6. Carcharias phorcys Jordan & Evermann. Plate 2.

Head 4.8 in length; depth 6.5; width of head 1.75 in its length; depth of head 1.8; snout about 2.2 in head; interorbital space 2.2; space between tip of snout and front of mouth 2.5; width of mouth 2.5; eye 6 in interobital space; internasal space 1.8; least depth of caudal peduncle a little over 4.8; caudal 3.5 in body; pectoral 5.75.

Body elongate, rather robust, the tail compressed; head elongate, somewhat narrow and depressed, snout long and narrowly pointed when viewed above, the tip rounded; eyes small, their posterior margins about midway between tip of snout and first gill-opening; nictitating membrane well developed; mouth large, very convex, the anterior margin of mandible below front rim of orbit; teeth in upper jaw narrow, with broad basis, not notched, compressed, serrate, and with four or five basal cusps behind; teeth in mandible rather long, pointed, not serrate, the edges smooth; nostril without flap, inferior, and nearer eye than tip of snout; interorbital space broad and convex; upper profile of head rising gradually in a nearly straight line to back of head; gill-opening of moderate length, posterior, over base of pectoral; peritoneum white or pale; body very finely roughened when stroked forward; height of first dorsal less than depth of body, its origin a little nearer tip of snout than origin of second dorsal; origin of second dorsal nearer origin of first dorsal than tip of caudal; fin small, about over anal, so that origins of the 2 fins are opposite; caudal long, with a notch at its tip, deep, the lower lobe 2.25 in length of fin; pectoral with margin slightly concave; ventrals small, their origins a little nearer base of lower caudal lobe than origin of the pectoral; back convexly ridged, broader between the dorsals; base of caudal with a pit above and below.

Color in alcohol, pale brown, the lower parts pale or whitish with a brown streak the color of the back along side from gill-opening to over origin of ventral; tips of dorsals, edge of caudal, and tip of pectoral blackish.

This description from an example 27.5 inches long, field No. 03747, taken at Honolulu. Type, No. 50612, U. S. Nat. Mus. We have 4 other examples also from Honolulu, one a fœtus, besides 2 from the same locality collected by Dr. Jenkins in 1889. Specimens were also secured by the *Albatross* in 1902 at Honolulu and at Hanalei Bay, Kauai.

Carcharias phorcys Jordan & Evermann, Bull. U. S. Fish Comm. 1902 (April 11, 1903), 163, **Honolulu**; Snyder, Bull. U. S. Fish Comm. 1902 (Jan. 19, 1904), 513 (Honolulu; Hanalei Bay, Kauai).

7. Carcharias insularum Snyder. Plate 3, fig. 1.

Head, measured to last gill-opening, 3.1 in length (tip of snout to caudal pit); depth at front of pectorals 6.1; at front of ventrals 6.7; snout 3 in head; interorbital width 2; pectoral 4 in length; upper lobe of caudal 2.7.

Mouth semicircular, its width equal to distance between tip of snout and posterior border of eye, distance between edge of mouth and tip of snout 1.7 times width of mouth, or a little more than distance between nostrils; upper teeth serrated from base to tips, the lower ones smooth on base, upper parts weakly serrated; teeth of upper jaw a little broader at base than they are high, the cutting edges of median ones straight; lateral teeth with edges slightly concave, concavity of outer edges deepening somewhat as they approach corners of mouth; teeth not pointing outward in either jaw, those of lower jaw much more slender than those above, the bases somewhat wider than height of teeth; cutting edges concave; 30 rows on each jaw, teeth of the 2 median rows minute or absent. Tip of pectoral fin acutely rounded; first dorsal broadly rounded; second dorsal slightly smaller than anal; caudal very large, underside of upper lobe with a deep notch; free edges of dorsals, pectorals, and ventrals concave; claspers of male 1.5 times as long as ventral fin is high.

In life, bluish slate-color, somewhat lighter below; first dorsal broadly tipped with lighter color; second dorsal, pectorals, ventrals, and caudal with slightly darker tips. In alcohol the fins and upper parts of the body are rather indistinctly spotted with a darker shade than that of body; spots of body somewhat larger than eye, the spaces between them somewhat wider than diameter of spots; spots on fins smaller and more closely crowded.

The following measurements were taken before the specimen, a male, was preserved: Total length 213 cm.; tip of snout to dorsal 71; to eye 17.8; to first gill-opening 40.5; to pectoral 48; length of gill-area 10; height of first gill-slit 7.5; of second 8.2; of third 8.8; of fourth 8.2; of fifth 5.7; length of pectoral 39; base of pectoral 14; free edge of pectoral 37; axil of pectoral to ventral 47; anterior margin of ventral 14; free margin of ventral 12; base of ventral 12.7; axil of ventral to front of anal 17.8; base of anal 9; anterior margin of anal 12.7; anal to caudal pit 8.2; base of dorsal 21; anterior margin of dorsal 32; free edge of dorsal 23.5; first to second dorsal 47; base of second dorsal 6.3; front margin of second dorsal 9; second dorsal to caudal pit 12.7; upper lobe of caudal 59.5; lower lobe of caudal 30; spread of caudal 61; girth at front of ventrals 66; girth at front of pectorals 78.5.

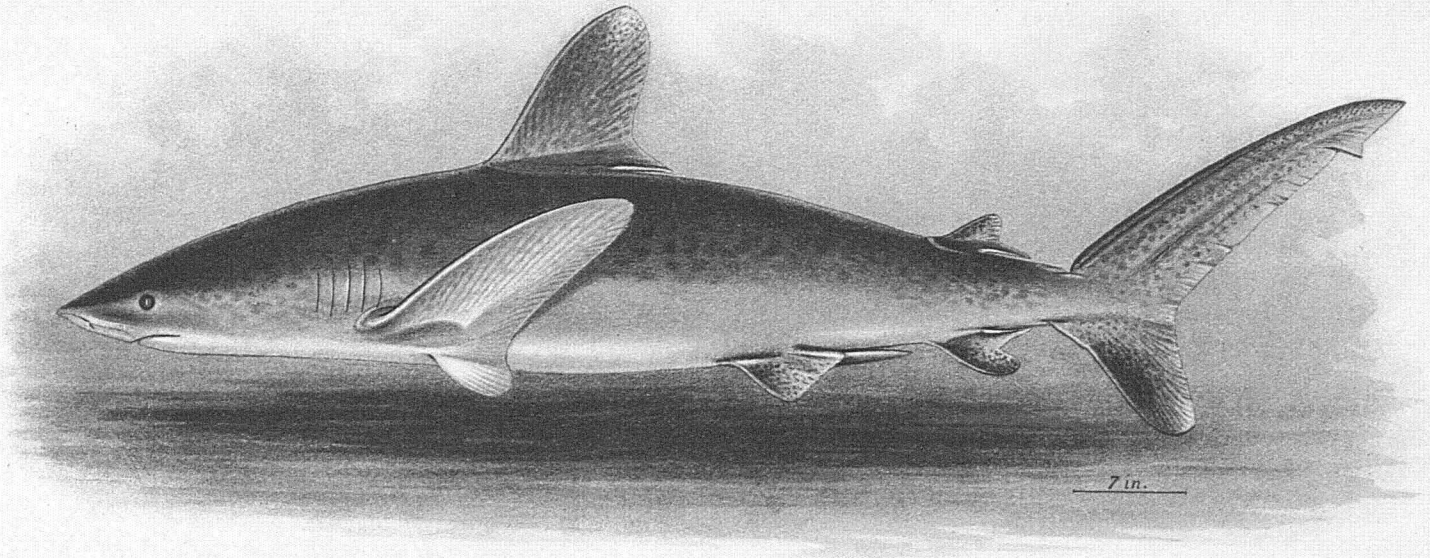
Seven young were obtained from a large female of this species taken at station 4111, between Molokai and Oahu, each measuring 61 cm. in length. Color bluish; pectorals, second dorsal, anal, and lower caudal lobe broadly tipped with black; ventral surface of body and paired fins, except the terminal dark areas, yellowish; tip of first dorsal yellowish. The head measured to last gill-opening 2.9 in length; depth at front of pectorals 5.5; depth of caudal peduncle 5.5 in head; snout 3; interorbital width 2.1. Curve of mouth elongate instead of circular, as in adult, its width being an eye's diameter less than distance between tip of snout and anterior border of orbit. Distance between edge of mouth and tip of snout 1.1 times width of mouth. Height of dorsal 6.25 in length of head and body; length of pectoral 3.4; upper lobe of caudal 2.7. Dorsal and pectorals broadly rounded.

This shark appears to be closely related to *Carcharias lamia* Rafinesque, of the Atlantic. Not common about the Hawaiian Islands.

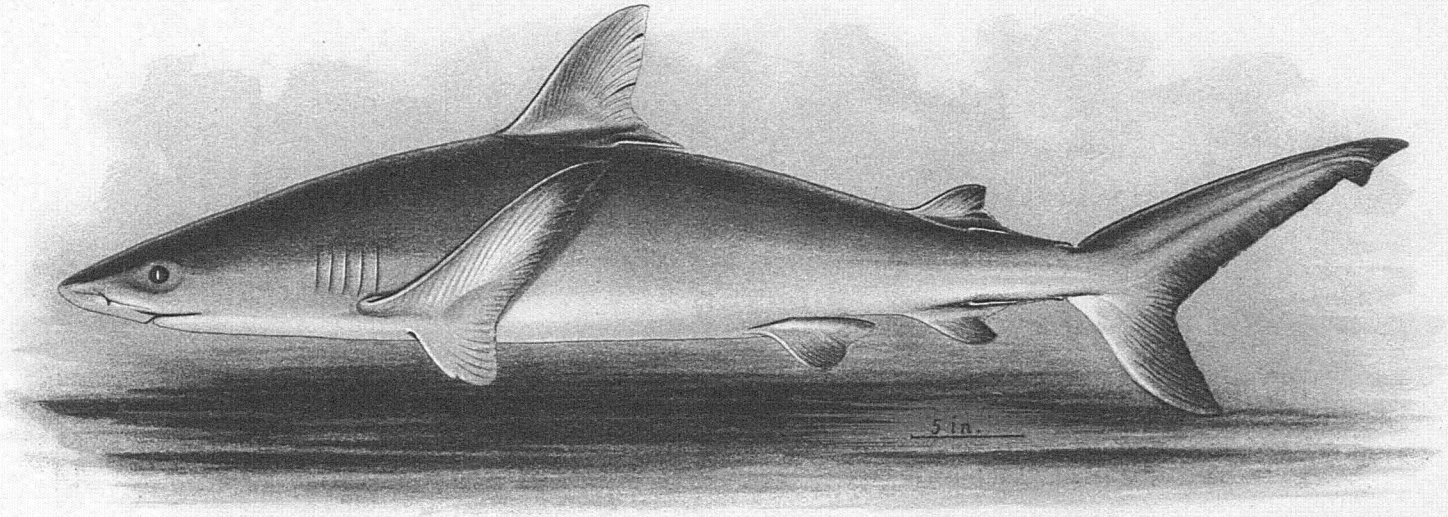
Carcharias insularum Snyder, Bull. U. S. Fish Comm. 1902 (Jan. 19, 1904), 513, pl. 1, fig. 1, off **Diamond Head, Oahu Island** (Type, No. 50859, U. S. N. M.).

8. Carcharias nesiotes Snyder. Plate 3, fig. 2.

Head, measured to last gill-opening, 3.1 in length (tip of snout to caudal pit); depth at front of pectorals 5.5; at front of ventrals 6.25; snout 3.1 in head; interorbital width 2.4; pectoral 3.7 in length; upper lobe of caudal 2.8. Mouth elliptical, not semicircular in shape, width equal to distance from tip of snout to posterior edge of orbit; width of space between tip of snout and anterior edge of mouth equal to distance between outer edges of nostrils, 3.9 in head; teeth of upper jaw strongly serrated, those near center of jaw symmetrical in shape, the width at base equal to or a little greater than height; laterally the outer edges of teeth grow concave, then notched; inner edges becoming convex, teeth pointing away from symphysis; teeth of lower jaw narrow, with wide bases, their edges smooth or very slightly serrated, symmetrical in shape on both middle and lateral parts of jaws. Pectorals pointed at tips when depressed, reaching as far back as posterior part of first



1. CARCHARIAS INSULARUM SNYDER.



2. CARCHARIAS NESIOTES SNYDER.

dorsal, the free edge concave; first dorsal bluntly pointed; second dorsal and anal equal in size, edge of anal deeply notched; edge of upper caudal lobe notched, distance from notch to tip of lobe 4.54 in length of lobe.

Color bluish gray above, the fins growing darker toward the tips; ventral surface lighter.

The following are the measurements of a male taken at station 3902, off the northern coast of Molokai: Total length 224 cm.; tip of snout to dorsal 71; to eye 17.8; to gill-opening 44; to pectoral 54; length of gill-area 13.5; height of first gill-slit 6.5; of second 7; of third and fourth 6.5; of fifth 5.8; anterior margin of pectoral 49; base of pectoral 14; posterior margin of pectoral 42; axil of pectoral to ventral 49.5; anterior margin of ventral 12.8; free margin of ventral 12.8; base of ventrals 10.8; axil of ventral to front of anal 19; base of anal 8.3; anterior margin of anal 12; anal to caudal pit 13.4; base of first dorsal 19.7; anterior margin of first dorsal 30.5; free edge of dorsal 26; distance between dorsals 58; base of second dorsal 7; second dorsal to caudal pit 19; upper lobe of caudal 61; spread of caudal 66; lower caudal lobe 29; width of mouth 20.5; preoral length of snout 15.

Type, No. 50860, U. S. Nat. Mus., a female about 4.86 feet long, taken at French Frigate Shoals. A smaller example, also a female, from Laysan Island, does not differ from the type, except that it is darker in color, the under parts being quite dusky. Cotype, No. 12790, L. S. Jr. Univ. Mus., a female 32 inches long (No. 03741), and the heads of 2 larger examples were obtained at Honolulu.

A large and voracious shark seen everywhere about the islands. Compared with *Carcharias japonicus* of Japan, it is more robust in form, having a shorter and broader head.

Carcharias (*Prionodon*) *gangeticus*, Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 519 and 521 (Laysan Island.)
Carcharias nesiotes Snyder, Bull. U. S. Fish Comm. 1902 (Jan. 19, 1904), 514, pl. 1, fig. 2, **French Frigate Shoals.**

Family IV. SPHYRNIDÆ.

General characteristics of the *Carchariidæ*, but the head singularly formed, kidney-shaped or "hammer"-shaped, from the extension of its sides, the nostrils being anterior and the eyes on the sides of the "hammer"; mouth crescent-shaped under the "hammer"; teeth of both jaws similar, oblique, each with a notch on the outside near the base; no spiracles; last gill-opening over the pectoral; first dorsal and pectorals large, the dorsal nearer pectorals than ventrals; second dorsal and anal small; a pit at the root of the caudal; caudal fin with a single notch toward its tip, its lower lobe developed. One genus with 5 species, inhabiting most warm seas. Large sharks, known at once by the singular form of the head, which is not quite the same in any two species.

Genus 7. SPHYRNA Rafinesque.

Characters of the genus included above. In the form of the head there is a perfect gradation among the species from the narrow hammer of *S. blochii*, with the lobes three times as long as broad and deeply grooved along the anterior edge, to the kidney-shaped head of *S. tiburo*, in which the anterior grooves are obsolete.

Sphyrna Rafinesque, Indice d'Ittiol. Siciliana, 60, 1810 (*zygæna*).
Cestrorhinus Blainville. Journ. Phys. 1816, 264 (*zygæna*).
Zygæna Cuvier, Règne Animal, Ed. I, 127, 1817 (*zygæna*); name preoccupied.
Platysqualus Swainson. Classn. Anim., II, 318, 1839 (*"tiburo"=tudes*).
Reniceps Gill, Ann. Lyc. Nat. Hist. N. Y., VIII, 1861, 412 (*tiburo*).
Cestracion (Klein; pre-Linnæan) Gill, l. c., 403 (*zygæna*).
Eusphyrna Gill, l. c., 412 (*blochii*).

9. **Sphyrna zygæna** (Linnæus). *Hammer-headed Shark; "Mano kihikihi."*

Head truly hammer-shaped; width of head about twice its length; length of hinder margin of hammer nearly equal to its width near the eye; nostril close to eye, prolonged into a groove which runs along nearly the whole front margin of head; first dorsal large; second quite small, smaller than anal; pectoral rather large. Color gray. A large voracious shark reaching a length of 15 feet or more, found in all warm seas; occasionally on our coasts from Cape Cod and Point Concepcion, southward.

A number of examples of this species were obtained at Honolulu, and it was taken by the *Albatross* at Station 3844, off the southern coast of Molokai. Dr. Jenkins also brought 13 examples from Honolulu in 1889, the largest measuring 20.5 inches. The species is also common in the South Seas and in Japan.

Squalus zygæna Linnæus, Syst. Nat., Ed. X, 234, 1758, **Europe; America.**
Sphyrna zygæna, Rafinesque, Indice d'Ittiol. Sic., 46, 1810 (Messina); Müller & Henle, Plagiostomen, 51, 1841 (Brazil; India); Jordan & Evermann, Fishes North and Mid. Amer., I, 45, 1896; Evermann & Marsh, Fishes of Porto Rico, 63, 1900; Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 420 (Honolulu); Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 515 (Molokai).
Squalus malleus Risso, Ichth. Nice, 34, 1810, **Nice.**
Zygæna malleus, Shaw, Nat. Miscell., pl. 267, 18——, ——; Günther, Cat., VIII, 381, 1870 (Totoya, Fiji Islands); Günther, Shore Fishes, Challenger, Zool., I, Part VI, 59, 1880 (Reefs at Honolulu).
Zygæna lewini Lord in Griffith, Animal Kingdom, X, 640, pl. 50, 1834, **New Holland.**
Zygæna subarcuata Storer, Proc. Bost. Soc. Nat. Hist., III, 1848, 70, **Cape Cod.**
Cestracion zygæna, Duméril, Elasmobr., II, 382, 1865 (Mediterranean; coasts of North and South America; Australia; Japan).

Family V. ALOPIIDÆ.—Thresher Sharks.

Body moderately elongate, the snout rather short; mouth crescent-shaped; teeth equal in both jaws, moderate sized, flat, triangular, not serrated; the third tooth of the upper jaw on each side much smaller than the others; gill-openings moderate, the last one above the root of the pectorals; no nictitating membrane; spiracles just behind eye, minute or absent; first dorsal large, midway between pectorals and ventrals; second dorsal and anal very small; caudal fin exceedingly long, about as long as rest of body, a pit at its root, a notch on the upper lobe near its tip; lower lobe moderately developed; no caudal keel; ventrals rather large; pectorals very large, falcate. A single species, reaching a large size, inhabiting most seas, known at once by the great length of the tail.

Genus 8. ALOPIAS Rafinesque.

The characters of this genus are included with those of the family.

Alopias Rafinesque, Caratteri di Alcuni Generi, 12, 1810 (*macrourus=vulpes*).
Alopecias Müller & Henle, Plagiostomen, 74, 1841; amended orthography.

10. Alopias vulpes (Gmelin). Fig. 4.

Body fusiform, cylindrical, thickest before dorsal fin; back regularly arched from above pectorals to end of snout, and gradually decreasing in size posteriorly to caudal. Head short, bluntly conical; snout blunt; eye rather large; mouth horseshoe-shaped; teeth about $\frac{22+22}{19+19}$ third or fourth tooth on either side of center of upper jaw smaller than others; spiracles very small or wanting; last gill-openings above or slightly in front of pectorals.

Body more or less roughened. First dorsal high, triangular, somewhat higher than its base is

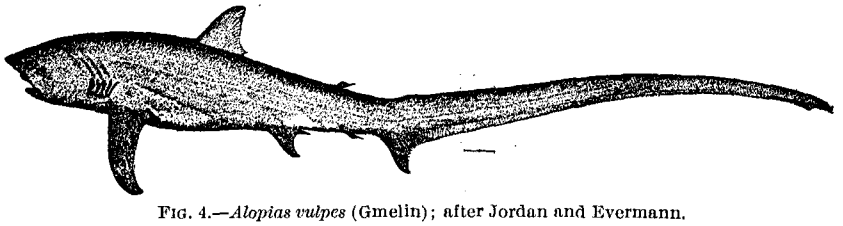


FIG. 4.—*Alopias vulpes* (Gmelin); after Jordan and Evermann.

long, slightly slender toward its summit, superior angle rounded; second dorsal similar in shape, but much smaller; anal small, placed behind second dorsal, which it resembles; pectorals long, wide, emarginate, with small process behind; ventrals wider than high, nearest first dorsal; caudal nearly as long or longer than body, composed of 3 distinct lobes, one small, triangular, at under side of tip, a second long and low, extending along upper side of tail, and a third short and broad, at lower base of tail.

Color, slate-blue above, beneath soiled white, marked with obsolete bluish spots; pupil a longitudinal slit, edged with golden.

Length, 12 feet.

One large specimen received from the Honolulu market through Mr. Berndt.

A large shark, abounding in all warm seas, common on the east coast of Japan. It was seen by Dr. Jordan at Misaki, Nagasaki, Tokyo, and Yokohama. No one has yet compared specimens of the Japanese fish with those from California or the Mediterranean, and the species may prove different.

Squalus vulpes Gmelin, Syst. Nat., I, 1496, 1788, **Mediterranean**; after Pennant.
Squalus vulpinus Bonnaterre, Tableau Encycl. Ichthy., 9, 1788, **Mediterranean**; after Pennant.
Alopias macrourus Rafinesque, Caratteri di Alcuni Generi, 12, 1810, **Sicily.**
Squalus alopecias Gronow, Cat. Fishes, 7, 1854, **Mediterranean.**
Carcharias vulpes, De Kay, New York Fauna, IV, Fishes, 348, pl. LXI, fig. 199, 1842.
Alopias vulpes, Duméril, Elasmobr., I, 421, 1865; Day, Fishes of India, Supplement, 810, 1888; Jordan & Gilbert, Synopsis. 27, 1883; Jordan & Evermann, Fishes North and Mid. Amer., I, 45, 1896.
Alopecias vulpes, Günther, Cat., VIII, 393, 1870.

Family VI. LAMNIDÆ.—The Mackerel Sharks.

Sharks of large size, with the body stout, the mouth wide with large teeth, and the tail slender; the caudal fin lunate, the 2 lobes being not very unequal, the upper lobe strongly bent upward; caudal peduncle with a strong keel on each side; gill-openings wide, all in front of the pectoral, entirely lateral, not extending under the throat; first dorsal large; pectorals large; ventrals moderate; second dorsal and anal very small; a pit at the root of the caudal; spiracles minute or absent. Genera 3, species 6 or more, besides numerous fossil species. In this family the dentition, as well as the muscular system, reaches its highest degree of specialization.

a. Lamnix: Teeth slender and sharp, with entire edges.....*Isuropsis*, p. —
aa. Carcharodontinæ: Teeth with serrated edges, compressed, and triangular in form, without basal cusp..*Carcharodon*, p. —

Genus 9. ISUROPSIS Gill.

Snout rather long and pointed; the body formed much like that of a tunny or mackerel; first dorsal large, inserted entirely behind pectorals, nearly midway between pectorals and ventrals; pectorals large; second dorsal and anal very small; caudal peduncle slender; teeth long, lanceolate, with sharp entire cutting edges and no basal cusps.

Isuropsis Gill, Ann. Lyc. Nat. Hist. N. Y., VIII, 1861, 398 (*glaucus*).

11. Isuropsis glauca (Müller & Henle). Fig. 5.

Snout long, pointed; teeth in 4 rows, very long, flexuous, without denticles at base; spiracles very small; first dorsal inserted well backward, midway between pectoral and ventral, scarcely longer than high, its upper angle rounded.

Color, dark blue, white below.

Coasts of Japan and southward, rather common about Nagasaki. Many jaws and a stuffed fœtus

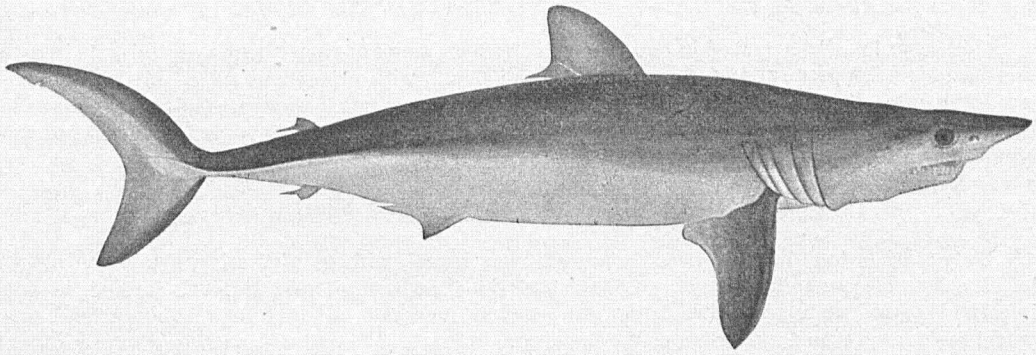


FIG. 5.—*Isuropsis glauca* (Müller & Henle); after Müller and Henle.

are in possession of Mr. Yahiro at Nagasaki. A specimen 7 feet long was taken by Jordan and Snyder at Matsushima, of which the head was preserved. Many teeth and jaws of specimens from Honolulu are in possession of Mr. E. L. Berndt, of Honolulu.

Oxyrhina glauca Müller & Henle, Plagiostomen, 69, Pl. XXIX, 1841, **Nagasaki** (erroneously stated to be from Java); Schlegel, Fauna Japonica, Poiss., 302, 1850 (Nagasaki); Duméril, Elasmobranches, 409, 1870; after Müller & Henle.
Lamna glauca, Günther, Cat., VIII, 391, 1870 (Cape Seas; St. Helena).

Genus 10. CARCHARODON Smith. The Man-eater Sharks.

General character of *Isuropsis* and *Lamna*, but with a different dentition, the teeth being large, flat, erect, regularly triangular, their edges serrated; first dorsal moderate, nearly midway between pectorals and ventrals; second dorsal and anal very small; pectorals large; ventrals moderate; caudal peduncle rather stout; spiracles minute or absent. Sharks of very large size; the strongest and most voracious of all fishes; pelagic, found in most warm seas.

Carcharodon Andrew Smith, Mag. Nat. Hist. (2), II, 37, January, 1838. (No type mentioned.)

12. Carcharodon carcharias (Linnæus). "*Niuhi.*"

Body stout; depth about 5.5 in total length; mouth very large; each jaw with 5 rows of large, triangular, serrated teeth, those in lower jaw narrower, about $\frac{24}{22}$ in each row; first dorsal somewhat behind pectorals; caudal fin large and strong. Color leaden gray; tips and edges of pectorals black. One of the largest of sharks, reaching a length of 30 feet; found in all temperate and tropical seas, and occasionally taken both in the Atlantic and Pacific. One caught near Soquel, California, was about 30 feet long and had a young sea lion, weighing about 100 pounds, in its stomach. (Jordan and Evermann.)

A large pair of jaws is preserved in the museum of the Imperial University at Tokyo, from a specimen taken somewhere off the east coast of Hondo, near Misaki. This constitutes the only record of the species from Japan. It was not seen by us in Hawaii, but we have unquestionable information of its occurrence off the coast of Puna, south of Hilo, whither it was attracted by the body of a dead horse. There are other statements of its frequent visits to Hawaii.

Lamia Rondelet, Hist. Poiss., 390, 1554, **Nice, Marseilles**; good figure.
Squalus carcharias Linnæus, Syst Nat., Ed. X, 235, 1758, **Europe**; after Artedi; not of most later authors.
Carcharias verus Agassiz, Poiss. Foss., III, 246, 1836; name on plate only.
Carcharodon smithi Bonaparte, Selach. Tab. Anal., 9, 1838; after Smith.
Carcharodon rondeleti Müller & Henle, Plagiostomen, 70, 1841, **Mediterranean Sea** and **Atlantic Ocean**; after Rondelet.
Carcharodon capensis Smith, Zool. S. Africa, III, pl. iv, 1842, **Cape of Good Hope.**
Carcharias atwoodi Storer, Proc. Bost. Soc. Nat. Hist., III, 1848, 72, **Provincetown, Massachusetts.**
Carcharodon rondeleti, Günther, Cat., VIII, 392, 1870.
Carcharodon carcharias, Jordan & Gilbert, Synopsis, 875, 1883; Jordan & Evermann, Fishes North and Mid. Amer., I, 50, 1896.

Order C. TECTOSPONDYLI.

Calcareous lamellæ arranged in one or more concentric series or rings about a central axis in each vertebra; spiracles present; anal fin wanting; dorsal fins 2, with or without spine. As here understood, the order *Tectospondyli* includes the sharks of the groups called *Cyclospondyli* and *Tectospondyli* by Hasse. The vertebræ in the rays show a similar structure, and it is probably from sharks of this group that the rays are descended.

Family VII. SQUALIDÆ.—The Dog Sharks.

Body more or less elongate; head depressed; eyes lateral, without nictitating membrane; mouth inferior, rather large, arched, a deep groove on each side; teeth compressed, variously formed; nostrils inferior, separate; spiracles rather large; gill-openings moderate, all in front of the pectoral fins; dorsal fins 2, each armed with a spine; the first dorsal in front of the ventrals; anal fin wanting; caudal fin with the lower lobe small or obsolete; ventral fins inserted posteriorly, not much before second dorsal. Oviparous.

Genera 6 or more; species about 15. Rather small sharks, chiefly of the Atlantic. These sharks represent a comparatively primitive type, apparently not descended from any other existing *Squali*.

a. Upper teeth simple, without smaller cusps at base.
b. Teeth alike in both jaws, subquadrate, each with a nearly horizontal cutting edge and a point directed backward, *Squalus*, p. 45.
aa. Upper teeth each with 1 or 2 small cusps at base on each side.
c. Teeth unequal, the upper erect and tricuspid, the lower oblique ..... *Etmopterus*, p. 46.
cc. Teeth equal, very small, and pointed ..... *Centroscyllium*, p. 46.

Genus 11. SQUALUS (Artedi) Linnæus.

Body rather slender; mouth little arched, with a long, straight, deep, oblique groove on each side; no labial fold; teeth rather small, all simple, equal in the 2 jaws, their points so much turned aside that the inner margin forms the cutting edge; spiracles rather wide, just behind the eye; fins moderately developed, the first dorsal larger than the second, much in advance of the ventral fins, which are behind the middle of the body although in advance of the second dorsal; dorsal spines strong, not grooved, tail scarcely bent upward. Small sharks abounding in the temperate seas; 4 or 5 species known.

Squalus (Artedi) Linnæus, Syst. Nat., Ed. X, 233, 1758 (includes all sharks).
Squalus Rafinesque, Caratteri, 13, 1810 (*acanthias* and *uyato*).
Acanthorhinus Blainville, Journ. Phys. 1816, 263 (*acanthias*).
Acanthias Risso, Europ. Mérid., III, 131, 1826 (*acanthias*).
Entoxychirus Gill, Proc. Ac. Nat. Sci. Phila. 1862, 496 (*uyato*).

13. Squalus mitsukurii Jordan & Snyder. "*Mano.*" Fig. 6.

We have 4 fœtal examples (No. 03752) of a species of this genus, obtained at Kailua, Hawaii, August, 1901. They were brought to us by a fisherman after having been removed from the body of the parent fish, which we did not see; this example was about 3 feet long. The species was said by the fisherman to be common in that region. The fœtuses each measured about 4.25 inches in total length, and may be described as follows:

Head 3.5 in length; depth 12; eye 3; snout 3.5. Body slender; head broad, depressed; mouth

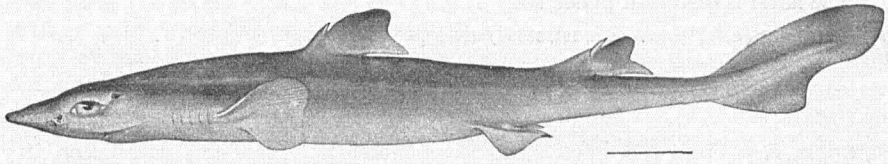


FIG. 6.—*Squalus mitsukurii* Jordan & Snyder; from the type.

between posterior edges of eyes, its width equal to half its distance from tip of snout; snout broad, obtusely pointed; interorbital space nearly flat, its width equal to diameter of eye; origin of first dorsal fin nearer tip of snout than base of caudal fin; body entirely smooth, asperities scarcely, if at all, perceptible.

Color in alcohol, yellowish white; upper parts dusky or brownish; dorsal fins pale at base, black on distal part; caudal black, tips of lobes white.

Adult examples were taken by the *Albatross* and recorded by Professor Snyder, who is unable to separate the species from *Squalus mitsukurii* of Japan. The latter is thus described by Snyder:

Head, measured to last gill-opening, 3.9 in length (snout to caudal pit); measured to first gill-opening 4.5; width of head 2 in its length to last gill-opening; snout 2.4 in head measured to first gill-opening; interorbital space 2.4; height of first dorsal fin 2; second dorsal 3.4.

Teeth in both jaws similar, except that the lower ones are slightly larger than those above; placed in 3 closely apposed rows, pointing away from middle of jaw; outer edge with a deep notch, inner serving as cutting edge; distance between mouth and tip of snout 2 in length of head to first gill-opening; width of mouth 3.4; length of fold at corner of mouth equal to distance between nostrils; distance between nostril and tip of snout 3.9 in head; between nostril and middle of mouth equal to distance between nostril and tip of snout; distance between spiracles 2.3 in head; length of gill-area 4.5; diameter of eye 5.

Length of exposed portion of first dorsal spine equaling distance from tip of spine to tip of fin; height of spine equaling base of fin; second spine 0.75 as high as fin; distance between dorsals 3.66

times length of snout; pectoral, when depressed, reaching to a vertical through posterior edge of base of dorsal, the tip bluntly pointed; edges of pectoral and first dorsal concave, that of second dorsal emarginate; edge of ventrals straight; distance from anterior edge of anal opening to tip of depressed ventral 2.4 in head; upper caudal lobe 3.7 in its length; a low lateral keel on caudal peduncle.

Color, dark slaty blue above, lighter below.

Some of the specimens examined have the head slightly narrower than examples of the same species from Japan, while others are like them in every particular.

Squalus mitsukurii Jordan & Snyder, Proc. U. S. Nat. Mus., XXVI, 1903 (Mar. 30), 629, fig. 3, **Misaki** (Type, No. 7184, Stanford Univ.); Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 515 (*Albatross* Station 4085, off north coast of Maui).

Genus 12. ETMOPTERUS Rafinesque.

Mouth little arched; teeth of lower jaw with the point so much turned aside that the inner margin of the tooth forms the cutting edge; upper teeth erect, each with a long pointed cusp and one or two smaller ones on each side; spiracles wide.

Of the 2 known species one occurs in Hawaiian waters. It is described in Section II of this work.

Etmopterus Rafinesque, Caratteri, etc., 14, 1810 (*aculeatus*).
Spinax Cuvier, Règne Animal, Ed. I, 129, 1817 (*acanthias* and *spinax*).
Spinax Müller & Henle, Plagiostomen, 86, 1838 (*spinax*).
Acanthidium Lowe, Proc. Zoöl. Soc. London 1839, 91 (*pusillum*).

Genus 13. CENTROSCYLLIUM Müller & Henle.

Teeth equal in both jaws, very small, straight, pointed, each with 1 or 2 smaller cusps on each side at base; mouth crescent-shaped, with a straight, oblique groove at its angle; spiracles moderate; gill-openings rather narrow; dorsal fins small, each with a strong spine; the second dorsal entirely behind the ventrals. One species in the Arctic Seas and another recently discovered by the *Albatross* off Kauai. The latter is described in Section II.

Centroscyllium Müller & Henle, Plagiostomen, 191, 1838 (*fabricii*).

Order D. BATOIDEI.—The Rays.

Gill-openings 5, slit-like and inferior; spiracles present; no anal fin; dorsal fins, if present, inserted on the tail; body typically disk-like, broad and flat, the margin of the disk being formed by the expanded pectorals; tail comparatively slender, the caudal fin small or wanting; vertebræ cyclospondylous. With the exception of the *Rajidæ*, most or all of the rays are ovoviviparous.

a. Pectoral fins uninterrupted, confluent around the snout; teeth small ..... *Dasyatidæ*, p. 46
aa. Pectoral fins interrupted, one portion forming detached appendages, or "cephalic fins," on the snout.
b. Teeth very large, flat, tesselated, few in number..... *Actobatidæ*, p. 48
bb. Teeth very small, flat, or tubercular, numerous; cephalic fins conspicuous, resembling horns; size enormous. *Mobulidæ*, p. 50

Family VIII. DASYATIDÆ.—The Sting Rays.

Disk usually more or less broad than long; pectoral fins uninterruptedly confluent in front, forming the tip of the snout; tail variously formed, usually whip-like, sometimes short and stout, sometimes bearing a single dorsal or caudal fin, but never with 2 dorsals; usually one or more vertical folds of skin on the tail, rarely a lateral fold; tail generally armed with a large, sharp, retrorsely serrate spine on its upper surface toward the base; 2 or 3 spines occasionally present; ventral fins not emarginate; skin smooth or variously prickly or spinous, roughest in the adult; no differentiated spines on the pectorals in the males, the sexes similar; mouth rather small; teeth small, paved, usually more or less pointed or tubercular; nostrils close together, nasal valves forming a rectangular flap, which is joined to the upper jaw by a narrow frenum; spiracles large, placed close behind the eyes; skull not elevated, the eyes and spiracles superior. Ovoviviparous. Genera about 10; species

50. Found in most warm seas, some of them in the fresh waters of the northern parts of South America. The large, jagged spine on the muscular tail is capable of inflicting a severe and even dangerous wound.

Only the genus *Dasyatis* is thus far known to be represented in Hawaiian waters.

Genus 14. DASYATIS Rafinesque.

Disk oval, flat, with rounded angles; tail very long and slender, whip-like without fin, but often with one or 2 vertical membranous folds; a strong serrated spine toward the base of the tail; skin more or less spinous or prickly, rarely smooth; teeth small, paved; a few papillæ usually present in the mouth behind the lower jaw. Species about 30. Sting rays of large size, abundant in warm seas. Many of the spinous species are nearly or quite smooth when young, becoming rough with age.

Dasyatis Rafinesque, Caratteri di Alcuni Nuovi Gen., 16, 1810 (*ujo=pastinaca; Dasybatus* Klein, 1742); Jordan & Evermann, Fishes North and Mid. Amer., I, 82, 1896 (*pastinaca*).
Uroxis Rafinesque, Indice d'Ittiol. Sicil., 61, 1810 (*ujus*).
Trigonobatus Blainville, Journ. Phys. 1816, 261 (*vulgaris*).
Trygon Adamson in Cuvier, Règne Animal, Ed. I, 136, 1817 (*pastinaca*).
Himantura Müller & Henle, Wiegmann's Archiv 1837, 400 (*uarnak*).
Hemitrygon Müller & Henle, Mag. Nat. Hist., II, 1838, 90 (*bennetti*).
Pastinaca Swainson, Class. Anim., Vol. II, 319, 1839 (*olivacea*).
Anacanthus Ehrenberg in Swainson, l. c., 320 (*orbicularis*).
Pastinaca Cuvier in De Kay, New York Fauna, Fish., 373, 1842 (*hastata*).
Dasibatis Garman in Jordan & Gilbert, Synopsis, 65, 1883 (*pastinaca*); corrected orthography.

a. Tail with a keel or wing-like expansion below only; adult with stout bucklers on back and tail; tail rough.
b. Tail not more than twice length of disk; body and tail without large tubercles ..... *sciera*, p. 47
bb. Tail more than twice length of body; body and tail with some large tubercles ..... *lata*, p. 47
aa. Tail with a narrow keel or wing-like expansion above, and a wider one below ..... *hawaiiensis*, p. 48

14. Dasyatis sciera Jenkins. Plate 4, fig. 2.

Snout about 4 in length to base of tail; eye a little over 3 in interorbital width, which is 1.3 in snout or twice width of mouth; internasal width 1.4 in snout.

Body very rhomboid, the width of the disk being much greater than its length, greatest width somewhat in front of center of length; head very broad, the anterior margins of the disk nearly straight, very slightly undulated; snout broad and obtuse; eye small; mouth small, only slightly undulated; posterior margins of disk very slightly rounded; teeth small, in about 26 very oblique series in the upper jaw; upper buccal flap with a broad fringe; floor of mouth with 4 median short tentacles and each side with 2 smaller ones; nostrils large, the border of the broad nasal flap with a fine fringe; interorbital space more or less flattened and concave in the middle; gill-openings of about equal length, the fourth level with the greatest width of the fish; body more or less smooth, except the upper surface of the tail, which is covered with many asperities; many pores below; tail a little less than twice length of disk and with a narrow cutaneous fold beneath, beginning under insertion of dorsal.

The above description is from the type, a specimen about 41 inches in total length (to base of tail 12.63 inches, length of tail 28 inches), collected at Honolulu by Dr. O. P. Jenkins in 1889.

Of this species we know but few examples. One is described above, and another was also taken at Honolulu by Dr. Jenkins. In the latter the tail has been severed from the body. In all essential characters it agrees with the type. This species was also recorded by Snyder.

Dasyatis sciera Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 421, pl. I, **Honolulu**; Snyder, l. c. (Jan. 19, 1904), 515 (Honolulu).

15. Dasyatis lata (Garman).

Disk quadrangular, one-fourth wider than long; anterior margins nearly straight, forming a very blunt angle at the snout, rounded near the outer extremities, convex posteriorly; inner margins straight a portion of their length; ventrals truncate, rounded; snout produced, forming a rounded prominence in front of the margins of the disk; length from forehead less than width of head; a line joining the wider portions of disk passes nearer to the head than to the shoulders; tail more than

twice as long as body, subcylindrical, without a trace of keel above, roughened with small tubercles, with an irregular series of broad-based conical tubercles on each side; a long narrow cutaneous expansion below has its origin opposite the beginning of the spine, and terminates in a keel which continues to the extremity; a pair of large, compressed, erect tubercles immediately in front of caudal spine, and a single one over the middle of the pelvic arch; these suggest a continuous series in larger specimens; 3 larger elongated tubercles with points directed backward—similar to those of *hastata*—occupy the middle of the shoulder-girdle; mouth curved, 6 (5–6 ?) papillæ at the bottom; 2 of these are in the middle in front where usually there is but one.

Color light olive, probably greenish in life, white below. Distinguished from *Dasyatis centrura* by the prominent snout, the shape of the tubercles on the middle of the back, and the narrowness of the posterior portion of the disk.

Length of body 16, length of tail 35.3, and width of pectorals 20.5 inches. Collected at the Hawaiian Islands by Andrew Garrett. (Garman.)

Trygon lata Garman, Bull. Mus. Comp. Zool., VI, October, 1880, 170, **Hawaiian Islands.**
Dasibatis lata, Jordan & Gilbert, Bull. U. S. Nat. Mus., No. 16, 67, 1883 (after Garman).

16. Dasyatis hawaiensis Jenkins. Plate 4, fig. 1.

Snout 4.5 to base of tail; eye about 3.67 in interorbital space; interorbital space broader than length of snout; width of mouth 2.3 in interorbital space; internasal space 2 in head.

Body more or less circular, the width of the disk a little greater than its length and its greatest width a little in advance of the center of its length; head very broad, the anterior margins of the disk very slightly undulated; snout very broad, only slightly pointed; eye small; mouth very small, very slightly undulate; teeth very small, in about 30 very oblique series in the upper jaw; upper buccal flap with a broad fringe; floor of mouth with 5 tentacles; nostrils large, the border of the broad nasal flap with a fine fringe; interorbital space broad, more or less flattened; gill-openings of about equal length, the fifth about level with the greatest width of the fish; body more or less smooth; tail without any asperities; caudal spine broad, flattened, the sides strongly serrate; pores more or less obsolete; tail about 1.67 longer than disk and with a somewhat broad cutaneous fold both above and below, the latter beginning below base of dorsal spine; pectorals rounded obtusely; ventrals very broad, the width of their bases a little less than their height or length.

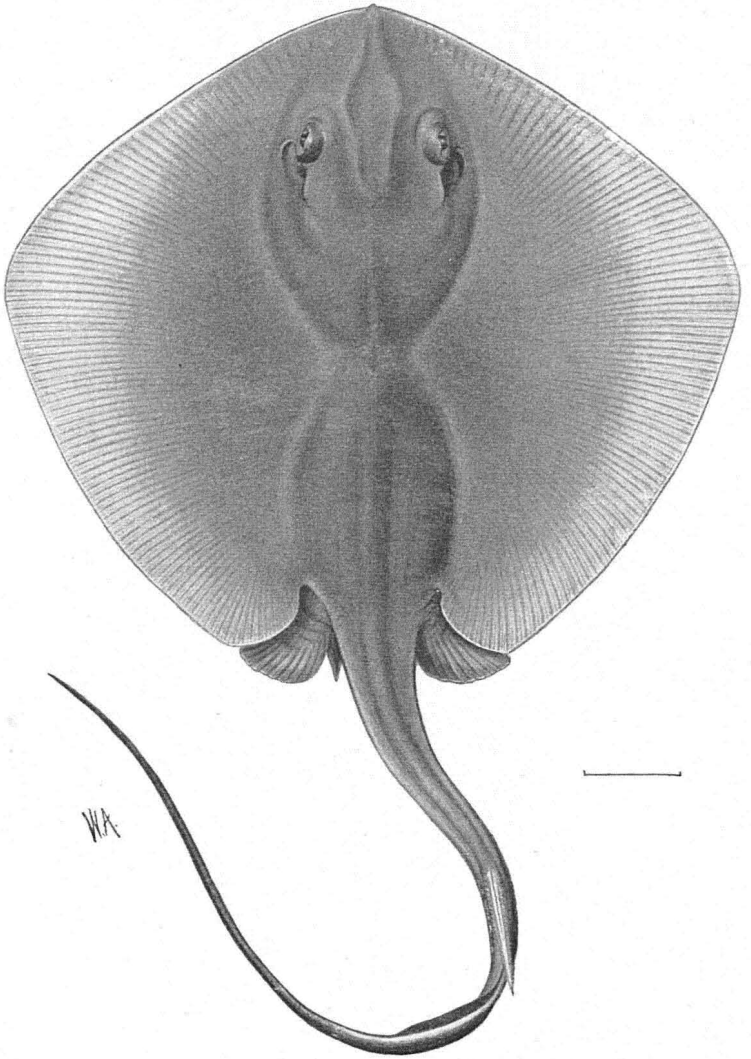
Color in alcohol, dark brown above with the edges of the disk pale, or dull, and the lower surface creamy white with margins of the disk soiled or dirty brown; posterior margins of pectorals and ventrals with their edges below very narrowly white.

The specimen upon which this description is based was obtained at Honolulu by Dr. Jenkins. It has a total length of 16.5 inches (5.87 inches to base of tail; tail 10.63 inches) and is the only example of the species thus far known from the Hawaiian Islands. It is allied to *Dasyatis dipterura* Jordan & Gilbert, from San Diego Bay.

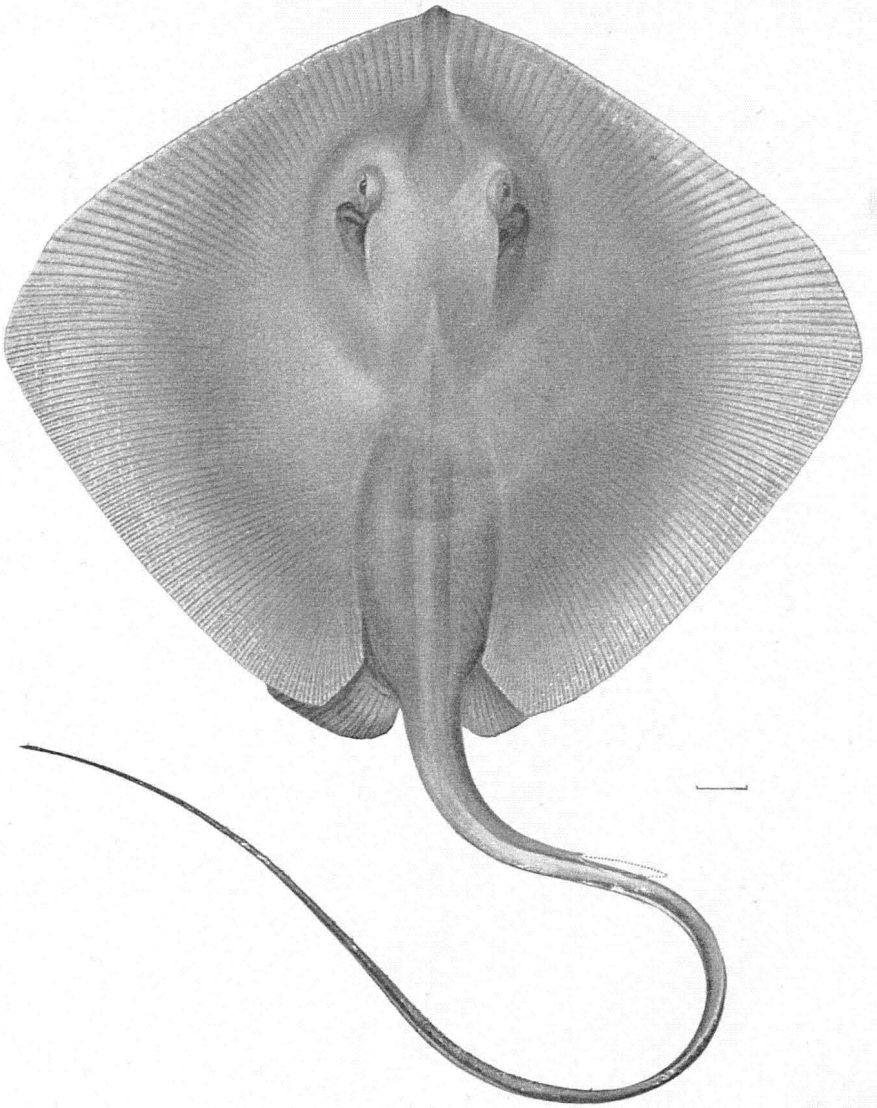
Dasyatis hawaiensis Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 420, pl. I, **Honolulu.**

Family IX. AETOBATIDÆ.—The Eagle Rays.

Disk broad; pectoral fins not continued to end of snout, but ceasing on sides of head and reappearing in front of snout as one or 2 fleshy protuberances (cephalic fins), which are supported by fin rays; tail very long, slender, and whip-like, with a single dorsal fin near its root, behind which is usually a strong, retrorsely serrated spine; nasal valves forming a rectangular flap, with the posterior margin free, attached by a frenum to the upper jaw; skull less depressed than usual among rays, its surface raised so that the eyes and spiracles are lateral in position; teeth hexangular, large, flat, tessellated, the middle ones usually broader than the others; skin smooth; no differentiated spines on the pectorals in the males, the sexes being similar; ventrals not emarginate. Genera 3; species about 20. Large sting-rays inhabiting warm seas, feeding chiefly on mollusks, which they crush with their large grinding teeth. Ovoviviparous.



1. DASYATIS HAWAIENSIS JENKINS, NEW SPECIES. TYPE.



2. DASYATIS SCIERA JENKINS, NEW SPECIES. TYPE.

Bull. U. S. F. C. 1903


DEPARTMENT OF THE INTERIOR
GENERAL LAND OFFICE
WILLIAM A. RICHARDS, COMMISSIONER.
MAP
OF THE
TERRITORY OF HAWAII
Compiled from data on file in the U.S. Coast and Geodetic Survey: Hydrographic Office: Hawaiian Government Surveys, and other authentic sources under the direction of
FRANK BOND
Chief of Drafting Division G.L.O.
1904
Scale: 1 Inch = 12 Miles.
STAT MILES.
Longitude West from Greenwich
KAMUKAHI CHANNEL
KAIEIE WAHO CHANNEL
KAIWI CHANNEL
PAILOLO CHANNEL
KAI O KALOHI
AUAU CHANNEL
KEALAIKAHIKI CHANNEL
ALALAKEIKI CHANNEL
ALENUIHAHA CHANNEL
NORTH PACIFIC OCEAN
NORTH KOHALA
SOUTH KOHALA
HAWAII
HAWAIIAN ARCHIPELAGO
Scale of Miles
NORTH PACIFIC OCEAN
West from Greenwich
Compiled and Lettered by I.P. Berthrong – Revised

GENUS 15. STOASODON Cantor.

General form of *Aetobatis*. Muzzle entire; teeth flat, broad, forming a single series corresponding to the middle series in *Myliobatis*, there being no small lateral teeth; upper dental lamina straight, lower curved, the latter projecting beyond the upper; free border of the nasal valve deeply emarginate; skin smooth. Tropical seas.

Aetobatus Jordan & Evermann, Fishes North and Mid. Amer., I, 88, 1896 (*narinari;* not of Blainville, 1816, which equals *Myliobatis* Cuvier, 1817.)
Aetobatis Müller & Henle, Plagiostomen, 179, 1841 (*narinari*); first restriction; not of Blainville, 1828.
Stoasodon Cantor, Cat. Malay. Fish., 434, 1850 (*narinari*); substitute for *Aetobatis;* restricted to *aquila*.
Goniobatis Agassiz, Proc. Bost. Soc. Nat. Hist., VI, 1858 (October 25), 385 (*flagellum*).

17. Stoasodon narinari (Euphrasen). *Spotted Sting-Ray;* "*Hihimánu.*" Fig. 7.

Disk nearly or quite twice as broad as long; tail very long, about 2.5 times length of disk; snout 7 in length of disk; distance from snout to eye 10 in width of disk; width of mouth 10 in length of disk; a long furrow in middle of interorbital space, deepest in front; spiracles obliquely placed.

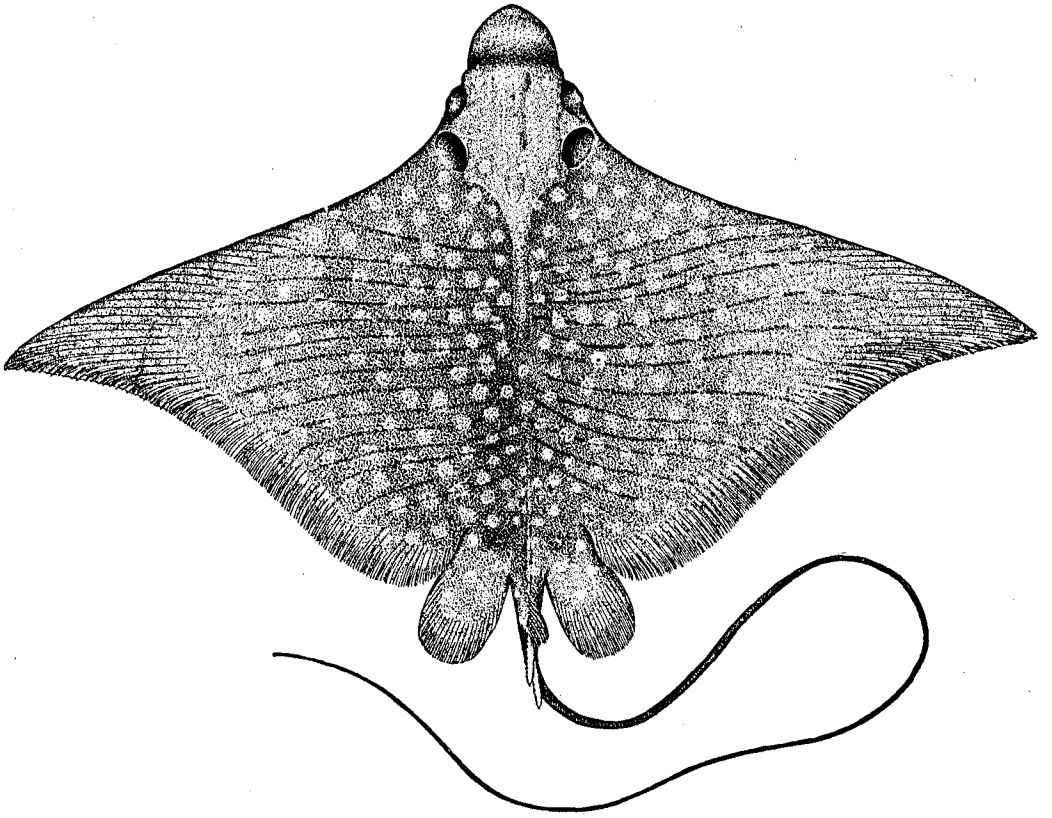


FIG. 7.—*Stoasodon narinari* (Euphrasen); after Jordan and Evermann.

Color in life (No. 03387) mostly bluish gray above, edges of fins slightly darker; back covered with bluish white spots, smallest at edges of fins and largest in middle of back; belly and under part of head white.

General color of whole upper surface (taken from another example) light chocolate-brown, everywhere covered with roundish or oblong pearly or bluish spots or blotches, largest about size of eye,

smallest less than half as large; under surface milky white except margin of snout, which is dark gray; tail uniform chocolate-brown; iris yellowish gray.

This large ray, common in most tropical seas, was obtained by us at Honolulu and Hilo, and one example has been recorded by Steindachner from Laysan.

Raja narinari Euphrasen, Vet. Ak. Nya. Handl., XI, 1790, 217, **Brazil**; after *narinari* of Marcgrave.
Raja flagellum Bloch & Schneider, Syst. Ich., 361, pl. 73, 1801, **Coromandel.**
Raja guttata Shaw, General Zoology, V, 285, pl. 142, 1804, **Madagascar.**
Raja quinqueaculeata Quoy & Gaimard, Voyage de l'Uranie, Zool., 200, pl. 43, fig. 3, 1824, **Guam.**
Myliobatis celtenkee Rüppell, Neue Wirbelthiere, Fisch., 70, pl. 19, fig. 3, 183, 1835 (teeth), **Red Sea.**
Aetobatis indica Swainson, Class. Fish., II, 321, 1839; after Russell, **no locality.**
Myliobatis narinari, Cuvier, Règne Animal, Ed. I, 137, 1817 (both hemispheres).
Aetobatis narinari, Müller & Henle, Plagiostomen, 179, 1841; Jordan & Evermann, Fishes North and Mid. Amer., I, 88, 1896; Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 519 (Laysan); Evermann & Marsh, Fishes Porto Rico, 67, figs. 4 and 5, 1900; Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 421 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 515 (Honolulu).
Aetobatis flagellum, Müller & Henle, op. cit., 180.
Myliobatis macroptera McClelland, Calcutta Journ. Nat. Hist. 1840, 60, pl. 2, fig. 1, **Bay of Bengal.**
Stoasodon narinari, Cantor, Cat. Malay. Fish., 434, 1850 (Sea of Pinang; Malayan Peninsula; Singapore).
Goniobatis flagellum, Agassiz, Proc. Bost. Soc. Nat. Hist., VI, 1858 (Oct. 25), 385.
Goniobatis meleagris Agassiz, op. cit., 385, **Hawaiian Islands.**
Aetobatis laticeps Gill, Ann. Lyc. Nat. Hist. New York, VIII, 1861, 137, **San Francisco, California.**
Aetobatis meleagris, Gill, op. cit., 138 (Sandwich Islands). (Coll. Wilkes Expl. Exped.)
Aetobatis latirostris Duméril, Arch. Mus. Paris, X, 1861, 242, pl. 20, **East Coast Africa.**

Family X. MOBULIDÆ.

Rays of enormous size, with the disk broader than long and the pectoral fins not continued on the sides of the head, the anterior or cephalic portion being separate, developed as 2 long horn-like or ear-like appendages; mouth wide, terminal or inferior; teeth very small, flat or tubercular, in many series, those of the upper jaw sometimes wanting; eyes lateral; nostrils widely separated, their valves united, forming a flap as wide as the cleft of the mouth; tail long and slender, whip-like, with a single dorsal fin at its base and with or without a serrated spine; ventral fins not emarginate; skin more or less rough; males without differentiated spines on the pectorals, the sexes similar. Ovoviviparous. Genera 2, species about 7. Largest of all rays and among the largest of all fishes; found in the tropical seas.

Genus 16. MOBULA[a] Rafinesque.

Head free from pectoral fin, truncated in front, with the cephalic fin on each side developed as a straight horn-like appendage pointing forward; nostrils widely separated; mouth inferior, wide; teeth in both jaws very small, flat or tubercular, in many series; tail very slender, with a dorsal fin between the ventrals; the serrated spine present or absent. Species about 5; in the tropical seas, reaching an enormous size and therefore not well known.

The family name *Mantidæ* must give way to *Mobulidæ*, inasmuch as the same name is used for the group of insects typified by the genus *Mantis*.

Cephaloptera Duméril in Risso, Ichthyol. Nice, 14, 1810 (*giorna=edentula*); not of Geoffroy St. Hilaire, 1809, a genus of birds.
Mobula Rafinesque, Indice d'Ittiol. Sicil., 61, 1810 (*auriculata=edentula*).
Apterurus Rafinesque, op. cit., 62 (*fabroni=edentula*).
Dicerobatus Blainville, Journ. de Phys. 1816, 262 (*mobular=edentula*).
Cephaloptera Duméril in Cuvier, Règne Animal, Ed. I, 2, 138, 1817 (*giorna*).
Pterocephala Swainson, Nat. Hist. Fish., II, 321, 1839 (*giorna*).

18. Mobula japonica (Müller & Henle). "*Hihimánu.*"

On August 16, 1901, some fragments of 2 large sea-devils were found in the Honolulu market. The individuals had been cut up and many of the pieces sold. The left cephalic fin of one was secured (No. 03556). Its length from tip to eye is 1 foot, and the eye is 1.25 inches in diameter; distance from

[a] The name *Aodon*, accepted for this genus by Jordan & Evermann, was originally based on a shark of the Red Sea. *Aodon massua*, said to have microscopic serrated teeth and very large pectoral fins. It may belong to the *Scylliorhinidæ*,