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AT HARVARD COLLEGE.

VOL. XXVI. No. 6.

REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE TROPICAL PACIFIC, IN CHARGE OF ALEXANDER AGASSIZ, BY THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM AUGUST, 1899, TO MARCH, 1900, COMMANDER JEFFERSON F. MOSER, U. S. N., COMMANDING.

X.

THE LANTERN FISHES.

BY CHARLES HENRY GILBERT.

WITH SIX PLATES.

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CAMBRIDGE, U. S. A. :
Printed for the Museum.

JULY, 1908.

TROPICAL PACIFIC.

The following Publications of the Museum contain Reports on the Dredging Operations in charge of Alexander Agassiz, of the U. S. Fish Commission Steamer "Albatross," during 1899 and 1900, Commander Jefferson F. Moser, U. S. N., Commanding.

- I. A. AGASSIZ. Preliminary Report and List of Stations. With Remarks on the Deep-Sea Deposits by Sir John Murray. Mem. M. C. Z., Vol. XXVI. No. 1. January, 1902. 114 pp. 21 Charts.
- II. A. G. MAYER. Some Species of *Partula* from Tahiti. A Study in Variation. Mem. M. C. Z., Vol. XXVI. No. 2. January, 1902. 21 pp. 1 Plate.
- III. A. AGASSIZ and A. G. MAYER. Medusæ. Mem. M. C. Z., Vol. XXVI. No. 3. January, 1902. 40 pp. 13 Plates, 1 Chart.
- IV. A. AGASSIZ. The Coral Reefs of the Tropical Pacific. Mem. M. C. Z., Vol. XXVIII. February, 1903. 33, 410 pp. 238 Plates.
- V. C. R. EASTMAN. Sharks' Teeth and Cetacean Bones from the Red Clay of the Tropical Pacific. Mem. M. C. Z., Vol. XXVI. No. 4. June, 1903. 14 pp. 3 Plates.
- VI. W. E. HOYLE. Cephalopoda. Bull. M. C. Z., Vol. XLIII. No. 1. March, 1904. 71 pp. 12 Plates.
- VII. H. LUDWIG. Asteroidea. Mem. M. C. Z., Vol. XXXII. July, 1905. 12, 292 pp. 35 Plates, 1 Chart.
- VIII. W. E. RITTER and EDITH S. BYXBEE. The Pelagic Tunicata. Mem. M. C. Z., Vol. XXVI. No. 5. August, 1905. 20 pp. 2 Plates.
- IX. MARY J. RATHBUN. The Brachyura. Mem. M. C. Z., Vol. XXXV. No. 2. August, 1907. 54 pp. 9 Plates.
- X. C. H. GILBERT. The Lantern Fishes. Mem. M. C. Z., Vol. XXVI. No. 6. July, 1908. 23 pp. 6 Plates.

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THE collections, which form the subject of the present paper, were made by the "Albatross," during the month of September, 1899, on a cruise from San Francisco to the Marquesas Islands and thence to Tahiti of the Society Islands. Frequent hauls were taken with the surface net and the open intermediate net to a depth of 300 fathoms. Fifteen species of Lantern Fishes were obtained, five of which are described as new, the others being known variously from Australia, the China Seas, Hawaii, the Pacific Coast of tropical America, or Southern California. One species is known also from the Eastern Atlantic. A very wide distribution is thus shown for the pelagic fishes of the tropical Pacific.

Myctophum affine (LÜTKEN).

Scopelus affinis Lütken, *Spolia Atlantica*, 1892, 2, p. 32.

Myctophum nitidulum Garman, *Mem. Mus. Comp. Zool.*, 1899, 24, p. 266, pl. 56, fig. 3.

Rhinoscopelus oceanicus Jordan and Evermann, *Bull. U. S. Fish Com.*, 1903, 22, p. 168.

Myctophum margaritatum Gilbert, *Bull. U. S. Fish Com.*, 1905, 23, p. 596, pl. 68, fig. 2.

Direct comparison of types has failed to develop any differences between *Myctophum affine* from the Atlantic and *M. nitidulum*, *M. oceanicum*, and *M. margaritatum* from the Pacific. The oldest name, *affine*, is here used.

The species has been shown to be abundant throughout the Hawaiian Group as far to the west as Laysan Island and as far to the northeast as Lat. N. 28° 13' 42", Long. W. 145° 44'. The present collection extends the

range from this point almost directly south to the Marquesas Islands, as is shown by the following list of stations:

	Lat. N. 17° 32'	Long. W. 135° 40'
	10° 57' 35"	137° 35' 25"
	3° 28'	136° 54'
	1° 45'	137° 36'
Marquesas Islands (approximately)	Lat. S. 9°	Long. W. 139° 45'

Throughout this extensive area, the species shows a striking uniformity. The photophores are invariable in number and position, except in the anal series. For comparison with the extensive Hawaiian collections previously reported, we give below the variation in the antero- and postero-anals in the 17 specimens of the present collection, the two sides of each specimen being listed separately: Antero-anals, 8 in 9 cases, 9 in 23 cases, 10 in 2 cases; postero-anals, 5 in 21 cases, 6 in 13 cases; 8 + 5 occurs in 4 cases, 8 + 6 in 5, 9 + 5 in 15, 9 + 6 in 8, 10 + 5 in 2. The three specimens from Lat. N. 10° 57' 35", Long. W. 137° 35' 25" have the numbers $\begin{cases} 8 + 6 \\ 8 + 6, \end{cases} \begin{cases} 8 + 5 \\ 8 + 5, \end{cases} \begin{cases} 8 + 5 \\ 8 + 5, \end{cases}$ thus averaging one less than the others in this collection and in that from the Hawaiian Islands.

In the type of *M. nitidulum*, the anals are 8 + 5 on one side, 8 + 6 on the other.

Myctophum evermanni GILBERT.

Bull. U. S. Fish Com., 1905, 23, p. 597, pl. 70, fig 2.

Eleven specimens from the following localities:

Lat. N.	Long. W.
17° 32'	135° 40'
10° 57' 35"	137° 35' 25"
5° 49'	136° 47'
Lat. S.	
16° 39'	149° 11'

The range is thus extended from the Hawaiian region directly south to beyond the Marquesas Islands. No differences are evident in the southern specimens, so far as the limited material is adequate to determine that point. The usual number of anal photophores is 8 + 5, which occurs bilaterally in

5 specimens and on one side of 3 others; 9 + 5 occurs bilaterally in 1 specimen, 8 + 6 bilaterally in 2; 7 + 5 occurs unilaterally in 3 specimens.

This species has been compared with specimens of *M. humboldti* and *M. californicse* and is very distinct from both.

Myctophum reinhardti LÜTKEN.

Scopelus reinhardtii LÜTKEN, Spolia Atlantica, 1892, 2, p. 257, fig. 16.

Myctophum atratum GARMAN, Mem. Mus. Comp. Zool., 1899, 24, p. 268.

Myctophum braueri GILBERT, Bull. U. S. Fish Com., 1905, 23, p. 598, pl. 70, fig. 1; not *Myctophum* (*Lampanyctus*) *braueri* LÖNNBERG, Zool. Anz., 1905, 28, p. 764.

Six young specimens from near the equator, Lat. N. 1° 45', Long. W. 137° 36'. The anals number 11 to 13 instead of 13 to 15, as in Hawaiian specimens. The following combinations are present: 6 + 7 in 5 cases, 6 + 6 in 3, 5 + 8 in 1, 5 + 7 in 1, 5 + 6 in 2. As in *D. spinosus*, the southern specimens show a lower average number of photophores, but the limited amount of the material makes the comparison inadequate. The type of *M. atratum*, from near the entrance to the Gulf of California, was in rather poor condition, so the number of posterior anals could not be determined with certainty. Six can be made out on one side of the type specimen and 5 on the other, but others may have been present in life.

Lütken's account of *M. reinhardti* as having 11 dorsal and 16 anal rays and with antero-anal photophores varying from 4 to 7, seemed to indicate a species distinct from this Pacific form. Examination of the two specimens which Lütken designated as types shows, however, that they represent two very distinct species. The one figured by him, from 34° 22' N. Lat., 18° 10' W. Long., may be considered the type, and has 14 dorsal and 24 anal rays, as in *M. atratum*. On direct comparison with the latter no important differences appear. Lütken's fin-counts were taken from his second specimen, which belongs to a species still undescribed.

Dasyscopelus spinosus (STEINDACHNER).

Scopelus spinosus STEINDACHNER, Sitz. akad. wiss. Wien, 1867, **55**, p. 711, pl. 3, fig. 4.

Twenty specimens of this species were obtained at the following localities:

Lat. N. 13° 32'	Long. W. 135° 40'
Lat. N. 3° 28'	Long. W. 136° 54'
Lat. S. 15° 24' 30"	Long. W. 147° 59' 40"
Lat. S. 16° 39'	Long. W. 149° 11'

The number of individuals is too limited for satisfactory comparison with Hawaiian material. The photophores of the anal series are present in numbers as follows: 7 + 5 in 4 cases, 7 + 6 in 20, 7 + 7 in 9, 6 + 6 in 3, 6 + 7 in 3, 6 + 8 in 1. Thus in the anterior group, 7 occurs in 33 cases, 6 in 7 cases; in the posterior group 8 occurs in 1 case, 7 in 12 cases, 6 in 23 cases, and 5 in 4 cases. Comparing these with data given for Hawaiian material (Bull. U. S. Fish Com., 1905, **23**, p. 599), it appears that the more southerly specimens average one less photophore in the anal series. The total number varies from 12 to 14, 13 prevailing, while in Hawaiian material the range was from 13 to 15 with 14 prevailing. In the southern material, the number 8 is absent from the anterior group, and 6 occurs not infrequently, while in Hawaiian species, 8 is common and 6 very rare. A similar difference is found in the posterior group.

The serrations on the scales are very evident in specimens 30 mm. long, but are not apparent in those 20 mm. long. The serrations develop first on the scales along the dorsal profile behind the dorsal fin.

Dasyscopelus pristilepis GILBERT & CRAMER.

Gilbert & Cramer, Proc. U. S. Nat. Mus., 1897, **19**, p. 412, pl. 39, fig. 1; Gilbert, Bull. U. S. Fish Com., 1905, **23**, p. 600.

Three young specimens from the following stations:

Lat. N. 1° 45'	Long. W. 137° 36'
Lat. S. 16° 39'	Long. W. 149° 11'

In the number of anal photophores 7 + 4 occurs bilaterally in one specimen, 7 + 5 bilaterally in another, 7 + 4 and 7 + 5 in the third.

Dasyscopelus asper (RICHARDSON).

Myctophum asperum RICHARDSON, Ichth. Erebus & Terror, 1845, p. 41, pl. 27, figs. 13-15.

Four specimens not exceeding 20 mm. long, taken at the surface Sept. 8, 1899, in Lat. N. 3° 28', Long. W. 136° 54', about 700 miles north of the Marquesas Islands.

Most nearly related to *Myctophum pristilepis*, Gilbert & Cramer, from the Hawaiian Islands, differing in the higher, more compressed head, the blunter, somewhat projecting snout, the much smaller eye, which is far below the upper profile, the more angulated supra-anals, and the slightly more distant precaudals. The number of anal photophores is larger.

Measurements in hundredths of length to base of caudal: length of head 32; eye 9; axial length of snout 4.5; greatest depth of body 26; least depth of caudal peduncle 9; distance from snout to front of dorsal 46; to base of ventrals 47; to front of anal 62; to adipose dorsal 82.

Dorsal 13, anal 17, pectoral 15, lateral line 37.

Head and body comparatively deep and compressed, eye small, well below the upper profile, snout high and compressed, slightly protruding beyond premaxillaries. Maxillary little widened posteriorly, extending beyond eye a distance less than half orbital diameter. Teeth all straight, in very narrow bands, consisting of a series of somewhat longer teeth with smaller ones interspersed. Cheeks not oblique, the posterior border of preopercle vertically rounded.

Pectorals long, extending to or slightly beyond middle of ventrals; ventrals reaching vent, inserted a trifle behind origin of dorsal; first anal ray under the last of the dorsal, its last rays under the adipose fin.

Scales mostly fallen, those present showing a few coarse serræ. Two minute antorbital photophores, one above the other below level of nostrils, the two connected by a narrow black bar. Supra-pectoral slightly nearer pectoral fin than lateral line; upper infra-pectoral opposite base of lower pectoral ray, the lower infra-pectoral nearer the upper than the first pair of ventrals. First pair of ventral photophores nearest the median line, the second, third, and fourth pairs nearly equidistant from it, the fifth pair

more divergent, but not markedly so; interval between third and fourth pairs shortest, that between fourth and fifth but slightly longer; second interval but little shorter than the first. Supra-ventrals slightly nearer ventral fins than lateral line. First pair of ventral photophores nearly in contact on median line, the others farther apart and equidistant from median line, the fourth pair at the sides of the vent and somewhat anterior to it; second interval longest, the first shortest. Upper supra-anal immediately below lateral line on its seventeenth scale, and in a vertical line passing through the second anal ray; middle supra-anal slightly nearer upper supra-anal than fourth ventral, in an oblique line joining the two; lower supra-anal below and well in advance of middle supra-anal, in a line joining middle supra-anal with first ventral. Antero-anals 7 (6 in one specimen), equally spaced, forming a gently curved line with the concavity downwards. Postero-lateral immediately below lateral line, above or slightly behind last antero-anal. Postero-anals 5. Precaudals 2, in an oblique line, the interspace a little wider than that separating those of anal series.

In the four specimens before us, the anal photophores number as follows:

$$\begin{array}{cccc} \{ 7 + 5 & \{ 7 + 5 & \{ 7 + 5 & \{ 6 + 5 \\ \} 7 + 5, & \} 7 + 5, & \} 7 + 4, & \} 6 + 5 \end{array}$$

General color very light brown, marked with distinct blackish spots distributed as follows: one immediately behind nape, one before dorsal fin, one at base of adipose fin, — these all on median line; a humeral spot; a very small spot at base of caudal.

It seems highly probable that *D. naufragus* Waite (Waite, Records Australian Museum, 1904, 5, p. 154, pl. 18, fig. 3), should be placed in the synonymy of this species, the differences indicated by the author being drawn from the somewhat inaccurate drawing of the immature type of *D. asper*.

Rhinoscopelus tenuiculus (GARMAN).

Myctophum tenuiculum Garman, Mem. Mus. Comp. Zool., 1899, 24, p. 262, pl. J, fig. 5.

A single specimen, 50 mm. long, was taken September 4, 1896, in Lat. N. 10° 57' 35", Long. W. 137° 35' 25". The species is considered by Brauer (Zool. Anz., 1904, 28, p. 390) to be a synonym of *R. coccoi*, but comparison

with specimens of the latter from the Atlantic Coast of the United States off Cape Hatteras shows that the two are distinct. *R. tenuiculus* has a much larger head, with deeper, blunter, scarcely protruding snout, and much larger eye. The mouth is smaller compared with length of head. The upper profile is much more curved than the lower, the two nearly equally curved in *coccoi*. In the single specimen before us, the ventral fins contain but seven rays, as in Garman's type, while in all specimens of *R. coccoi* which we have examined there were eight ventral rays; no outer rudimentary ventral ray could be detected in either form. Scales along dorsal and ventral outlines produced and narrowed backward, terminating in an acute point which is more pronounced in *R. tenuiculus* than in *R. coccoi*.

For purposes of comparison, there is given below a table of comparative measurements of *R. tenuiculus* and *R. coccoi* in hundredths of total length without caudal.

	Tenuiculus	Coccoi
Length of head (in hundredths)	26	23
Diameter of eye	8	6
Axial length of snout	4	6
Interorbital width	8	7.5
Length of maxillary	17	16
Greatest depth of head	21	18
Depth at origin of dorsal fin	22	21
Snout to front of dorsal	43	43
Snout to base of ventrals	33	34
Snout to origin of anal	50	53
Snout to adipose fin	73	71
Length to base of caudal	43 mm.	42 mm.
Number of dorsal rays	11	11
Number of anal rays	18	20
Number of ventral rays	7	8
Number of pectoral rays	14	13
Scales in lateral line	38 or 39	41 or 42

Centrobranchus choerocephalus FOWLER.

Proc. Ac. Nat. Sci., Phila., 1903, **55**, p. 754; Gilbert, Bull. U. S. Fish Com., 1905, **23**, p. 594, pl. 69, fig. 1.

One small specimen, from Lat. S. 16° 39', Long. W. 149° 11', extends the range from the Hawaiian Islands to a point well south of the Equator. No differences are apparent between this and northern specimens. The anals number 6 + 11 on one side, 5 + 10 on the other.

Diaphus nanus, sp. nov.*Plate 1.*

Type 17 mm. long, from Hydrographic Station 3798 (A. A. 27), near Nukuhiva Island, Marquesas Group; taken in open intermediate net from surface to 300 fathoms.

Most nearly related to *D. theta* Eigenmann and Eigenmann, from the coast of California, agreeing with this species in its short, bluntly rounded snout, its pair of small circular preocular organs, which are directed forwards, but little visible laterally, and are closely approximated on the median line of the snout; the subocular organ is also short and narrow, often with a minute detached point posteriorly. The species differs from *D. theta* among other respects in the more slender form, the more elevated first antero-anal, the angulated supra-anals, and the closer approximation to the lateral line of the upper supra-anal, the postero-lateral, and the fourth precaudal. *Diaphus fulgens* Brauer apparently has the preocular not circular in shape, widely visible laterally, and the upper series of photophores more distant from the lateral line.

Measurements in hundredths of total length to base of caudal: length of head 31; depth of head at occiput 21; axial length of snout 4; diameter of eye 12; length of maxillary 19; greatest depth of body 23; least depth of caudal peduncle 11; distance from snout to origin of dorsal 48; to insertion of ventrals 46; to origin of anal 61; longest gill-raker 5.

D. 13; A. 13; P. 12; V. 9; lateral line 36; gill-rakers 5 + 13, including all rudiments, Br. 9.

Snout very short, comparatively wide, bluntly rounded; maxillary nearly horizontal, extending beyond orbit a distance nearly equaling half diameter of orbit, its posterior portion not widened; preopercular margin nearly vertical.

Pectorals slender, of 12 rays, broken in all our specimens, but probably not reaching the ventrals; ventrals inserted slightly behind origin of dorsal, reaching vertical from front of anal; origin of dorsal slightly in advance of middle of body; origin of anal just behind last dorsal ray, the adipose dorsal over last anal rays.

Scales all fallen, but those of lateral line apparently not enlarged.

Preocular photophore small, circular, scarcely equaling half diameter of pupil, occupying a pit immediately above nostrils, the two organs narrowly separated mesially by the ethmoidal ridge. They are placed on the anterior aspect of the snout, directed forwards, scarcely visible from the side. Subocular organ short and narrow, below the anterior half of the pupil or a little farther forwards, a minute detached point behind it often to be made out with difficulty. Supra-pectoral spot below opercular angle, its distance from pectoral base scarcely more than half its distance from lateral line; a very narrow white luminous body below it, often scarcely visible. Upper infra-pectoral at base of lower pectoral rays, in a straight line with lower infra-pectoral and first thoracic. Second thoracics only slightly nearer first than fifth pairs, the second and third pairs closely approximated, the elevated fourth pair a little higher on sides than the middle pectoral rays, vertically over interspace between third and fourth thoracics. Supra-ventrals half way between lateral line and the base of ventrals. Ventral organs typically arranged, the first three equally spaced, in an oblique line, the fourth and fifth near median ventral line. Supra-anals forming an angulated line, the upper one on lower margin of the eighteenth scale of lateral line, the middle one half way between the upper and the vent, the lower one in advance of and slightly below the middle spot, the interspace between the two upper spots nearly twice that between the two lower; lower supra-anal very near the fifth ventral, a little above the line connecting fifth ventral and the middle supra-anal. Antero-anals 5, in a wide curve, the first distinctly elevated, forming with the second a very oblique line passing above the

middle supra-anal; second antero-anal nearest the anal base, the third, fourth, and fifth forming a gently diverging curved line which passes behind the postero-lateral. Postero-lateral on the twenty-fourth scale of the lateral line near the lateral line but not in contact with it, its distance from fifth antero-anal nearly twice that separating fifth from fourth. Postero-anals 5 (or 6) in number. Precaudals in a wide shallow curve, nearly evenly spaced, the fourth distinctly below the lateral line.

Color apparently deep brown, lighter on cheeks, mandibles, and snout; black on opercles.

Two co-types from Hydrographic Station 3797 (A. A. 25), and two from 3798 (A. A. 27), near the Marquesas Islands. All are smaller than the type.

***Diaphus agassizii*, sp. nov.**

Plate 2.

Type 21 mm. long, from Hydrographic Station 3798 (A. A. 27), near Nukahiva Island, Marquesas Group; taken with open intermediate net down to 300 fathoms.

Characterized by the deep compressed head and snout, by the absence of preocular or subocular luminous areas, and by the normal number and arrangement of photophores. In *Diaphus urolampus*, the only other species of the genus described without preocular luminous area, there are but two supra-anals, and the second and third ventrals are equally elevated.

Total length, excluding caudal, 18 mm.; length of head, 32 hundredths of this length; diameter of eye 7; length of snout 6; length of maxillary 23; greatest depth of body 23; least depth of caudal peduncle 9; distance from snout to front of dorsal 45; to front of ventrals 42; to front of anal 60; to adipose fin 78.

D. 14; A. 16; P. 13; scales in lateral line 36 to 38; gill-rakers 8 + 13.

Head unusually deep and compressed; eye small, but little above middle of head, barely longer than snout; maxillary not widened posteriorly, its middle point a trifle behind vertical from center of eye; preopercular margin comparatively little oblique.

Pectorals mutilated but evidently weak, probably not reaching the

ventrals; ventrals overlapping front of anal, their insertion under the first rays of the dorsal; origin of anal under last dorsal rays; front of adipose fin vertically above last anal ray.

Scales and much of the epidermis lost, but the ground color evidently dark brown or blackish. An evident pigment line dividing the photophores. A minute round photophore, smaller than any of the others, on the anterior upper margin of the orbit immediately above the nostril, under the anterior projecting rim of the supraorbital portion of the frontal. A similar minute photophore is frequently present in this exact location in many species of *Diaphus* and *Myctophum*, and is frequently to be recognized as distinct from the large preocular luminous area, where this is present in *Diaphus*. In *D. urolampus*, this minute photophore is represented by a densely pigmented black globular body, apparently no longer functional.

Supra-pectoral photophore slightly nearer lateral line than base of pectoral, without the glandular body usually associated with it in this genus; the two infra-pectorals forming with the first thoracic a straight, obliquely ascending line, the spots evenly spaced; first pair of thoracics separated from second pair by a wide interval, about twice the length of the space separating the second pair from the third and the third from the fifth; fourth pair elevated as usual, above and slightly behind the third pair; first three ventrals forming an obliquely ascending line, the second more widely separated from the third than from the first; distance between upper and middle supra-anals more than twice that between the middle and lower; lower supra-anal very near the fifth ventral and a little behind it; antero-anals 7 or 8 in number, the first above and slightly in front of the second, the line joining the two traversing the lateral line slightly behind the upper supra-anal; last antero-anal also elevated, above and behind the next to the last, the line joining the two passing behind the postero-lateral; all antero-anals, except the first and last, in a straight line parallel with the base of the anal fin; postero-anals 4 or 5 in number; precaudals 4, equally spaced, following the curve of the base of the fin; upper supra-anal and the postero-lateral immediately below the lateral line, the upper precaudal somewhat more distant from it, the supra-ventral very slightly nearer lateral line than base of ventrals.

Two small specimens secured at Hydrographic Station 3798 (A. A. 27).

Diaphus signatus, sp. nov.*Plate 3.*

Type 60 mm. long, from the surface at Hydrographic Station 3798 (A. A. 27), near Nukuhiva Island, Marquesas Group.

Most nearly related to *Diaphus* (*Nyctophus*) *splendidus* Brauer (Zoöl. Anz., 1904, 28, p. 399, fig. 7), differing in the smaller head and shorter snout, the less elevated interorbital region which scarcely protrudes above the orbital rim, and the more anterior insertion of the ventral fins. The preocular luminous organ is apparently not divided into upper and lower portions, but has immediately above it a distinct luminous dot surrounded by the black pigment. In general proportions, fin rays, and number and distribution of photophores, this species does not differ from *D. splendidus*.

Length of head 28 hundredths of total length without caudal; diameter of eye 7; length of snout 4.3; length of maxillary 20; greatest depth of body 18; least depth of caudal peduncle 8; distance from snout to front of dorsal, 45; to insertion of ventrals 41; to front of anal 64; to adipose fin 80.

D. 15; A. 15; P. 12; V. 9; lateral line 38; the 11th scale over the supra-ventral photophore, the 18th scale over the upper supra-anal, the 25th over the postero-lateral.

Form slender; snout short and bluntly rounded, its length little more than half the diameter of orbit; maxillary long and slender, not widened posteriorly, its middle well behind the pupil; preopercular margin very oblique; gill-rakers slender, 6 + 13 in number on outer arch, the longest three-fourths the diameter of the eye.

Pectorals small, inserted low, but little above the level of the ventrals, which they fail to reach. Ventrals inserted well in advance of the dorsal, unusually well developed, their longer inner rays extending to base of third or fourth anal ray. The vertical from the last dorsal ray falls between the vent and the front of the anal. Last anal ray under the middle of the adipose fin.

Scales and much of the integument lost, but the general color was

evidently blackish, the bases of the vertical fins black. Dorsal, anal, and caudal fins with the articulations of the rays finely dotted with black, the fins thus with fine wavy cross-lines, which are especially noticeable on the caudal. Two broad dark bars cross the mandibles, one below the posterior part of eye, the other immediately in front of mandibular joint.

Preocular luminous organ occupying the space between the eye and the nostril, extending but little above or below the latter, not extending on the suborbital region. Its anterior margin is deeply indented opposite the nostril, but there is no evident division into an upper and a lower portion. At its upper margin, but separated from it, is a minute round photopore surrounded with pigment, as in *D. agassizii*. No subocular spot, the anterior half of suborbital region bright silvery. Supra-pectoral slightly nearer the lateral line than the pectoral fin, there being associated with it a whitish glandular organ, as in nearly all species of this genus. Lower infra-pectoral spot midway between upper infra-pectoral and first thoracic. First and second thoracics widely separated, the third midway between second and fifth; fourth thoracic elevated as usual in the genus, a little higher than the base of the ventral fins, and slightly behind the third thoracic. Second and third ventral photophores progressively elevated, as usual, the third slightly in front of the vertical from the fourth and below the direct line joining the first and second; the second is much nearer the first than the third. First antero-anal elevated, slightly in advance of the second, which is widely separated from the third; third to sixth antero-anals equally spaced and less widely separated, the third, fourth, and fifth almost equally distant from base of anal, the sixth distinctly elevated, but less so than the first. Postero-anals four in number (five in *splendidus*), the last separated by a wide interval from the first precaudal, which is inserted distinctly in advance of the rudimentary caudal rays. Distance from supra-ventral spot to lateral line two-thirds its distance from ventral fins. The upper supra-anal, the postero-lateral, and the upper precaudal encroach on the scales of the lateral line. Supra-anals slightly angulated, the lower two forming with the fifth ventral an obliquely ascending straight line, which intersect the lateral line behind the upper supra-anal.

In addition to the type, there is a co-type, of equal size, from the same locality.

Dr. Brauer has kindly re-examined the types of *D. splendidus* at the request of the writer and states that the ventral is always inserted under the beginning of the dorsal, the supraorbital region projects always above the eye as shown in the figure, and the snout, although somewhat variable in length, is always more than half the diameter of the eye. In three specimens in which the snout is 1.5 cm., 1.75 cm. and 2 cm. long, the diameter of the eye is 2.1 cm., 2.2 cm. and 2.5 cm. in length.

***Lampanyctus townsendi* (EIGENMANN and EIGENMANN).**

Plate 4.

***Myctophum townsendi* EIGENMANN and EIGENMANN.** West American Scientist, 1889, p. 125, from Cortez Banks, south of San Diego, California.

A single young specimen, 26 mm. long, from Hydrographic Station, 3797 (A. A. 25), near Ua Huka Island, Marquesas Group, taken with the open intermediate net between the surface and 300 fathoms.

Measurements in hundredths of length without caudal: Length of head 34; diameter of eye 10; length of snout 7; length of maxillary 25; greatest depth of head 20.5; distance from snout to dorsal 49; to ventrals 48; to anal 63; to adipose fin 79; least depth of caudal peduncle 9.

Dorsal 13; anal 13; pectoral 14; lateral line 38; well-developed gill-rakers 4 + 11, in addition to two short rudiments on vertical and three on horizontal limb of arch.

Body slender, snout short but not bluntly rounded, the premaxillaries mesially about on the level of middle of orbit; maxillary oblique, noticeably but not greatly widened at tip, extending beyond eye a distance about equaling half diameter of orbit. Teeth in very narrow bands, mandibular teeth straight, the inner series somewhat longer than the outer; in the premaxillaries, the inner series is more enlarged, the teeth strongly curved. Preopercular margin rounded, little oblique.

Pectorals mutilated; ventrals reaching at least to front of anal, probably

overlapping, their insertion a little in advance of dorsal; origin of anal under last dorsal ray; adipose dorsal immediately behind anal.

Photophores: A minute antorbital photophore between eye and nostril. Pectorals as usual in this section in a nearly straight vertical line, the upper immediately below the lateral line, the middle in front of base of fin immediately above its middle, the lower nearly vertically below the second, not on shoulder girdle, and not concealed by opercular margin; the line which joins the three passing a little in advance of the second pair of thoracics. Thoracics 5, none of them elevated, the first four pairs forming gently diverging lines, the fifth abruptly diverging, in front of outer ventral rays; interval between first and second pairs longest, nearly equaling that separating second from fourth pairs; third interspace shortest, the fourth less than the second. Supra-ventral vertically over axil of ventral fin, midway between base of ventral and lateral line. Ventrals 5, the anterior pair nearer median line than are the inner ventral rays; second and third pairs more widely separated, opposite the outer half of ventral base; fourth pair nearer median line, fifth pair again diverging. Supra-anals distinctly but slightly angulated, the third pair on lateral line, vertically above first anal ray, the second above or slightly behind the vent, the first farther forward, in a line joining the second supra-anal and the fourth ventral; space between first and second supra-anals about half that between second and third. Antero-anals 7, the first nearest the anal base, the second, third, and fourth in a slightly diverging line, the fifth, sixth, and seventh in a more strongly diverging curve which includes the postero-lateral; the seventh more widely spaced than the preceding photophores, but distinctly nearer the sixth than the postero-lateral. Postero-lateral on the lateral line, under middle of adipose fin, a little behind last anal ray. Postero-anals 5, widely separated from the precaudals, the fifth postero-anal equidistant between second postero-anal and first precaudal. On one side there are apparently two scars of photophores between the post-anal series and the first precaudal, indicating that the two series are continuous. But these cannot be found in other specimens of *townsendi*, nor on the other side of the specimen in question. They may be scars of the minuter photophores which are generally distributed. Precaudals 4, the first three equally spaced, in a gentle curve, the first

opposite first caudal ray; the fourth on the lateral line, well behind and above the third, and separated from it by a wide interval. Luminous patch on underside of caudal peduncle involving rudimentary caudal rays and extending forwards to below first postero-anal photophore; that on back of caudal peduncle short, extending but little in advance of the rudimentary caudal rays, which it covers. Integument of body rubbed so that complete distribution of luminous patches cannot be given, but a series is evident along base of anal fin, and another of four or five luminous scales on median line between ventral and anal fins.

General color blackish, the mouth and gill cavities, including gills and gill-arches and gill-rakers, jet black.

The *Ceratoscopelus* section of *Lampanyctus*, to which this species belongs, contains also *L. maderensis* and *L. warmingi*, and is characterized as follows: (1) thoracic and ventral photophores each five in number, none of them elevated; (2) middle pectoral photophore in front of base of pectoral fin; (3) antero-anals forming an \sim -shaped curve, the first are nearest the anal base, the last one or two elevated, forming a curve which includes the single postero-lateral; (4) precaudals 4 in number, sharply distinguished from postero-anals; (5) dorsal and anal short, about equal in length; (6) luminous patches following a definite arrangement which is similar in all the species.

Most nearly related to *L. warmingi* Lütken from the Atlantic, the latter having apparently a much blunter, more rounded snout, but the description inadequate for detailed comparison.

***Lampanyctus omostigma*, sp. nov.**

Plate 5.

Type 62 mm. long, from the surface at $10^{\circ} 57' 35''$ N. Lat., $137^{\circ} 35' 25''$ W. Long., in the open Pacific about 1000 miles north of the Marquesas Islands.

Very closely allied to *L. macropterus* Brauer (Zool. Anz., 1904, **28**, pp. 397, 404, fig. 5, p. 381), from the Indian Ocean, apparently differing in the following respects:

1. The first anal ray is vertically below the next to the last dorsal ray instead of the middle of the dorsal fin ;
2. The supra-pectoral, supra-ventral, and the fourth thoracic photophores are less elevated ;
3. The middle pectoral photophore is opposite the upper instead of the middle pectoral rays ;
4. The second ventral photophore is in advance of the first instead of behind it ;
5. The upper and middle supra-anals are more anteriorly placed and the lower one is more depressed ;
6. Interspaces between antero-anals (excepting between first and second pairs) not noticeably greater than between postero-anals.

Measurements in hundredths of total length without caudal : length of head 32 ; diameter of eye 7.5 ; axial length of snout 4 ; length of maxillary 21 ; greatest depth of body 21 ; least depth of caudal peduncle 10 ; distance from snout to front of dorsal 47 ; length of base of dorsal 16 ; distance from snout to adipose dorsal 79 ; to insertion of ventrals 44 ; to front of anal 60 ; length of base of anal 21 ; length of longest gill-raker 5.

Dorsal 14 ; anal 18 ; pectoral 13 ; ventral 9 ; lateral line 39 ; gill-rakers 5 + 12. Snout short but not rounded, the upper profile not descending more steeply in front ; the snout much shorter than in *L. macropterus* ; little more than half diameter of orbit. Maxillary little widened posteriorly, nearly reaching margin of preopercle, extending beyond the eye a distance about equaling the diameter of the latter.

Fins somewhat mutilated, both pectorals and ventrals evidently extending beyond origin of anal ; origin of ventrals in advance of dorsal ; anal originating under the next to last ray of dorsal, the adipose fin over the last two anal rays. In *L. macropterus*, the origin of the anal is under the middle of the dorsal fin, a character which Dr. Brauer has kindly verified for me on the types of *L. macropterus*.

A minute preorbital photophore surrounded with much black pigment between the eye and the lower portion of nostril. Humeral photophore present, as in *L. macropterus*. Supra-pectoral almost in a direct line joining the lower two pectorals, its distance from lateral line two-thirds its distance

from pectoral; middle pectoral photophore opposite the upper, not the middle, pectoral rays, its distance from lower pectoral spot two-thirds its distance from the upper; line joining middle and lower pectoral photophores passing well in advance of the second thoracic pair. Fourth thoracic greatly elevated, slightly below the middle pectoral (not above as in *L. macropterus*), over anterior part of interspace between third and fifth pairs; other thoracics nearly equidistant from the median line, the posterior slightly diverging; the interval between second and third pairs is the narrowest, that between third and fifth pairs one third the distance between first and fifth, a little shorter than that between first and second. Supraventral vertically above ventral axil, its distance from lateral line two-fifths its distance from base of ventrals. First ventrals closely approximated at base of inner ventral rays; second ventrals elevated, about on the level of the lower pectoral photophore and slightly anterior to the vertical from the first ventrals (not well posterior to this vertical as in *L. macropterus*); third ventrals slightly elevated, nearly equidistant between first and fourth pairs; fourth pair closely approximated, at the sides of the vent and a little anterior to it. Supra-anals angulated, the upper in contact with the lateral line, vertically above the first anal ray; middle supra-anal slightly anterior to the upper, in a vertical which passes between vent and first anal ray; lower supra-anal nearly equidistant between middle supra-anal and third ventral, the angle between the three much less than in *L. macropterus*, a line joining the two lower supra-anals traversing the base of the ventral fins. Antero-anals 6, the first and fifth closely approximating anal base and equally distant from it, the first above the fifth anal ray, the fifth above the twelfth; second antero-anals widely diverging; the third and fourth intermediate in position between second and fifth pairs; sixth pair (designated by Brauer as one of the postero-laterals) abruptly elevated, nearer the fifth pair than the postero-lateral, which is in contact with lateral line. Postero-anals 8 or 9, evenly spaced, the second spot immediately above base of last anal ray, the series continuous with the two lower precaudals, which are in no way distinguished from them. Precaudals 4, consisting of the two mentioned, a fourth on the lateral line and a third below and in front of the fourth,

nearly midway between latter and second precaudal. We do not follow Brauer in counting the two anterior precaudals with the postero-anals in cases like the present in which no gap separates the two series. According to Brauer, such an interval may or may not occur in different individuals of *L. macropterus*. In both specimens, the luminous scales are four in number on back of caudal peduncle and nine below, the most anterior of the lower luminous scales being under the interspace between second and third postero-anals (not under fifth postero-anal as in *L. macropterus*).

The general color was evidently dark, blackish on opercles and at bases of fins. Vertical fins with fine wavy lines, due to pigment along the lines of articulation of the rays.

A second specimen, here designated as co-type, of equal length and from the same locality.

***Lampanyctus stilbius*, sp. nov.**

Plate 6.

Type 20 mm. long from Hydrographic Station 3798 (A. A. 27), near Nukuhiva Island, Marquesas Group, taken in open intermediate net between the surface and a depth of 300 fathoms.

Near *L. guentheri*, differing in the presence of photophores on the cheeks and in having numerous minute scattered photophores on head and body, in having 4 instead of 5 ventral photophores, and in a number of details in arrangement of thoracic, ventral, anal, and supra-anal photophores; the eye is also larger. It is still more closely allied to *L. longipes* Brauer (Die Tiefseefische, 1906, p. 236, text-fig. 155), but has the preocular on the ventral instead of the dorsal side of the nostril.

Measurements in hundredths of total length without caudal: length of head 36; diameter of eye 13; axial length of snout 6; length of maxillary 23; greatest depth of body 22; depth of caudal peduncle 9; distance from snout to dorsal 51; to ventral 52; to anal 58.

Dorsal 11; anal 13; pectoral 15; lateral line about 38. Snout short but not bluntly rounded; eye very large, more than one-third length of head; maxillary moderately widened posteriorly, extending beyond eye a distance not much exceeding half its diameter; body slender.

A small but distinct antorbital photophore between the orbit and the lower edge of nostril. Three small photophores on the cheek near the posterior border of the orbit, and apparently a fourth immediately above the maxillary near its end. Apparently a small humeral spot present above anterior part of opercle. Upper pectoral spot on the lateral line, the second in front of pectoral fin just above the middle of the base, the third below and a little behind the second, the three about in a straight line. Thoracics 5, the fourth pair elevated, vertically over middle of interspace between third and fifth pairs; photophores of first pair separated from second pair by an interspace longer than distance from second to fifth pairs; third pair about equidistant from second and fifth pairs; photophores of first pair very close together, those of second pair but little farther apart, those of third pair widely distant (three times the width separating first pair), photophores of fifth pair apparently larger than the others, nearer together than those of third pair, farther apart than those of second pair. This condition is very different from that in *L. guentheri*, where the first, second, third, and fifth pairs form two regularly diverging lines. Supra-ventrals on the lateral line. Ventral photophores 4, the anterior pair opposite middle ventral rays and a little removed from them; second pair elevated, above and behind the first pair, a little lower than fourth thoracics; third pair but slightly nearer fourth than first pair, the photophores of third pair a little farther apart than those of fourth pair, the latter at sides of vent. Supra-anals slightly angulated, the upper distinctly above lateral line, vertically above second anal ray, the second above the first anal ray, the third above the fourth ventral pair; second supra-anal a trifle nearer the lower than the upper one of the series; line joining middle and lower supra-anals passing through the third ventrals. Antero-anals 7, forming a slight \smile -shaped curve, the first a little nearer anal base than the following, the sixth slightly diverging, the seventh more so, the interspaces equal or nearly so; the curve of the last antero-anals crossing lateral line well behind the postero-lateral. Postero-lateral above the lateral line. Postero-anals 4, the last well separated from first precaudal. Precaudals 3 or 4, the two lower well-developed, horizontally placed, approximated at base of rudimentary rays of caudal, the upper above lateral line, the third intermediate in position, sometimes faint or absent.

Minute scattered photophores on head and body, but the integument largely rubbed off, so these are now visible infrequently and are not represented in the drawing. Luminous scales can be made out only on upper and lower sides of caudal peduncle, but such were probably present at base of ventrals and of anterior dorsal and anal rays.

Short luminous patches on upper and lower margins of caudal peduncle, not extending more than one-third distance from caudal rays to anal and adipose fins.

Paired fins broken, their length uncertain; ventrals inserted a trifle behind origin of dorsal; anal originating slightly behind last dorsal ray; adipose dorsal over last anal rays.

A single small specimen in poor condition.

Vinciguerrria lucetia (GARMAN).

Maurolicus lucetius GARMAN, Mem. Mus. Comp. Zool., 1899, 24, p. 212, pl. J, fig. 2.

Several small specimens, in poor condition, from Hydrographic Station 3798 (A. A. 27), near the Marquesas Islands. It is not clear in what respects this species differs from typical *V. attenuata* (Cocco) from the Atlantic, as characterized by Lütken and Bellotti (see Lütken, *Spolia Atlantica*, Scopelini, 1892, pp. 270-2). In its slender habit, posterior anus, and the limitation of silvery pigment to the preanal region, as also in the somewhat smaller number of photophores, it agrees with *attenuata*. On the other hand, *Zalarges nimbarius* Jordan and Williams (Proc. Cal. Ac. Sci., 1895, ser. 2, 5, p. 793, pl. 76), a true *Vinciguerrria*, agrees with *V. poweriae* (Cocco) from the Atlantic in its deeper form, anterior position of anus, the extension of the silvery pigment to near the base of the caudal fin and the increased number of photophores. Lütken was unable to distinguish *attenuata* and *poweriae* on the examination of a large amount of material. If his conclusion is valid, it may well prove that *lucetia* and *nimbaria* are the Pacific representatives of a variable and widespread species for which the name *attenuata* must be used. The dorsal fin contains 14 rays in the types of *Z. nimbarius*, not 9 as given.

EXPLANATION OF THE PLATES.

PLATE 1.

Diaphus nanus Gilbert.

Hydrographic Station 3798 (A. A. 27), near Nukuhiva, Marquesas Islands.

PLATE 2.

Diaphus agassizii Gilbert.

Hydrographic Station 3798 (A. A. 27), near Nukuhiva, Marquesas Islands.

PLATE 3.

Diaphus signatus Gilbert.

Hydrographic Station 3798 (A. A. 27), near Nukuhiva, Marquesas Islands.

PLATE 4.

Lampanyctus townsendi (Eigenmann and Eigenmann)

Hydrographic Station 3797 (A. A. 25), near Ua Huka, Marquesas Islands.

PLATE 5.

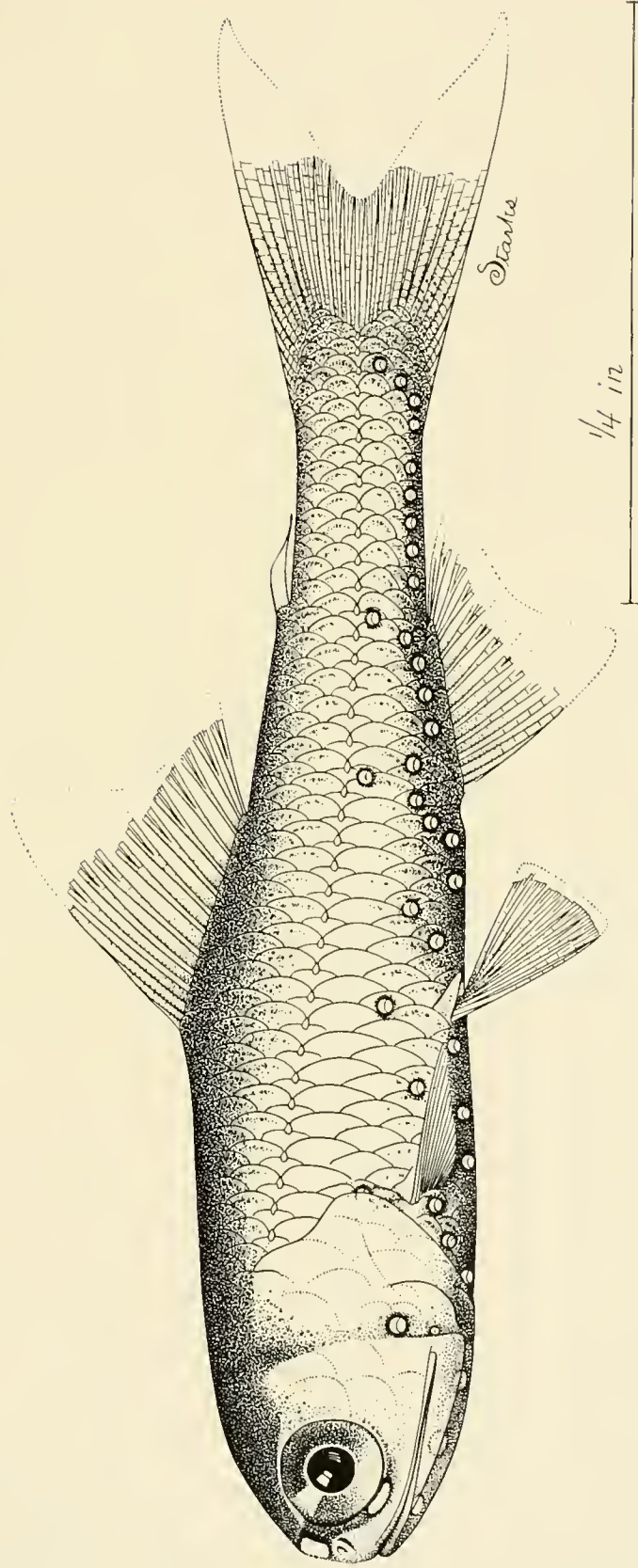
Lampanyctus omostigma Gilbert.

Pacific Ocean, $10^{\circ} 57' 35''$ N. Lat., $137^{\circ} 35' 25''$ W. Long., about 1,000 miles north of the Marquesas Islands.

PLATE 6.

Lampanyctus stilbins Gilbert.

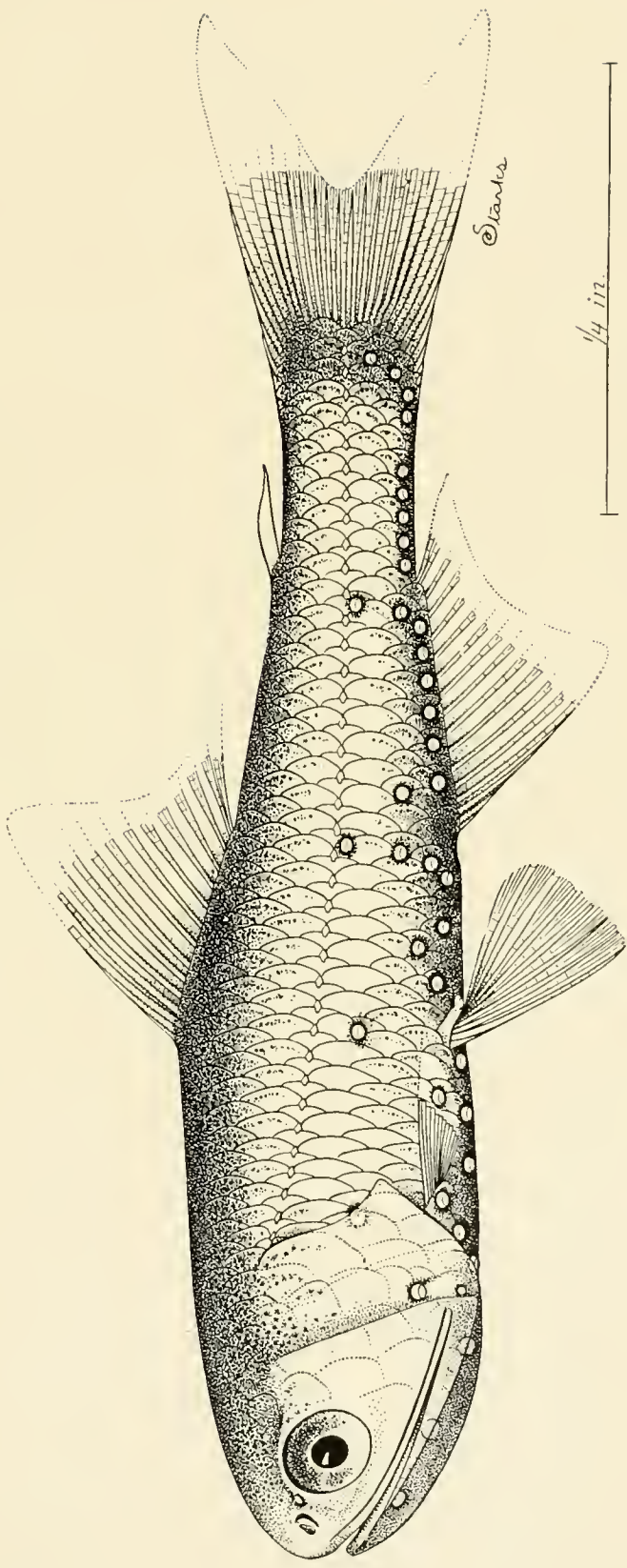
Hydrographic Station 3798 (A. A. 27), near Nukuhiva, Marquesas Islands.



DIAPHUS NANUS GILBERT.

"ALBATROSS" TROPICAL PACIFIC EX.—LANTERN FISHES.

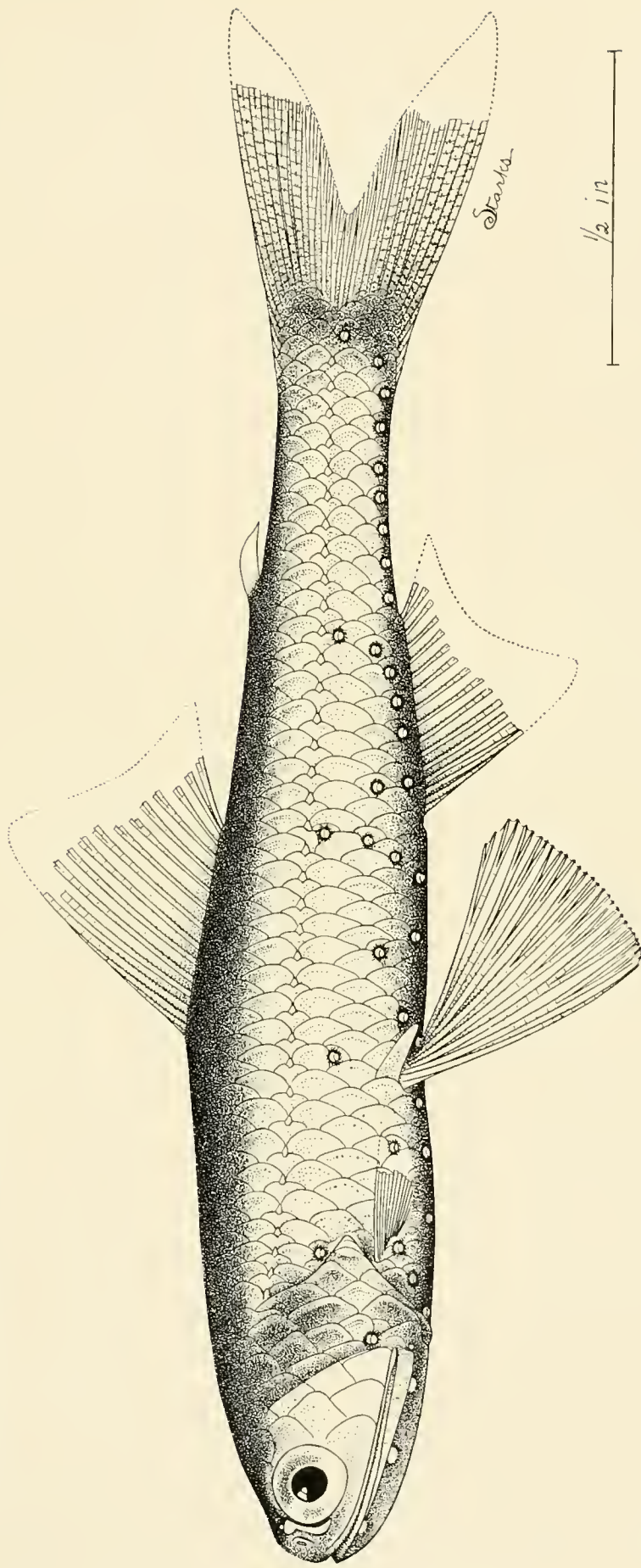
PLATE 2.



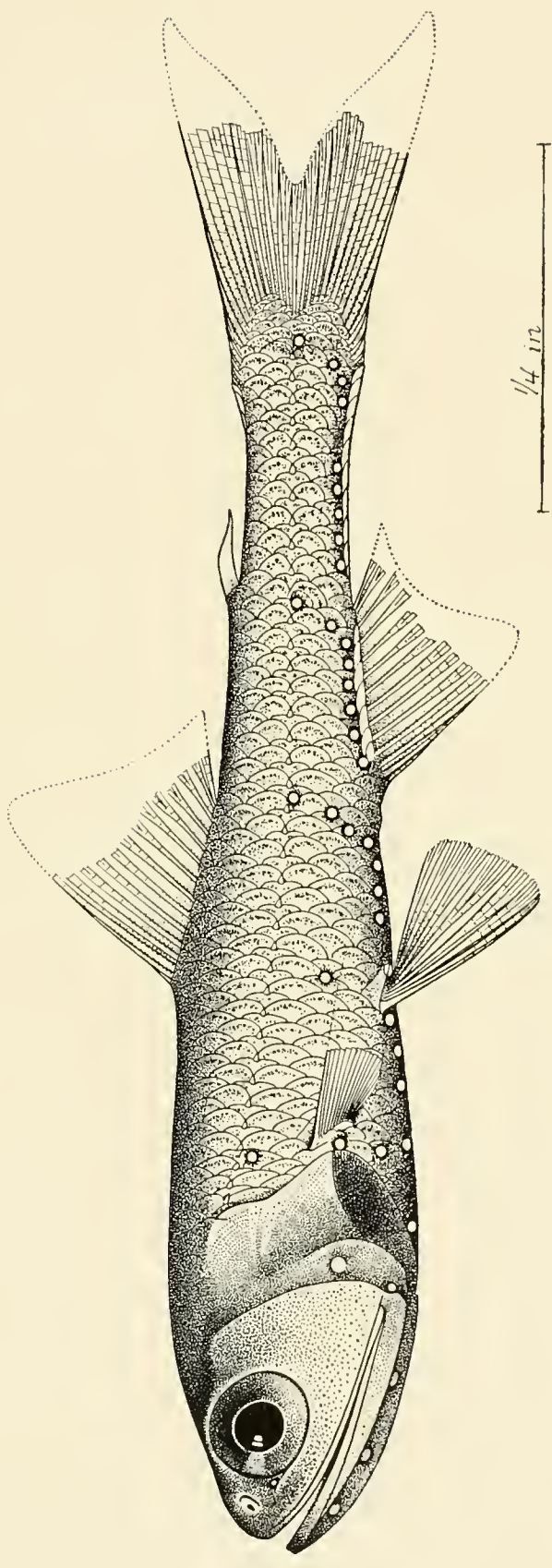
DIAPHUS AGASSIZII GILBERT.

"ALBATROSS" TROPICAL PACIFIC EX.—LANTERN FISHES.

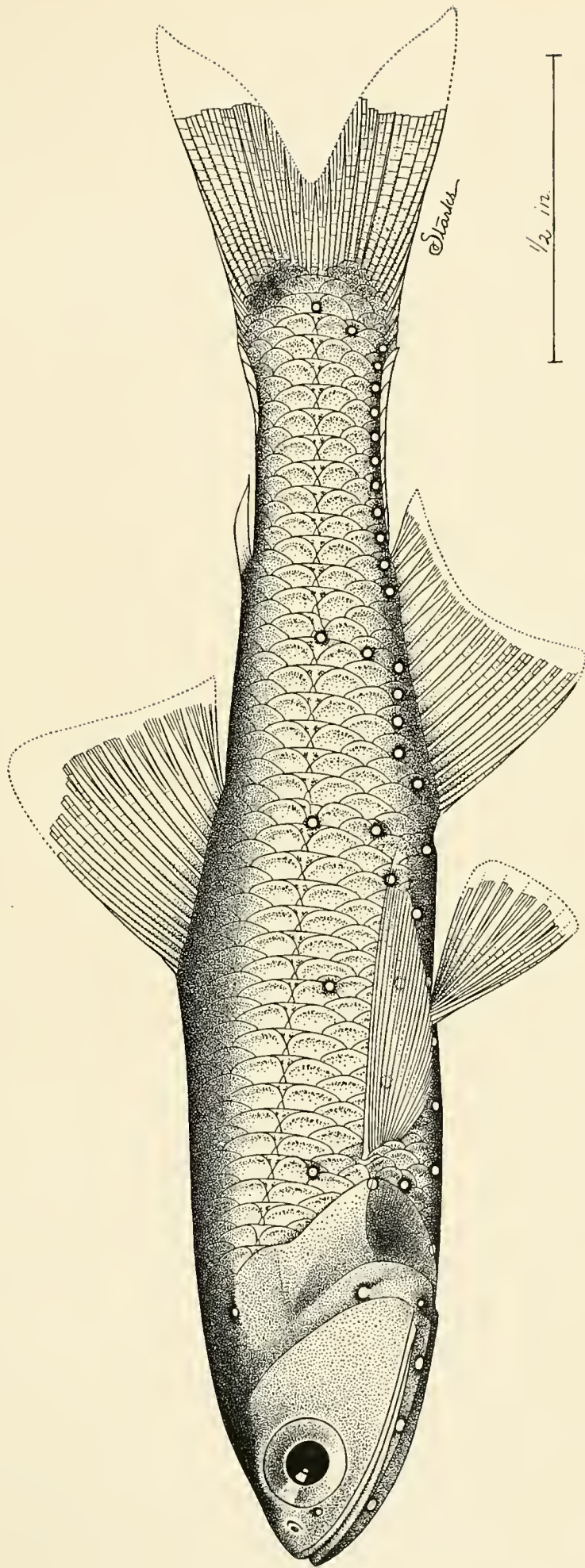
PLATE 3.



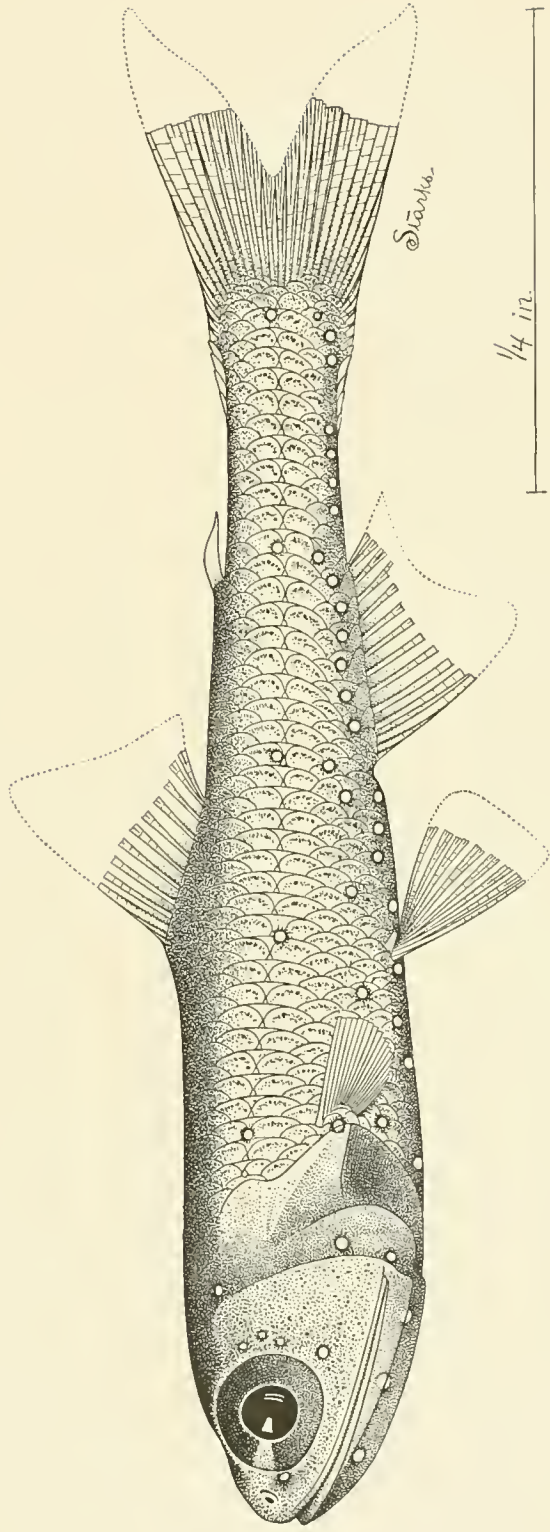
DIAPHUS SIGNATUS GILBERT.



LAMPANTYCTUS TOWNSENDI (EIGENMANN & EIGENMANN).



LAMPANYCTUS OMOSTIGMA GILBERT.



LAMPANYCTUS STILBIUS GILBERT.

The following Publications of the Museum contain Reports on the Dredging Operations in charge of Alexander Agassiz, of the U. S. Fish Commission Steamer "Albatross," during 1891, Lieut. Commander Z. L. Tanner, U. S. N., Commanding.

- Three Letters from ALEXANDER AGASSIZ to the Hon. Marshall McDonald, U. S. Commissioner of Fish and Fisheries, on the Dredging Operations of the "Albatross" in 1891. Bull. M. C. Z., Vol. XXI. No. 4. June, 1891. 16 pp.
- I. A. AGASSIZ. On Calamocerinus Diomedæ, a new Stalked Crinoid from the Galapagos. Mem. M. C. Z., Vol. XVII. No. 2. January, 1892. 95 pp. 32 Plates.
- II. A. AGASSIZ. General Sketch of the Expedition of the "Albatross," from February to May, 1891. Bull. M. C. Z., Vol. XXIII. No. 1. February, 1892. 89 pp. 22 Plates.
- III. A. GOËS. Neusina Agassizi. Bull. M. C. Z., Vol. XXIII. No. 5. December, 1892. 4 pp. 1 Plate.
- IV. H. LUDWIG. Vorläufiger Bericht über die erbeuteten Holothurien. Zeit. Anz., No. 420. 1893. Bull. M. C. Z., Vol. XXIV. No. 4. June, 1893. 10 pp.
- V. GEO. P. MERRILL. The Rocks of the Galapagos. Bull. M. C. Z., Vol. XVI. No. 13. July, 1893. 3 pp.
- VI. W. FAXON. Preliminary Descriptions of new Species of Crustacea. Bull. M. C. Z., Vol. XXIV. No. 7. August, 1893. 72 pp.
- VII. S. H. SCUDDER. The Orthoptera of the Galapagos. Bull. M. C. Z., Vol. XXV. No. 1. September, 1893. 25 pp. 3 Plates.
- VIII. W. SCHIMKÉWITSCH. The Pynogonidæ. Bull. M. C. Z., Vol. XXV. No. 2. December, 1893. 17 pp. 2 Plates.
- IX. W. McM. WOODWORTH. The Planarians. Bull. M. C. Z., Vol. XXV. No. 4. January, 1894. 4 pp. 1 Plate.
- X. TH. STUDER. Note préliminaire sur les Alcyonaires. Bull. M. C. Z., Vol. XXV. No. 5. February, 1894. 17 pp.
- XI. S. F. CLARKE. The Hydroids. Bull. M. C. Z., Vol. XXV. No. 6. February, 1894. 7 pp. 5 Plates.
- XII. H. LUDWIG. The Holothurians. Mem. M. C. Z., Vol. XVII. No. 3. October 1894. 183 pp. 19 Plates.
- XIII. R. BERGH. Die Opisthobranchien. Bull. M. C. Z., Vol. XXV. No. 10. October, 1894. 109 pp. 12 Plates.
- XIV. A. ORTMANN. The Pelagic Schizopoda. Bull. M. C. Z., Vol. XXV. No. 8. September, 1894. 13 pp. 1 Plate.
- XV. W. FAXON. The Crustacea. Mem. M. C. Z., Vol. XVIII. April, 1895. 292 pp. 67 Plates.
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- XVII. C. H. TOWNSEND. The Birds of Cocos Island. Bull. M. C. Z., Vol. XXVII. No. 3. July, 1895. 8 pp. 2 Plates.
- XVIII. C. HARTLAUB. Die Comatuliden. Bull. M. C. Z., Vol. XXVII. No. 4. August, 1895. 26 pp. 4 Plates.
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- XXXIII. E. VON MARENZELLER. Stein- und Hydro-Korallen. Bull. M. C. Z., Vol. XLIII. No. 2. August, 1904. 16 pp. 3 Plates.
- XXXIV. E. VON MARENZELLER. Lagisca Irritans, sp., nov., ein Symbiont von Hydrokorallen. Bull. M. C. Z., Vol. XLIII. No. 3. August, 1904. 6 pp. 1 Plate.
- XXXV. H. LUDWIG. Asteroidea. Mem. M. C. Z., Vol. XXXII. July, 1905. 12, 292 pp. 35 Plates, 1 Chart.
- XXXVI. E. TROJAN. Ein Beitrag zur Morphologie des Tiefseefischgehirnes. Mem. M. C. Z., Vol. XXX. No. 3. October, 1906. 41 pp. 6 Plates.

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