PARVILUX, A NEW GENUS OF MYCTOPHID FISHES FROM THE NORTHEASTERN PACIFIC, WITH TWO NEW SPECIES [1])

by

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A relatively gigantic species of lanternfish, described below as representing a new genus, has appeared sparingly since 1950 in bathypelagic collections from off southern California and northern Baja California, Mexico. Although the distinctness of the species has been known for some time, most available specimens had generally been so badly damaged by the nets that an adequate evaluation of the various characters was not possible. Due to a recent increase in collecting effort in these regions, and to the use of a very large midwater trawl, more specimens have been taken than were before available, and a number of these are in a sufficiently good condition to permit the drawing of rather firm conclusions regarding the reliability and constancy of the characters necessary for the indication of the species as sufficiently distinct to warrant the establishment of a new genus.

The accumulated study material has been taken on the various cruises of the research vessels of the Scripps Institution of Oceanography and by the Research Vessel "John N. Cobb" during the gear-research and exploratory fishing program of the United States Bureau of Commercial Fisheries. Three additional specimens were taken by the Research Vessel "Velero IV" of the Allan Hancock Foundation of the University of Southern California.

In 1952, on the Eastropic Expedition of Scripps Institution, a single specimen of a related species, herein named *Parvilux boschmai,* was collected in a midwater trawl off northern South America, at about 2° N. Despite the circumstance that numerous hauls have been made by Scripps vessels in the eastern tropical Pacific and off temperate South America, no additional specimens of this species have been secured.

We are indebted to several colleagues for help in securing specimens and collection data, particularly to Frederick H. Berry and Herbert C. Perkins of the United States Bureau of Commercial Fisheries (of the Fish and Wildlife Service), La Jolla Laboratory; to Dayton Lee Alverson and Richard D. McNeely of the same Bureau's Seattle Laboratory; and to

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Geographical and Vertical Distribution

The genus *Parvilux* has thus far been taken only in the eastern Pacific, and the two species appear to have restricted and distinct ranges (figs. 1, 2).

Parvilux ingens seems to be confined largely to the outer part of the California Current and to waters just beyond what is ordinarily taken to be the western limit of that great stream, off California and northern Baja California; and to the more inshore areas, as well, off southern California

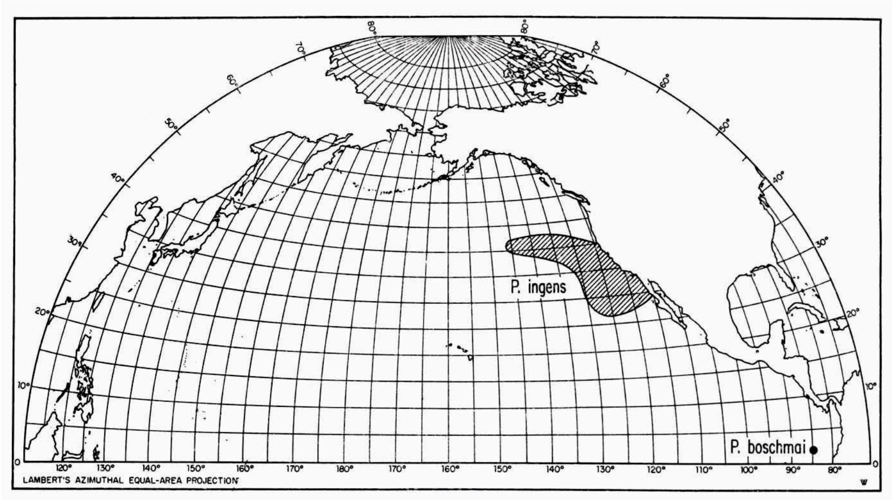

Fig. 1. Geographical distribution of the species of *Parvilux*.

and off northern Baja California, where the water periodically flows either southward or northward. The species appears to be especially abundant about Guadalupe Island, which lies directly in the California Current (as is indicated by the occurrence there of drift timber and of drifting kelp: throughout the year stipes of the genus *Nereocystis*, which inhabits the rocky coasts north of Point Conception, commonly float around the island, but the similar genus *Pelagophycus*, which grows only south of that faunal-boundary point, does not drift there). Five of the 31 collections and 33 of the 77 specimens of the species were taken in the immediate vicinity of Guadalupe.

The range of *P. ingens* (figs. 1, 2) virtually coincides with the Transition

Region of the water-mass system as portrayed by Sverdrup, Johnson & Fleming (1942, fig. 209A). Only one specimen was taken well outside this area, at 40° 37′ N 143° 25′ W, near the indicated boundary between three water masses: the Subarctic Pacific, the North Pacific Central, and the Transition. It seems probable that the range of *P. ingens* is rather well delimited, because the species has not appeared in numerous appropriate collections from the Subarctic Pacific, North Pacific Central, and Pacific Equatorial water masses, nor from the broad intermediate area (indicated by shading in the figure referred to above and in fig. 2 of this paper)

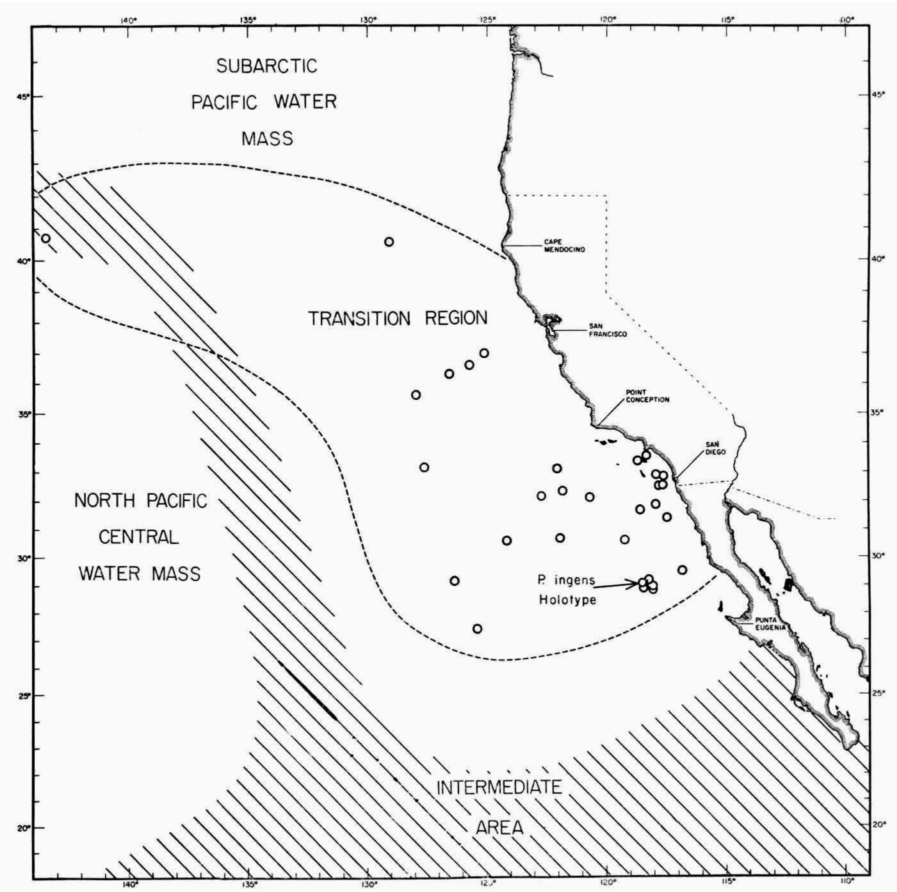

Fig. 2. Geographical distribution of *Parvilux ingens* new species, with boundary as of figure 1 shown by the dashed line, and showing boundary areas (shaded) between the indicated water mass (after Sverdrup, Johnson, & Fleming, 1942). The intermediate area between the Transition Region and the Pacific Equatorial Water Mass extends to just south of the southern boundary of this chart.

between the two waters last named. Many midwater-trawl stations have been made in these areas where the species has not been taken. The trawls that took Melamphaidae through 1959 were mapped by Ebeling (1962, fig. 42), and all Isaacs-Kidd trawls to date are being listed by Clarke (in press).

In vertical distribution (table 1), *P. ingens* is not restricted to the greater midwater depths, though its precise depth range is obscured by reason of the almost invariable failure to use closing nets (a fault that we trust will soon be rectified). Of a total of 76 specimens, with depth data, from 30 hauls, 52 were from 14 hauls (12 made during hours of darkness) to depths (calculated from wire angle) of less than 500 meters; 15 were from 8 hauls to depths between 600 and 1,000 m; 1 each were from 2 hauls to between 1,000 and 2,000 m; and 7 were from 6 hauls to between 2,000 and 4,000 m. The shallowest recorded maximum depths were calculated to be 155 m (1 adult), 275 m (1 large young), and 320, 360, 366, 366, and 400 m (12 young to adult specimens). One of the two smallest specimens, 49 mm in standard length, the only one without depth record, is in such perfect condition that it is thought to have been taken in a meter net, probably at a depth of less than 150 m (it was taken at one of the stations of the California Cooperative Oceanic Fisheries Investigations, which agency ordinarily uses no other nets). All other specimens were taken in midwater trawls. None, unless unrecognized larvae, have been taken in thousands of other meter-net hauls made since 1949 by the cooperative survey throughout the area off California and off Baja California, chiefly within the known range of *P. ingens.*

Parvilux boschmai is known only from the holotype, which was collected between the Galápagos Islands and the Gulf of Panamá, at 02° 09′ N 84° 53.5′ W (fig. 1), in a midwater trawl hauled from a depth calculated from the wire angle as 1,265 m. It is possible that this species occupies a rather deep midwater zone in the Pacific Equatorial Water Mass, which forms a wedge narrowing westward.

That distinctive faunas characterize the Transition Region, which is occupied by *Parvilux ingens,* and the Pacific Equatorial Water Mass, which presumably harbors *P. boschmai,* has been indicated for fishes by Ebeling (1960 and 1962) and others, and for invertebrates by Bieri (1959), McGowan (1960), and Brinton (1962).

Parvilux new genus

Type species: *Parvilux ingens* new species.

This genus is typical of the *Lampanyctus* group of myctophid fishes in having an elongate, moderately compressed, and slender body form, with rather weak and flaccid musculature; and the caudal peduncle deep, about half as deep as the greatest depth of body. In general the appearance is most like that of the deep-living, flaccid species of *Lampanyctus,* particularly those with weakly developed pectoral fins. The head is long and the eye small. The wide gape extends far behind the eye. The highly irregular opercular margin ends above the pectoral base in a bluntly pointed flap. The dorsal fin originates before the midpoint of the body, a little behind the vertical from the pelvic origin; the anal origin lies under the posterior half of the dorsal base; the two bases are approximately equal in length; the short pelvics do not reach the anus; the small and weakly formed pectorals (they are damaged in all specimens) probably do not extend beyond or even to the pelvics in life. The adipose fin lies entirely behind the anal base. The procurrent caudal rays are spiny, as in *Lampanyctus* and allied genera, and do not bear luminous tissue. The scales are very caducous; the margins are smooth; the anterior lateral-line scales are not markedly larger than adjacent scales, but the posteriormost few scales (intact in a specimen 49 mm in standard length) are alate, with a straight and vertical posterior edge, are about three times as high as the adjacent scales, and cover about three-fourths of the depth of the caudal peduncle where slenderest. The photophores, ovate to reniform in appearance, are unusually small, about as in *Lampanyctus regalis* (Gilbert), about twice as long as high, superficial, and caducous.

The third PO is slightly elevated, but much less so than is the fourth (fig. 3). The 3 to 6 VO often grade into the SAO series, which is herein interpreted as consistently comprising 3 photophores; the fifth and sixth VO are slightly elevated. The SAO series is only slightly angulated. There are 2 Pol. The 4 Prc are either continuous with or separated from the AOp series. The PVO pair does not form a line with the first PO. There are no secondary photophores, no luminous gland on the adipose fin, and no photophores on the cheek.

Relative to most myctophid genera, *Parvilux* attains a large size. The largest specimen measures 200 mm in standard length, more than half are 15 to 20 cm long, and the modal length is 15 cm, with about 20 percent of all specimens at this centimeter size group (fig. 3).

Systematic position. — The placement of *Parvilux* within the myctophid hierarchy requires some discussion, especially in view of the current tendency toward the recognition of additional genera, as by Bolin (1959) and Wisner (1963). Primarily on the basis of photophore patterns, Fraser-Brunner (1949), in revising the once broadly inclusive genus *Lampanyctus,* recognized or split off five genera (*Lampanyctodes* Fraser-Brunner, *Cera-*

toscopelus Günther, *Gymnoscopelus* Günther, *Lampichthys* Fraser-Brunner, and *Notoscopelus* (Günther), and within the restricted genus *Lampanyctus* recognized four subgenera (*Stenobrachius* Eigenmann & Eigenmann, *Triphoturus* Fraser-Brunner, *Lampanyctus* Bonaparte, and *Lepidophanes* Fraser-Brunner). Bolin (1959) elevated *Lepidophanes* to full generic status and expressed the opinion that *Stenobrachius* and *Triphoturus* also merit generic separation from *Lampanyctus*. We accept these opinions and propose the additional genus *Parvilux*, while recognizing the subjective nature of generic appraisal.

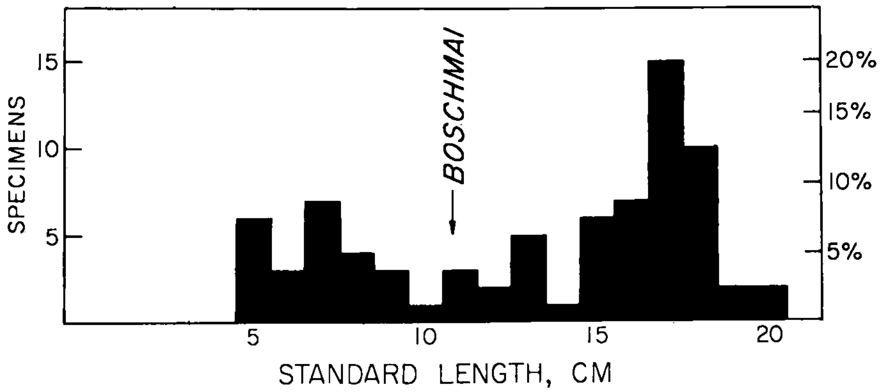

Fig. 3. Frequency distribution of standard lengths of all known specimens of *Parvilux*, new genus.

The following brief outline of principal characters is offered to diagnose the related genera and to compare *Parvilux* with them. The genus *Stenobrachius* is characterized, principally, by having the 3 SAO in a straight or slightly angulated line, a single Pol, and either 4 or 5 VO, none of which is elevated. The genus *Triphoturus* has 2 Pol, a strongly angulated SAO series, and 5 VO, with 1 or 2 elevated. The two characters, strongly angulated SAO and 2 Pol, also occur in combination throughout the genus *Lampanyctus*, as hereby provisionally restricted, but *Lampanyctus* has only 4 VO, with 1 elevated in some species. Fraser-Brunner (1949, p. 1083) further characterized *Triphoturus* as having only 3 Prc, but this character calls for reinterpretation, inasmuch as the Prc and AOp series are continuous in some species. Two Pol occur throughout *Lepidophanes*, but the SAO group, although not straight, is normally much less angulated than it is in *Triphoturus* and *Lampanyctus*, and is similar to the arrangement in *Parvilux*. *Lepidophanes* differs further from the genera discussed above in having small patches of luminous tissue at the bases of the dorsal and anal fins, on the procurrent caudal rays, and, often, elsewhere on the body; it has 5 or 6 VO, with VO_2 elevated. *Ceratoscopelus* also has the SAO series slightly curved, and it has 2 Pol, 5 VO in a curved series, and patches of luminous tissue on the body; it is so distinctive in other ways as to call for no further consideration here.

The slight angulation of the SAO series, coupled with the number (2) of Pol photophores, would seem to call for the placement of *Parvilux* either between *Stenobrachius* and *Triphoturus*, or between *Lepidophanes* and *Ceratoscopelus*. As the new genus has from 3 to 6, usually 4, VO and no luminous patches, it would appear to be most satisfactorily located between *Stenobrachius* and *Triphoturus*. It may be said that *Parvilux*, by reason of its relatively straight to moderately angulated SAO series and the two Pol, forms a natural evolutionary stage between *Stenobrachius* (with single Pol, 4 to 5 VO, and a relatively straight SAO series) and *Triphoturus* (with 2 Pol, 5 VO, and a sharply angulated SAO series).

Etymology. — From the Latin, parvus, little, and lux, light, in reference to the small size of the photophores distinctive, though not exclusively so, of the two species. The gender is feminine.

Parvilux ingens new species (textfigs. 1-4; pl. XXV fig. 1)

Lampanyctus ingens Ebeling, 1962, p. 140 (nomen nudum; latitudinal and water-mass distribution).

Holotype: SIO 57—207—25A, 160 mm in standard length, deposited in the Marine Vertebrates Collection at Scripps Institution of Oceanography; taken on December 13, 1957, off the southwest side of Guadalupe Island, Baja California, México, at 29° 09′ N 118° 27.3′ W, in an Isaacs-Kidd 6-foot midwater trawl fished open to 1,016 meters (calculated from the wire angle).

Paratypes: All other specimens are designated as paratypes, and are listed in Table I by catalogue number, locality of capture, date, depth, and size range. The abbreviations SIO = Scripps Institution of Oceanography (the Scripps Collection Numbers are also the Catalogue Numbers); AHF = Allan Hancock Foundation, University of Southern California. The recorded depth (in meters) represents the depth of trawling calculated from the wire angles; none of the trawls were equipped with a closing device. Two positions, when entered, indicate beginning and end of haul.

One or more specimens from the following Scripps Collection Numbers are being deposited in other museums, as follows: SIO 62—404—25A to

TABLE I

Collections of *Parvilux ingens*

Collection Number	Lat. N.	Long. W.	Trawl Depth, m	Date, 19—	No.	S. L.,* mm
SIO 50—286—25D	32°30.0′	117°23.3′	626	XII: 6:50	1	111
SIO 51— 76—25B	28°52.7′	117°59.8′	366	III:17:51	4	173—184
	28°46.3′	117°54.3′				
SIO 51—187—25B	32°54.0′	117°47.0′	275	V:21:51	1	70
	33°02.5′	117°56.0′				
SIO 51—278—25E	32°31.2′	117°45.6′	320	VII:27:51	1	106
	32°28.4′	117°44.6′				
SIO 51—351—25C	40°31.0′	129°01.0′	860	VIII: 1:51	1	200
SIO 51—357—25E	40°37.0′	143°25.0′	3,990	VIII: 8:51	1	172
SIO 51—377—25F	33°01.0′	127°39.0′	3,920	IX:23—24:51	1	76
	33°09.0′	127°24.0′				
SIO 57— 87—25D	29°15.0′	126°07.0′	755	V:14—15:55	2	70—194
	28°55.0′	126°24.0′				
SIO 57—207—25A†	29°09.0′	118°27.4′	1,016	XII:13:57	1	160
	28°58.8′	118°21.5′				
SIO 57—208—25D	29°01.0′	118°25.0′	1,520	XII:14:57	1	77
	28°47.1′	118°21.1′				
SIO 62—404—25A	36°55.5′	125°04.0′	366	VIII: 7— 8:62	3	105—127
	37°03.5′	124°59.1′				
SIO 62—440—25A	32°05.0′	120°41.5′	400	VIII:28:62	2	133—150
	32°03.0′	120°39.0′				
SIO 63—110—25F	27°22.6′	125°20.0′	2,700	IV:16:62	1	75
SIO 63—189—25A	29°07.5′	118°06.2′	2,100	IV:26:63	2	63—155
	28°49.1′	118°03.3′				
SIO 63—344—25A	31°36.0′	118°29.0′	425	III:27:62	2	71— 74
SIO 63—373—25A	33°04.0′	121°58.8′	490	III: 6:63	3	51—182
SIO 63—374—25A	32°07.3′	122°39.5′	640	III: 6:63	6	94—181
SIO 63—379—25A	32°17.0′	121°44.0′	640	III: 8:63	1	174
SIO 63—388—25A	30°32.5′	119°09.8′	460	III:19:63	4	141—184
SIO 63—389—25A	31°49.0′	117°53.0′	360	III:21:63	2	49— 51
SIO 63—393—25A	29°12.0′	118°09.0′	460	III:23:63	25	50—195
SIO 63—394—25A	29°28.4′	116°47.0′	155	III:23:63	1	165
SIO 63—402—25A	36°34.4′	125°46.0′	480	III:28:62	1	95
SIO 63—403—25A	36°17.0′	126°31.0′	3,000	III:28:62	1	71
SIO 63—404—25A	35°35.2′	127°54.0′	480	III:28:62	2	55— 93
SIO 63—421—25A	30°28.8′	124°06.6′	2,700	IV: 4:62	1	118
SIO 63—426—25A	31°21.2′	117°26.7′	480	IV:12:62	1	69
SIO 63—468—25A	ca. 30°36′	121°53.2′	?	?	1	49
SIO 63—471—25A	+	+	670	VIII: 3:51	1	59
Velero 7343	33°41.7′	118°32.0′	790	IV: 7:61	1	185
(AHF—3042)	33°26.5′	118°17.1′				
Velero 8022	33°23.1′	118°50.8′	940	VI:19:62	2	66—164
(AHF—3024)	33°15.5′	118°35.8′				

* Standard length, to end of hypural plate.
† Holotype of *P. ingens*.
\+ In San Diego Trough, off San Diego, California.

Museum of Comparative Zoology, Harvard University; SIO 62—440—25A to California Academy of Sciences; SIO 63—373—25A to Museu Municipal do Funchal, Madeira; SIO 63—374—25A to Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands; SIO 63—388—25A to British Museum (Natural History); SIO 63—393—25A to United States National Museum; SIO 63—421—25A to Division of Systematic Biology, Stanford University.

The following description supplements the characters assigned above to the genus. Except as otherwise indicated it is based on the holotype only.

The greatest depth measures 6, the head about 3.5 times in standard length. The eye is small (7.0 in head, 5.0 in upper jaw, 2.3 in interorbital). The mouth is large: the upper jaw measures 1.4 in head and extends about three-fifths its length beyond a perpendicular drawn from the sloping jaw through posterior margin of orbit. The maxillary is expanded posteriorly in a small, round, domelike terminal protuberance. A broad shelf, projecting outward and downward, extends along the midline of the maxillary from near its end to below the anterior margin of the orbit. The dentary bone appears to fit against this ridge.

Dorsal 16 and anal 17 (including rudimentary rays and interpreting the last ray as divided through its base); pectoral 11—11; pelvic 8—8; caudal 8, 10—9, 8. The procurrent caudal rays are stiff and spiny. The vertebrae number 37 and the lateral line pores 36. The slender gillrakers (excluding one rudiment on upper limb and two on lower limb) number 5 + 1 + 11 on each side; the one at the angle is as long as the orbit.

Morphometric data are presented in table II and meristic data in table III. In table IV certain counts are correlated for *Parvilux ingens*, further to test the generalizations (Hubbs & Hubbs, 1954, pp. 192-193; Hubbs, 1963, pp. 143-145, 158, 169-170) that the numbers of segments of parallel structures (opposed bilaterally or more or less opposed dorsoventrally) are positively correlated, whereas the numbers for serial structures (especially those that are anterior and posterior) are negatively correlated. In confirmation we find that the numbers of dorsal and anal rays and the number of upper of lower rakers are positively correlated, as are the numbers of VO photophores and of AO photophores (anterior, posterior, and total) on left and right sides. The numbers of anterior and posterior anal photophores (AOa and AOp) are negatively correlated, but the correlation is not significant statistically.

The dorsal origin is well before midbody (predorsal length 1.4 in distance from dorsal origin to caudal base). The pelvic origin is less than a pupil's length before the vertical from the dorsal origin. The anal originates just within the posterior third of the dorsal base. The dorsal and anal bases are

TABLE II

Proportional measurements of the two species of *Parvilux,* expressed in thousandths of the standard length, as means and ranges. N = number of specimens measured for each size-class of *P. ingens.*

	Size class, *P. ingens,* in mm			N	Type of *P. ingens*	Type of *P. boschmai*
	50—76	95—133	148—200		160 mm	113 mm
Head length	297	303	299		286	310
	282—312	293—314	286—316	6—8		
Orbit length	52	45	42		41	56
	44—61	42—49	38—45	8—10		
Interorbital width	93	95	95		94	87
	84—99	90—100	86—100	8—10		
Upper-jaw length	222	215	207		201	209
	210—237	207—224	192—218	8—11		
Prepectoral length	314	313	298		295	296
	302—328	302—322	284—311	9—11		
Prepelvic length	426	433	421		411	421
	404—449	410—454	402—455	8—11		
Predorsal length	459	450	448		435	425
	446—473	439—463	435—464	8—10		
Preanal length	562	567	568		573	555
	550—584	552—594	552—608	8—11		
Preadipose length	784	783	784		780	793
	769—809	768—801	768—820	8—11		
Dorsal to pelvic	148	165	176		153	173
(origins)	138—158	145—174	153—192	8—10		
Dorsal to anal	198	210	220		205	216
(origins)	180—204	199—224	205—237	8—10		
Dorsal base	184	178	192		191	223
	172—198	168—186	187—203	8—10		
Anal base	191	192	192		197	224
	179—203	180—201	176—203	7—10		
Peduncle length*	261	255	258		248	243
	237—278	246—272	246—268	8—11		
Peduncle depth	78	87	101		90	88
	70—89	74—94	89—121	8—11		
Cadaul base to end	227	218	221		212	214
of adipose base	215—236	201—227	210—239	8—11		
Caudal base to anal	447	443	450		440	474
origin	436—464	423—454	436—465	7—11		
Pelvic insertion to	144	146	151		163	142
anal origin	136—155	134—157	141—163	8—11		
Supracaudal-gland	65	75	75		70	142
length	56—76	68—85	67—93	21		
Infracaudal-gland	78	88	108		92	148
length	69—92	79—96	78—100	24		

* From end of hypural plate to end of anal base.

TABLE III

Meristics of *Parvilux ingens* and *P. boschmai*

	Dorsal Rays						
	14	15	16	17		N	Mean
P. ingens	1	19	45	3		68	15.74
P. boschmai	...	1	...	...		1	15.0?
	Anal Rays						
	15	16	17	18		N	Mean
P. ingens	3	29	36	2		70	16.53
P. boschmai	...	...	1	...		1	17.0?
	Pectoral Rays*						
	10	11	12	13		N	Mean
P. ingens	4	21	30	10		65	11.71
	Vertebrae (including hypural plate)						
	35	36	37	38		N	Mean
P. ingens	...	4	50	17		71	37.18
P. boschmai	1	...	...	...		1	35.0?
	Upper Gillrakers (both sides)						
	4	5	6			N	Mean
P. ingens	12	131	1			144	4.92
P. boschmai	...	2	...			2	5.0?
	Lower Gillrakers (both sides, including raker at angle)						
	11	12	13	14		N	Mean
P. ingens	7	111	25	1		144	12.14
P. boschmai	...	2	...	...		2	12.0?
	Total Gillrakers (both sides)						
	15	16	17	18	19	N	Mean
P. ingens	4	11	103	24	2	144	17.06
P. boschmai	...	...	2	...	...	2	17.0?
	VO Photophores (both sides)†						
	3	4	5	6		N	Mean
P. ingens	6	116	12	2		136	4.07
P. boschmai	2	...	...	...		2	3.0?
	AOa Photophores						
	5	6	7			N	Mean
P. ingens	9	66	17			92	6.09
P. boschmai	...	2	...			2	6.0?
	AOp Photophores						
	6	7	8			N	Mean
P. ingens	20	30	13			63	6.89
P. boschmai	...	2	...			2	7.0?
	Total AO Photophores						
	11	12	13	14	15	N	Mean
P. ingens	1	15	32	12	3	63	13.02
P. boschmai	...	...	2	...	...	2	13.0?

* The pectoral rays in the holotype and only known specimen of *P. boschmai* are too badly damaged to permit an accurate count.

† Since the VO and SAO series are more or less continuous, the counts are rather arbitrarily made on the assumption that, as in myctophids in general, the SAO consistently number 3.

TABLE IV

Meristic correlations in *Parvilux ingens*

Frequency of Correlated Counts					Coefficient of Correlation
Dorsal Rays	Anal Rays				
	15	16	17	18	
14	...	1	...	...	$r = +.25$
15	1	11	6*	1	$\pm .12$
16	2	15	26	...	
17	...	1	1	1	
Upper Gillrakers	Lower Gillrakers†				
	11	12	13	14	
4	4	8	...	...	$r = +.32$
5	3	103*	24	1	$\pm .07$
6	...	...	1	...	
VO Photophores, Left	VO Photophores, Right				
	3	4	5	6	
3	2*	...	...	...	$r = +.72$
4	1	56	...	...	$\pm .06$
5	1	3	4	...	
6	...	...	...	1	
AOa Photophores, Left	AOa Photophores, Right				
	5	6	7		
5	2	...	...		$r = +.68$
6	4	28*	2		$\pm .08$
7	...	2	6		
AOp Photophores, Left	AOp Photophores, Right+				
	6	7	8		
6	6	3	...		$r = +.86$
7	1	11	...		$\pm .05$
8	...	...	6		
Total AO Photophores, Left	Total AOp Photophores, Right+				
	12	13	14	15	
12	5	1	1	...	$r = +.79$
13	2	10	...	...	$\pm .08$
14	...	...	4	1	
15	...	...	...	1	
AOa Photophores	AOp Photophores+				
	6	7	8		
5	1	2	1		$r = -.06$
6	13	26*	9		$\pm .13$
7	5	3	3		

* Correlated count for *P. boschmai.*
† Including the raker at the angle.
\+ AOp incomplete on right side of *P. boschmai.*

about equal in length. The adipose fin originates somewhat behind end of anal base. The pectoral base is narrow (about 1.8 in the small orbit). In the holotype, as in most paratypes, the pectorals are damaged too extensively to allow an accurate measurement; the rays are so weak and the fin so narrow as to indicate that the fin probably does not reach farther than, if as far as, the pelvic base (in 7 paratypes the pectoral length measures .041 to .098 of the standard length, but the fin was probably broken in nearly all, perhaps in all).

The rather elongate, and curved but not fanglike, cardiform teeth, none of which are markedly enlarged, form broad bands on the jaws and narrow bands on the palatines. Similar but smaller teeth occur along the posterior border of the heads of the vomer, but not between the heads, and are closely set over the entopterygoids.

Photophores. — The photophores are all very small, in which respect this species resembles *Lampanyctus regalis* (Gilbert, 1891), heretofore the only known myctophid with such small photophores. On most of the lateral photophores melanin is concentrated on either side ventrally, with a narrow median break that often extends downward to a more or less clear area, which in some of the organs approaches the photophore proper in conspicuousness, so that an appearance is given of a dumbbell-shaped organ. The ventrolateral encroachment of pigment gives many of the light organs an irregular, oval appearance.

Dn, if present, is modified to, or is covered by, a large patch of whitish tissue, probably luminescent, which extends downward in front of the orbit. The round, prominent Vn lies some three diameters before the orbital margin and at the bottom of the whitish patch. OP_1, which lies low, below the angle of the jaws, at the edge of preopercle, is covered with adipose tissue. OP_2, also low, is deeply buried at the edge of the preopercle and lies only slightly above the upper border of the maxillary. PLO is high, nearly touching the lateral line at upper extremity of supracleithrum. PVO_2 lies just before the midbase of the pectoral fin; PVO_1 lies almost directly below PVO_2; a line joining PVO_2 with PVO_1, when extended downward, runs closer to PO_2 than to PO_1. The 5 PO are unevenly spaced and are not on the same level: the first three pairs gradually diverge from the ventral midline; the first is forward near the isthmus (about four diameters distant); PO_2 lies well behind the pectoral origin; PO_1 lies about one diameter, PO_2 three diameters, and PO_3 about four diameters from the ventral midline; the PO_1—PO_2 interspace is about one-fifth less than that between PO_2 and PO_5; the PO_2—PO_3 interspace is a little more than half that of PO_1—PO_2; PO_4 is markedly elevated to the level of PVO_2, and lies a little nearer to

PO_3 than to PO_5; PO_5 lies but little farther from the ventral midline than does either PO_1 or PO_2, just before and slightly mesad to the base of the outer pelvic ray. The 4 VO are evenly spaced, essentially in a straight line; the first is posteromesad to the inner pelvic ray; the last lies before and above the anus (the range of VO counts is 3 to 6, but 85 percent of the counts are 4). The 3 SAO form a slightly angulated line: the first is over the anus and four vertical diameters above and outward from, and two horizontal diameters behind, VO_4; SAO_2 lies two horizontal diameters behind and three above SAO_1; SAO_3 touches the lateral line under the base of the eleventh or twelfth dorsal ray, approximately over anal origin, and is separated from SAO_2 by an interspace about twice that between the first two; a vertical from anal origin falls a little behind SAO_3. The 7 AOa are all equally spaced in a straight line; the first originates over the base of the fifth anal ray, the last over base of fourth from last ray. There are 2 Pol (since they are missing on the left side of the holotype, those of the right side were described and were utilized in preparing the type figure); a line through the two, when extended, passes behind the last AOa and through the anterior part of the adipose base; the first Pol lies at least two horizontal diameters behind and two above the last AOa; the second lies just below the lateral line, over end of anal base. The 7 AOp are equally spaced in a straight line; the first is well behind anal base. The 4 Prc not continuous with AOp; the first two lie close together, near the bases of the procurrent rays; Prc_3 is moderately elevated and lies slightly farther from Prc_2 than Prc_2 does from Prc_1; Prc_4 is widely separated from the third, touches the lateral line over end of hypural plate, and lies about two diameters behind the vertical from Prc_3.

The supracaudal and infracaudal luminous glands, each comprising 4 scales, are both short, which is unusual for a species of the *Lampanyctus* group. They begin at base of first procurrent ray and fill 40 and 44 percent of the distance between the first procurrent ray and the end of the adipose and the anal base, respectively.

The color in preservative, with all scales lost, is a dark, warm brown. In life the species is probably very dark, perhaps black.

Etymology. — The name *ingens,* from the Latin, denotes the relatively immense size of the species, which is known to attain 200 mm in standard length; next to *Lampanyctus crocodilus* (Risso) it is the largest known myctophine.

Parvilux boschmai new species (textfigs. 1, 3, 5; pl. XXV fig. 2)

Holotype (and only known specimen): SIO 52—384—25B, 113 mm in standard length, deposited in the Marine Vertebrate Collection at the Scripps Institution of Oceanography; taken in the Eastern Tropical Pacific at 02° 09′ N 84° 53.5′ W, on August 29, 1952, in an Isaacs-Kidd 10-foot midwater trawl fished open from 1,265 meters (by computation from the wire angle).

This species is characterized by the description of the genus and by the following details.

The greatest depth measures 5.9, the head about 3.2 in the standard length. The eye is small (but not as small as in *P. ingens*); it measures 5.5 in head, 3.75 in upper jaw, and 1.4 in interorbital width. The long upper jaw (1.5 in head) extends about half its length behind a perpendicular drawn from the jaw slope through posterior margin of orbit; the maxillary is expanded posteriorly only as a small round terminal dome.

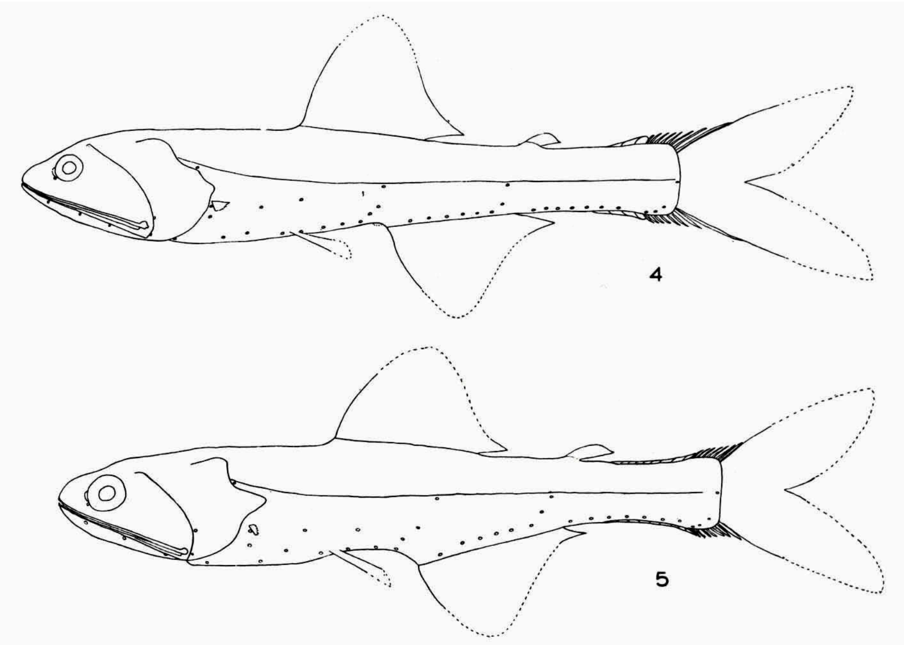

Fig. 4. *Parvilux ingens,* new species, holotype. Drawn by Robert L. Wisner.
Fig. 5. *Parvilux boschmai,* new species, holotype. Drawn by Robert L. Wisner.

Dorsal 15; anal 17; pectoral 12—13; pelvic 8—8; caudal 7, 10—9, 7. The procurrent caudal rays are stiff and spiny. The vertebrae number 35 and the lateral line pores 37. The scales are all lost. The slender gillrakers, excluding one rudiment on the upper and two on the lower limb, number 5 + 1 + 11 on each side; the one at the angle is as long as orbit.

Morphometric data are included in table II.

The dorsal origin is well before midbody (about as in *P. ingens*). The pelvic origin is a little before the vertical from that of dorsal (about as in *P. ingens*). The anal originates less than a pupil length behind the vertical from middle of dorsal base. The dorsal and anal bases are about equal in length. The adipose fin originates somewhat behind the end of the anal base. The pectoral base is narrow (about 3.5 in orbit); the rays are broken off near their bases, but probably were very short and weak in life.

The teeth of each jaw are arranged in a narrow band; they are minute, with none enlarged. There is an ovate patch of minute teeth on the posterior edge of each vomer head; the intervening space is toothless. Similar teeth are thickly set on the palatines and on the entopterygoids.

Photophores. — In size, appearance, and pattern the photophores of *P. boschmai* are generally similar to those of *P. ingens*. Dn, if present, is apparently represented merely by a narrow, silvery band of tissue (possibly luminous), about one-third as long as orbit, extending from anterior margin of orbit down to the prominent Vn. The body photophores are about half as high as long. OP_1, as large as most body photophores, lies at edge of preopercle about two vertical diameters below lower edge of maxillary end; OP_2 is about twice the size of OP_1 and lies at border of preopercle about on a level with lower margin of orbit. PLO is high, touching the lateral line. PVO_2 lies before and touches the middle of pectoral base; PVO_1 lies about five vertical diameters directly below PVO_2; a line joining the two, when extended downward, is nearer to PO_2 than to PO_1. The 5 PO, as in *P. ingens,* are unevenly spaced, and are not on the same level: the first lies about three diameters from the isthmus; PO_1 and PO_2 are close to ventral midline; PO_2 lies well behind a vertical from pectoral origin; the PO_1—PO_2 interspace is about one-fifth less than that between PO_2 and PO_5; the PO_2—PO_3 interspace is a little more than half that of PO_1—PO_2; PO_3 is elevated to three vertical diameters above, and lies four horizontal diameters behind, PO_2; PO_4 is markedly elevated to a point about level with PVO_2, and lies midway between PO_3 and PO_5; PO_5 is but little farther from the ventral midline than is either PO_1 or PO_2, and lies just before and slightly mesad to base of outer pelvic ray. There are only 3 VO, equally spaced, none elevated. VLO lies far behind a vertical from pelvic origin, about on a level with PVO_2 and PVO_4, a little below the midpoint between lateral line and ventral profile, and a little nearer to VO_1 than to VO_2. The 3 SAO form a nearly straight line; the first lies just behind and four vertical diameters above and outward from VO_3; SAO_2 lies three vertical diameters above and three horizontal diameters behind SAO_1 and over anal origin; SAO_3 touches lateral line under base of eleventh dorsal ray and over base of fourth anal ray; a vertical from the anterior border of AOa_1 touches the posterior border of SAO_3; the SAO_2—SAO_3 interspace is about one-half greater than that between SAO_1 and SAO_2. There are 6 AOa; the first is depressed one diameter below the second; the second through the last are level and straight; AOa_1 lies over the interval between bases of fifth and sixth anal rays; the last lies over the interval between the bases of the third and fourth from last ray; the AOa_1—AOa_2 interspace is slightly greater than any following interspace in the AOa series.

TABLE V

Comparison of the species of the genus *Parvilux*

	P. ingens	*P. boschmai*
Caudal glands	Short and deep	Much longer and slenderer
Overall length:*		
Above	.056—.093	.142
Below	.069—.100	.148
No. of scales:		
Above	2—6	6
Below	3—6	7
No. of vertebrae	36—38, usually 37	35
Photophores		
VLO	About over VO_1; much nearer to lateral line than to VO_1	Well behind VO_1; much nearer to VO_1 than to lateral line
VO	3—6 (seldom 3 or 6)	3
SAO_2	About over anus	About over anal origin
SAO_3	About over anal origin	About over AOa_1
AOa_1	Not depressed	Depressed about one diameter
Location of PO_4	Nearer to PO_3 than to PO_5	About equidistant
Anal origin	Under posterior third of dorsal base	About under middle of dorsal base
Teeth	Elongate, conical, and curved on jaws, vomer, and palatines; numerous only on jaws	More numerous and more minute on all structures
Proportional Measurements*		
Anal base	.176—.203	.224
Dorsal base	.168—.203	.223
Caudal-peduncle length†	.246—.272	.243
Anal origin to caudal base†	.423—.454	.474
Preanal length†	.552—.594	.555
Eye length†	.042—.049	.056

* Measurements expressed as proportions of standard length.

† Measured in specimens 95-133 mm in standard only, to ensure a reliable comparison of the species.

The 2 Pol form a straight line with the last AOa; this line, when extended, passes through the adipose base; the first (lower) Pol lies about two horizontal diameters behind and three above last AOa; the upper touches the lateral line over base of last anal ray. The 7 AOp are equally spaced. The 4 Prc are not continuous with AOp; the first two lie low on the caudal profile, nearly on the same level and well below the level of the AOp series; the third lies about three diameters above and four behind the second; the fourth is widely separated, touching the lateral line at end of hypural plate, about two diameters behind a vertical from the third Prc. The AOp—Prc interspace is little less than half that between AOa and AOp.

The long supracaudal luminous gland comprises 6 well coalesced scales and fills about 74 percent of the space between the first procurrent caudal ray and the adipose base. The infracaudal gland, also long, comprises 7 well coalesced scales, and fills about 68 percent of the space between first procurrent ray and end of anal base. Each gland is outlined by a narrow band of brownish pigment. No pigmented lines are visible between the individual scales of either gland.

Color in preservative is light brown.

Though the species are essentially alike in the characters cited in the generic description and are similar in most morphometric features (table II), *P. boschmai* differs trenchantly in a number of respects from *P. ingens* (table V).

Particularly notable among the diagnostic features of *P. boschmai* is the much greater length of the luminous glands on the margins of the caudal peduncle: in *P. boschmai* the upper gland occupies 74 percent of the free upper edge of the peduncle and measures 14 percent of the standard length, whereas in *P. ingens* the gland occupies less than half the free edge and measures less than 10 percent of the standard length; in *P. boschmai* the lower gland occupies 68 percent of the lower free edge and measures 15 percent of the standard length, whereas in *P. ingens* this gland also occupies less than half of the free edge and measures 7 to 10 percent of the standard length. The scales in the caudal glands are more numerous in *P. boschmai:* 6 above and 7 below, rather than 2 to 6 above and 3 to 6 below (when numbering 5 or 6, the scales in *P. ingens* are smaller than in *P. boschmai*).

The vertebrae number 35 in the type of *P. boschmai,* versus 36 to 38, usually 37 in *P. ingens.*

There are marked differences also in the arrangement of the photophores on the body — traditionally the main diagnostic feature of myctophids. The VLO is farther back in reference to VO_1 and is much lower; the SAO series is farther back in reference to the front of the anal fin (because the origin of the anal fin is more advanced); AOa_1 is depressed about one diameter instead of being in line with those following; and PO_4 is about equidistant between PO_3 and PO_5 instead of being much nearer to PO_3.

There are also some marked differences in proportions: the dorsal and anal fins are longer, the caudal peduncle is somewhat shorter, the distance from anal origin to caudal base is greater (and the preanal length averages less), and the eye is definitely larger.

We take much satisfaction in contributing to this volume and in dedicating this fine species to Hilbrand Boschma: a man who, with spirit as notably erect as his body, has ably carried on in the fine tradition of the great naturalists of Leiden.

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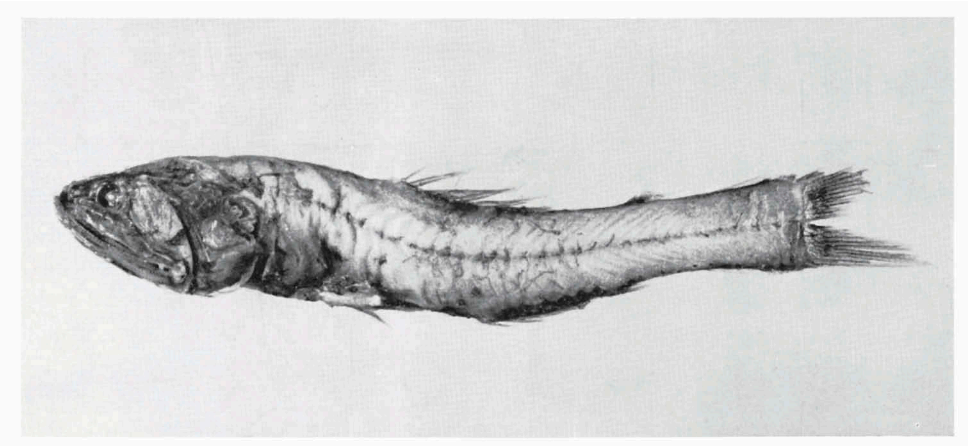

Fig. 1. *Parvilux ingens,* new species, holotype. Phot. Scripps Institution of Oceanography.

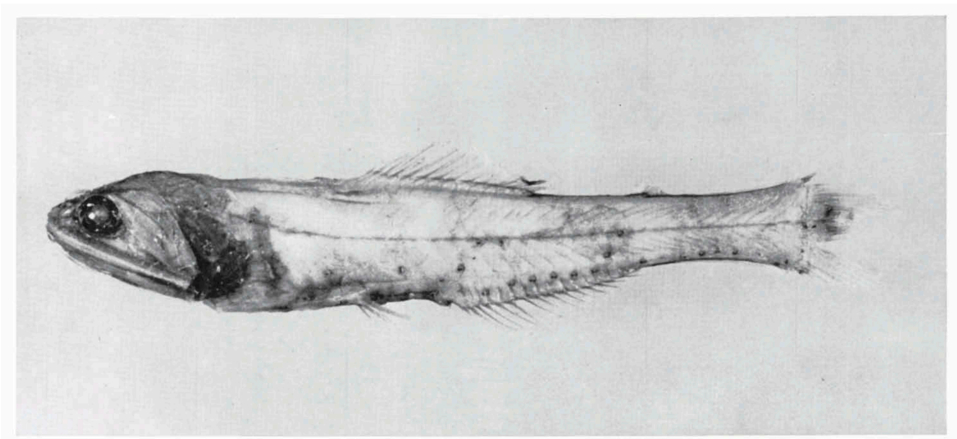

Fig. 2. *Parvilux boschmai,* new species, holotype. Phot. Scripps Institution of Oceanography.