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The barracudina genera *Lestidium* and *Lestrolepis* of Taiwan, with descriptions of two new species (Aulopiformes: Paralepididae)

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Abstract

Two genera of barracudinas with luminescent duct in abdominal cavity, *Lestrolepis* and *Lestidium*, collected from around Taiwan are studied. Two species in each genus are recognized in Taiwan, including one new species in each genus. New diagnostic characters are used to distinguish these species. *Lestrolepis nigroventralis* **sp. nov.** is similar to *Lestrolepis intermedia* and can be distinguished by having 32–35 prehaemal vertebrae; dorsal-fin origin slightly in front of midline of distance between origins of pelvic and anal fins, distance between origins of dorsal and pelvic fin 9.8–11.7% SL; and pelvic-fin origin at or slightly behind midline of body, prepelvic length 50.6–52.6% SL. *Lestidium orientale* **sp. nov.** is similar to *Lestidium atlanticum* and can be distinguished by having prehaemal vertebrae 37–40; caudal vertebrae 41–44; a relatively short and deep head, reflected by a shorter snout (9.7–10.4% SL), shorter upper jaw (8.6–10.1% SL), shorter lower jaw (11.9–13.7% SL) and a deeper head (31.2–33.9% HL). Data of *Lestrolepis japonicus* and *Lestidium prolixium* collected from Taiwan, as well as two Atlantic congeners, are provided. DNA barcoding is conducted to support the recognition of these new species.

Keywords. Actinopterygii, taxonomy, ichthyology, *Lestidium*, *Lestrolepis*, Taiwan

Introduction

The baracaudina family Paralepididae (*sensu* Rofen, 1966; Post, 1990) comprises 11 genera (excluding *Sudis*), and with about 60 species (Froese & Pauly, 2019; Ho, pers. data), despite Ghedotti *et al.* (2015) recognized an independent family Lestidiidae with four "naked body" genera. They mainly inhabit in midwater or near the bottom of continental shelf and slope and are important food for whales and swift predators (Rofen, 1966). *Lestidium* and *Lestrolepis* belong to the naked group, Tribe Lestidiini (or Lestididae), usually have a translucent body, or nearly so, a high number of vertebrae, and are relatively slender and delicate.

The genus *Lestrolepis* comprises three nominal species, *Lestrolepis japonica* (Tanaka, 1908) from the western Pacific Ocean; *Lestrolepis intermedia* (Poey, 1868) that is circumglobal in tropical and subtropical, seas and *Lestrolepis pofi* Harry, 1953a that is found in the west Pacific Ocean, including Hawaii. Although often included in *Lestrolepis*, *Paralepis luetkeni* Ege, 1933 is now placed in *Lestidiops* (Ho & Golani, 2019). In the present study, we found the northwestern Pacific population of *Ll. intermedia* has several distinct differences and can be separated from the western Atlantic population (type locality); hence it is described as a new species in this study.

The genus *Lestidium* also comprises three nominal species: *Lestidium atlanticum* that is circumglobal in tropical and subtropical seas previously, but it might need to be divided into several species (Ho, pers. data). *Lestidium prolixium* Harry, 1953a is found in the northwestern Pacific Ocean off Taiwan and Japan. *Lestidium nudum* is found in the Indo-Pacific Ocean previously, but it is found to be restricted in the Hawaiian Islands and tropical Pacific Ocean (Ho, pers. data). Following a detailed examination and comparison, we recognized the northwestern Pacific population of *Lt. atlanticum* as distinct from the Atlantic population (type locality). Another unidentified form is recognized from Taiwanese and Australian waters, which is being described in a separate work. Specimens of another species similar to *Lt. prolixum* were also found in Taiwan and the Philippines, however, these specimens have clear differences and are currently under study.

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A number of diagnostic characters are introduced to distinguish these species, which can also be applied to other paralepidids. DNA barcoding methods were used to support the recognition of these new species. The purpose of this work is to describe the two new species, to document species that occur in Taiwan, and to provide supplemental data of some congeners.

Methods and materials

Methods for taking counts and measurements and terminology followed Harry (1951), with some modifications provided in Ho & Golani (2019). Standard length (SL) is measured from tip of upper jaw to posterior margin of hypural plate. Head length (HL) is measured from tip of upper jaw to posterior margin of gill cover. Head depth is measured through middle of eye. Length of predorsal, prepelvic, and preanal are measured from tip of upper jaw to origins of the respective fins. Body depth and body width are measured at the base of the pectoral fin. Pectoral-fin length is measured from the upper base to the end of the fin when the fin is complete. Distance between the origins of pelvic and anal fins (V–A), origins of pelvic and dorsal fins (V–D), and origins of dorsal and anal fins (D–A) are calculated from prepelvic, predorsal and preanal lengths, or measured from horizontal distance of point to point. Snout length is measured from tip of upper jaw to anterior bony margin of orbital. Eye diameter is the horizontal distance of bony margins of the eye. Length of upper jaw is measured from tip of the jaw to posterior end of maxilla. Length of lower jaw is measured from tip of the jaw to the articulation of articular bone.

Vertebrae are counted in several values: prehaemal, anterior vertebrae without haemal spines (e.g. along abdomen cavity); caudal vertebrae with haemal spines (including urostyle); prepelvic, predorsal, and preanal vertebrae are the total number of vertebrae before each fin origin (not insertion of pterygiophore), respectively; total vertebrae is the sum of prehaemal and caudal vertebrae.

Lateral-line scales are also counted in several values: prepelvic, predorsal, and preanal lateral-line scales are the number of scales before the fin origins; total number of scales comprise large and broad scales at most of the length and narrow and small scales at posterior section, the scales can be separated by the shape and size easily, the boundary is at around AFO to anterior half of anal-fin base generally.

Part of specimens were stained by Alizarin Red (1,2-dihydroxyanthraquinone) which dissolved in 70% EtOH or 50% Isopropanol alcohol for better observation of meristic counts.

Abbreviations: DFO=dorsal-fin origin, VFO=pelvic-fin origin, AFO=anal-fin origin, and vert. =vertebrae.

Specimens examined in present study are deposited at Bishop Museum (BPBM), Kagoshima University Museum (KAUM–I), Museum of Comparative Zoology (MCZ), Pisces Collection of National Museum of Marine Biology & Aquarium (NMMB-P), National Science Museum, Tokyo (NSMT-P), and Museum of Natural History, Smithsonian National (USNM).

Specimens are measured and counted subject to their condition due to the preservation.

Genetic analysis. Extractions of genomic DNA and applications of polymerase chain reaction generally followed Tighe et al. (2018). Genomic DNA was eluted in 50 µl of ddH_2O. The DNA barcode 5' region of the COI mtDNA locus was amplified in 25 µl reactions using different combinations of four published primers: FishF1-5' TCAACCAACCACAAAGACATTGGCAC3', FishF2-5'TCGACTAATCATAAAGATATCGGCAC3', FishR1-5'TAGACTTCTGGGTGGCCAAAGAATCA3', FishR2-5'ACTTCAGGGTGACCGAAGAATCAGAA3'. Raw trace files were edited in MEGA 7 program, complementary strands were aligned, edited, and inspected for translation. Consensus sequences were generated and deposited in GenBank. Neighbor joining (NJ) analyses were performed using MEGA7 with the rapid bootstrap inferences (1000 replicates).

A total 29 COI sequences (ca. 600 base pairs), 7 downloaded from the GenBank and 2 from the BOLD, plus 2 sequences of *Arctozenus risso* (Paralepidinae) downloaded from GenBank, are analyzed. Accession numbers of these sequences are: *Ll. japonica*, n=10 (MN486236–43, KM981887, KJ190055); *Ll. intermedia*, n=4 (MF041199, MF041718, MG856491, MG856495); *Ll. nigroventralis* **sp. nov.**, n=2 (MN486234–5); *Lt. atlanticum*, n=3 (KF930044, BACQ297, UKFBJ488); *Lt. prolixum*, n=2 (MN486231–2); *Lt. orientale* **sp. nov.**, n=8 (MN486223–30, MN486233); and *Arctozenus risso*, n=2 (KY03386206, KY03386206).

Note on some diagnostic characters

Several additional meristic values are used to distinguish species found in Taiwan, as well as comparative materials from other localities. These characters are further explained below. Note the following observation may not be applied to all species but only to specimens found in Taiwan and most species that examined by the first author (HCH).

Dorsal-fin rays. The first dorsal-fin ray is short and unsegmented, closely attached to the second ray. With the ray stained in red color, they can be seen easily. The last ray is branched to the base and it base is clearly separated from the penultimate ray. There are consistently 9 fin rays in members of *Lestrolepis* and 10 fin rays in members of *Lestidium* examined by us (Table 1). It is notable that the fin rays are damaged commonly and some rays may break into branches which makes it difficult to count precisely.

TABLE 1. Frequency of fin ray counts of all species examined in present study.

	Dorsal-fin rays			Pectoral-fin rays				Pelvic-fin rays		
	n	9	10	n	12	13	14	n	9	
Lestrolepis intermedia	7	9		7	7			7	7	
Ll. japonica	82	82		82	78	4		82	9	
Ll. nigroventralis **sp. nov.**	40	40		43	27	16		43	43	
Lestidium atlanticum	8		8	8	3	5		8	8	
Lt. orientale **sp. nov.**	53		53	59	7	37	15	54	54	
Lt. nudum	4		4	6	5	1		6	6	
Lt. prolixum	20		20	20		19	1	20	20	

	Anal-fin rays																		
	n	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
Lestrolepis intermedia	10												1?	0	1	3	2	4	
Ll. japonica	82											2	12	11	55	2			
Ll. nigroventralis **sp. nov.**	42																19	19	4
Lestidium atlanticum	8			2	2	8													
Lt. orientale **sp. nov.**	38	1	17	19	16	2													
Lt. nudum	4								4										
Lt. prolixum	19						5	10	4										

Pectoral-fin rays. The first pectoral-fin ray is short and flattened, usually closely attached to the second ray, which makes it like a single strong ray. But the bases of first two rays are separated clearly when stained. In some members, the last ray is long, but it is inserted slightly behind that of the rest and the base is not easy to see without staining. Total fin rays is 12–14 in all specimens examined (Table 1).

Pelvic-fin rays. The first pelvic-fin ray is usually flat and closely attached to the second rays, which is counted separately. The last ray is long and supported by thick muscle, its base closely attached to penultimate ray. We counted consistently nine fin rays in species of *Lestrolepis* and *Lestidium* (Table 1).

Anal-fin rays. The first two (sometimes three) fin rays are much shorter, simple and unsegmented, the remainder of the anal-fin rays are branched and segmented; the last ray branched to the base. Because the first ray is short and flat, it sometimes attaches to the next ray and make both look like a single element. With the fish stained, these elements can be seen easily. Members of *Lestidium* have relatively few anal-fin rays (26–33); whereas, members of *Lestrolepis* have relatively more rays (32–43; Ho, pers. data). The numbers of anal-fin rays can separate the species well (Table 1).

TABLE 2. Frequency of total lateral-line scales of all species examined in present study.

	n	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Lestrolepis japonica	65	6	15	24	11	5	3	0	1															
Ll. intermedia	5									1	2	2												
Ll. nigroventralis **sp. nov.**	43											1	2	14	8	10	6	2						
Lestidium nudum	8														1	1	0	0	1	0	1	0	3	1
	n	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126					
Lt. orientale **sp. nov.**	35	1	1	2	0	3	3	3	1	3	0	2	3	1	1	6	1	3	1					
Lt. atlanticum	6							3	0	0	1	0	0	0	1	0	0	1						
	n	145	146	147	148	149	150	151	152	153	154	155	156	157	158									
Lt. prolixum	14	1	1	3	0	3	1	2	1	2	1	1	1	1	1									

TABLE 3. Frequency of prepelvic, predorsal and preanal lateral-line scales (LLs) in all species examined in present study.

	Prepelvic LLs									Predorsal LLs														
	n	31	32	33	34	35	36	37		n	33	34	35	36	37	38	39	40	41	42	43	44	45	46
Lestrolepis intermedia	4	3	1							4										1	3			
Ll. japonica	46	38	8							48						18	23	7						
Ll. nigroventralis **sp. nov.**	41			1	14	24	2			44											1	17	16	10
Lestidium atlanticum	8			3	4	1				8	1	6	16											
Lt. orientale **sp. nov.**	47				2	21	20	4		47		18	25	4										
Lt. nudum	3			3						3							2	1						
Lt. prolixum	20					1	14	5		20							4	12	3	1				

	Preanal LLs									
	n	49	50	51	52	53	54	55	56	57
Lestrolepis intermedia	4				3	1				
Ll. japonica	48	16	32							
Ll. nigroventralis **sp. nov.**	42					1	5	22	11	3
Lestidium atlanticum	8			4	5					
Lt. orientale **sp. nov.**	47				17	22	8			
Lt. nudum	3						3			
Lt. prolixum	20						2	10	6	2

TABLE 4. Frequency of prehaemal and caudal vertebrae of all species examined in present study.

	Prehaemal vertebrae															
	n	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
Lestrolepis intermedia	10	2	8													
Ll. japonica	79			26	45	8										
Ll. nigroventralis **sp. nov.**	44					5	19	19	1							
Lestidium atlanticum	8									1	7					
Lt. orientale **sp. nov.**	44										9	22	11	2		
Lt. nudum	4									4						
Lt. prolixum	23									1	3	12	5	1	1	

	Caudal vertebrae																							
	n	41	42	43	44	45	//	50	51	52	53	54	55	56	57	58	//	60	61	62	63	64	65	66	67
Lestrolepis intermedia	10																		2	0	2	2	1	1	2
Ll. japonica	79									1	1	20	29	21	6	1									
Ll. nigroventralis **sp. nov.**	42																	2	10	17	7	4	1	1	
Lestidium atlanticum	8			1	1	6																			
Lt. orientale **sp. nov.**	44	6	19	14	5																				
Lt. nudum	4											3	1												
Lt. prolixum	22							4	7	9	2														

TABLE 5. Frequency of total vertebrae of all species examined in present study.

	n	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98
Lestrolepis intermedia	10												1	0	3	2	3	0	1		
Ll. japonica	70				1	0	5	15	26	16	7										
Ll. nigroventralis **sp. nov.**	46																6	12	21	5	2
Lestidium atlanticum	8		1	2	5																
Lt. orientale **sp. nov.**	44	8	11	16	8	1															
Lt. nudum	4												3	1							
Lt. prolixum	22									2	2	6	6	5	0	1					

Lateral-line scales. In most paralepidids, the lateral line runs to about the middle anal-fin base (defined as "lateral line incomplete" herein). In this work, we counted fewer than 90 total scales in *Lt. nudum* and all three species of *Lestrolepis* (Table 2). On the other hand, the lateral line extends to the caudal fin base (defined as "lateral line completed" herein) in *Lt. atlanticum*, *Lt. orientale* **sp. nov.** and *Lt. prolixum*, with usually more than 110 (up to 158) total lateral-line scales (Table 2). The lateral-line scales can be roughly divided into two sections, the anterior scales (to about middle of anal-fin base) are large, each associated with one myomere, followed by clearly smaller scales, usually 2 or 3 associated with each myomere. There are 55–74 large scales in anterior section (usually to around anal-fin base), followed by 51–95 (lateral line complete) or 3–21 (lateral line incomplete) small scales.

Here we provide the numbers of prepelvic, predorsal, and preanal lateral-line scales which are useful in separating species (Table 3). Moreover, these values are closely associated with the number of prepelvic, predorsal, and preanal vertebrae, respectively, usually different by less than 3 in number. In other words, these scale counts can be used to predict the vertebral counts without radiographing the fish.

Morphology of lateral-line scales. The shape of lateral-line scales were used to distinguish some genera or species (*i.e.* Harry, 1951, 1953a, b). We found it is difficult to observe the shape without staining these scales, especially on these fresh caught specimens. Moreover, the shape of stained scales is similar in all species examined in the present study. Previous authors provided the number of small pores on the scales to distinguish the species. We found the number of small pores on lateral-line scales to be variable, and the results depend on which body position is examined. The scales before DFO usually have a consistent number and localities of pores and can be used to distinguish species as suggested by previous authors.

Gill rakers. There are usually 2 or 3 small teeth sharing the same base and forming gill rakers, except for some small and free teeth, on the first gill arch in all members of *Lestrolepis* and *Lestidium*. However, it is very difficult to distinguish the rakers due to the highly variable size. We also found that the number of teeth on each raker and the number of gill rakers are variable and subjected to the age of the fish. Although previous authors have used these characters to distinguish the species, we found the numbers are mostly overlapping among the members of *Lestrolepis* and *Lestidium*.

Vertebral counts. Previous authors, such as Harry (Rofen) and Post, counted prehaemal vertebrae (Table 4) and total vertebrae (Table 5) which can separate the species quite well. In this study, we add the values of caudal vertebrae (Table 4), prepelvic vertebrae, predorsal vertebrae, preanal vertebrae, and the number of predorsal vertebrae minus that of prepelvic vertebrae (e.g. vertebrae between origins of dorsal and pelvic fins). As mentioned above, the values of prepelvic, predorsal, and preanal lateral-line scales (Table 6) are closely related to these of prepelvic, predorsal, and preanal vertebrae, respectively. They can be used to distinguish most species together with combination of other characters.

Luminescent duct. Luminescent duct inside the ventral margin of abdominal cavity are present and branched into two in *Ll. japonicus*, *Ll. intermedia*, *Ll. pofi* and *Ll. nigroventralis* **sp. nov.**, whereas the luminescent duct is simple and unbranched in *Lt. atlanticum*, *Lt. nudum*, *Lt. orientale* **sp. nov.**, *Lt. prolixum*. It is obvious that *Lestidium bigelowi* Graae, 1967 does not process such a luminescent duct based on the original description. The duct is extended further beyond the eye in *Lt. atlanticum* and *Lt. orientale* **sp. nov.**, whereas that in *Lt. nudum*, *Lt. prolixum*, and all three species of *Lestrolepis* extended to only below opercle and not further anterior.

TABLE 6. Frequency of of prepelvic, predorsal, preanal vertebrae, and vertebrae between VFO and DFO of all species examined in present study. Negative values means that VFO is behind DFO.

	Prepelvic vertebrae											
	n	30	31	32	33	34	35	36	37	38	39	40
Lestrolepis intermedia	8	1	4	3								
Ll. japonica	78	8	52	17	1							
Ll. nigroventralis **sp. nov.**	47				4	27	16					
Lestidium atlanticum	8				1	4	3					
Lt. orientale **sp. nov.**	44					2	22	16	4			
Lt. nudum	8					2	5	1				
Lt. prolixum	23						4	9	8	2		

	Predorsal vertebrae															
	n	33	34	35	36	37	38	39	40	41	42	43	44	45	46	
Lestrolepis intermedia	8										4	3	1			
Ll. japonica	79				1	9	34	25	10							
Ll. nigroventralis **sp. nov.**	47											3	26	16	2	
Lestidium atlanticum	8		2	5	1											
Lt. orientale **sp. nov.**	44	4	20	16	4											
Lt. nudum	8	1	4	3												
Lt. prolixum	23						1	1	10	8	3					

	Preanal vertebrae										
	n	48	49	50	51	52	53	54	55	56	57
Lestrolepis intermedia	8			1	0	4	3				
Ll. japonica	79	6	30	35	8						
Ll. nigroventralis **sp. nov.**	47						1	14	28	3	1
Lestidium atlanticum	8					5	3				
Lt. orientale **sp. nov.**	44				2	20	12	10			
Lt. nudum	4								3	1	
Lt. prolixum	23							1	10	7	5

	Vertebrae between VFO and DFO														
	n	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12
Lestrolepis intermedia	8													1	3	4
Ll. japonica	78								1	7	43	23	4			
Ll. nigroventralis **sp. nov.**	47												9	27	11	
Lestidium atlanticum	8			3	5											
Lt. orientale **sp. nov.**	44	10	26	8												
Lt. nudum	3								1	2						
Lt. prolixum	21						4	15	2							

Light organ in front of eye. As confirmed by Ghedotti *et al.* (2015), the black papilla in front of eye is a light organ. All species of *Lestrolepis* possess a light organ in front of the eye; whereas, there is no such a light organ in species of *Lestidium*. In addition, Gilbert (1905) noted that *Lt. nudum* possesses a light organ duct on the lower margin of the orbit which was confirmed by us. Based on our observation, there is a luminescent duct along the inner side of first and second infraorbitals, which is connected to the light organ in front of eye in all three species of *Lestrolepis* and in *Lt. nudum* and *Lt. prolixum*; whereas, it is absent in *L. atlanticum* and *L. orientale* **sp. nov.** Harry (1953a) disagreed the observation of Gilbert (1905) and stated "…*This was in error; no paralepidid has any light organ*" which has subsequently been shown to be incorrect (Ho & Golani, 2019).

The position of nostrils. The anterior and posterior nostrils are close to each other. According to Harry (1953a, b), the nostrils are located at either above or well before the posterior end of maxilla. All specimens examined in present study have the nostrils before the posterior end of maxilla.

Pigmentation. Arrangement of pigments are variable and depend on growth stages and species. Some species tend to have more black pigmentation than others, and adults tend to have more pigmentation than the juveniles. However, as pointed out by previous authors (e.g., Harry, 1953a, b; Rofen, 1966), the chromophores along the lateral line and abdomen ridge are more consistent than those in other areas. The luminescent duct(s) are usually accompanied with black pigment and can be seen from the translucent abdominal cavity. In *Stemonosudis*, the overall body coloration and blotches are also fairly consistent. Although peritoneal sections can be used to distinguish the species as well, this character will subject to the condition of the specimen(s) following fixation and preservation. Moreover, large adults may have all sections fused and thus not countable.

Jaw teeth. Although previous authors described jaw teeth and their arrangement in detail, we found no significant difference in specimens examined in present study. In some other cases, the number of teeth can be used to distinguish species (Ho, pers. obs.).

Family Paralepididae

Key to species of *Lestrolepis* and *Lestidium* in Taiwan

1A. A light organ in front of eye; luminescent duct divided into 2 branches; dorsal-fin rays 9 . . . . . *Lestrolepis* 2
1B. No light organ in front of eye; luminescent duct unbranched; dorsal-fin rays mainly 10 . . . . . *Lestidium* 3
2A. DFO clearly in front of midline of V–A; anal-fin rays 36–40; lateral-line scales 65–72; total vertebrae 82–88; narrow band of chromatophores above the abdominal ridge. . . . . *Ll. japonica*
2B. DFO at or slightly in front of middle of V–A; anal-fin rays 41–43; lateral-line scales 75–81; total vertebrae 94–98; abdomen ridge with broad black margin . . . . . *Ll. nigroventralis* **sp. nov.**
3A. Luminescent duct extending beyond anterior margin of eye; DFO at about same level of VFO; total vertebrae 79–86 4
3B. Luminescent duct extending to below opercle; DFO clearly behind VFO; total vertebrae 86–93 5
4A. Total vertebrae 79–83; total lateral-line scales 109–126; predorsal vertebrae 33–36; predorsal lateral-line scales 34–36 . . . . . *Lt. orientale* **sp. nov.**
4B. Total vertebrae 85–86; total lateral-line scales 130–134; predorsal vertebrae 38–40; predorsal lateral-line scales 38–39 . . . . . *Lestidium* sp.1 (cf. *atlanticum*)
5A. DFO above or slightly behind tip of appressed pelvic fin; total lateral-line scales 145–158; scales between VFO and DFO 3–5 . . . . . *Lt. prolixium*
5B. DFO close, but clearly behind tip of appressed pelvic fin; total lateral-line scales 123–139; scales between VFO and DFO 5–7 . . . . . *Lestidium* sp.2 (cf. *prolixum*)

Lestrolepis Harry, 1953

Lestrolepis Harry, 1953a:240 (Type species *Paralepis philippinus* Fowler, 1934, a junior synonym of *Lestrolepis japonica*).

Diagnosis. Body scaleless, except for the lateral line covered by a single row of scales; luminescent duct present, originating from below opercle and divided into two branches immediately; a light organ (black papilla) in front of eye; a luminescent duct along lower margin of orbit in some species; DFO well behind VFO; ventral adipose fin well developed between anus and anal fin; dorsal-fin rays 9; anal-fin rays 32–43; pelvic-fin rays 9; vertebrae: prehaemal 28–35, predorsal 36–46, caudal 52–66, and total 82–98. Dorsal surface light grayish, chromatophores

cover upper fourth or fifth of body, head and caudal region. Ventral ridge between pectoral and pelvic fins variously with pigment.

Remarks. *Lestrolepis* currently includes four species, *Ll. japonica* from western Pacific Ocean, *Ll. intermedia* from western central Atlantic Ocean, *Ll. pofi* from Indo-Pacific ocean (including Hawaii) and *Ll. nigroventralis* **sp. nov.** from the western Pacific. Although the genus previously included *Lestrolepis luetkeni* (Ege, 1933), as a senior synonym of *Ll. Pofi*, this species is now recognized as a member of *Lestidiops* (Ho & Golani, 2019).

***Lestrolepis nigroventralis* sp. nov.**

New English name: Black-belly barracudina

Figures 1A–C, 2A–D, 3A; Tables 1–8

Lestrolepis intermedia (non Poey, 1868): Chen & Yu, 1986:324.

Holotype. NMMB-P28481 (1, 234), off Dong-gang, Pingtung, southwestern Taiwan, South China Sea, midwater trawl, 0–50 m, 30 Jan. 2018 [from bycatch].

Paratypes. Forty-three specimens, 134–244 mm SL. Collected from off Dong-gang, near the type locality: KAUM–I. 125204–125206 (3, 180–185), 27 Mar. 2018. NMMB-P18105 (2, 220–240, stained), 4 Jan. 2013. NMMB-P24635 (1, 238), 12 Oct. 2011. NMMB-P24718 (2, 183–249, stained), 11 Oct. 2016. NMMB-P25563 (1, 180, stained), 4 Feb. 2016. NMMB-P25564 (1, 184), 20 Jan. 2017. NMMB-P25565 (1, 230), 10 Jan. 2017. NMMB-P27930 (1, 244), NMMB-P27933 (17, 148–197), NMMB-P27935 (5, 180–235), NMMB-P27940 (1, 231), NMMB-P27941 (1, 228), NMMB-P30790 (4, 177–237, stained), Dong-gang, 6 Dec. 2017. **Japan.** NSMT-P48916 (1, 167), south of Sagami Bay, Honshu, southern Japan, 4 Nov, 1995. NSMT-P65466 (1, 134), 36°53.76'N, 141°33.7'E, Pacific coast off Ibaraki, Honshu, southern Japan, 459–530 m, ottet trawl, 20 Oct. 2002. NSMT-P67598 (1, 230), 28°59.87'N, 127°9.35'E, Each China Sea, 350 m, otter trawl, 5 Nov. 2003.

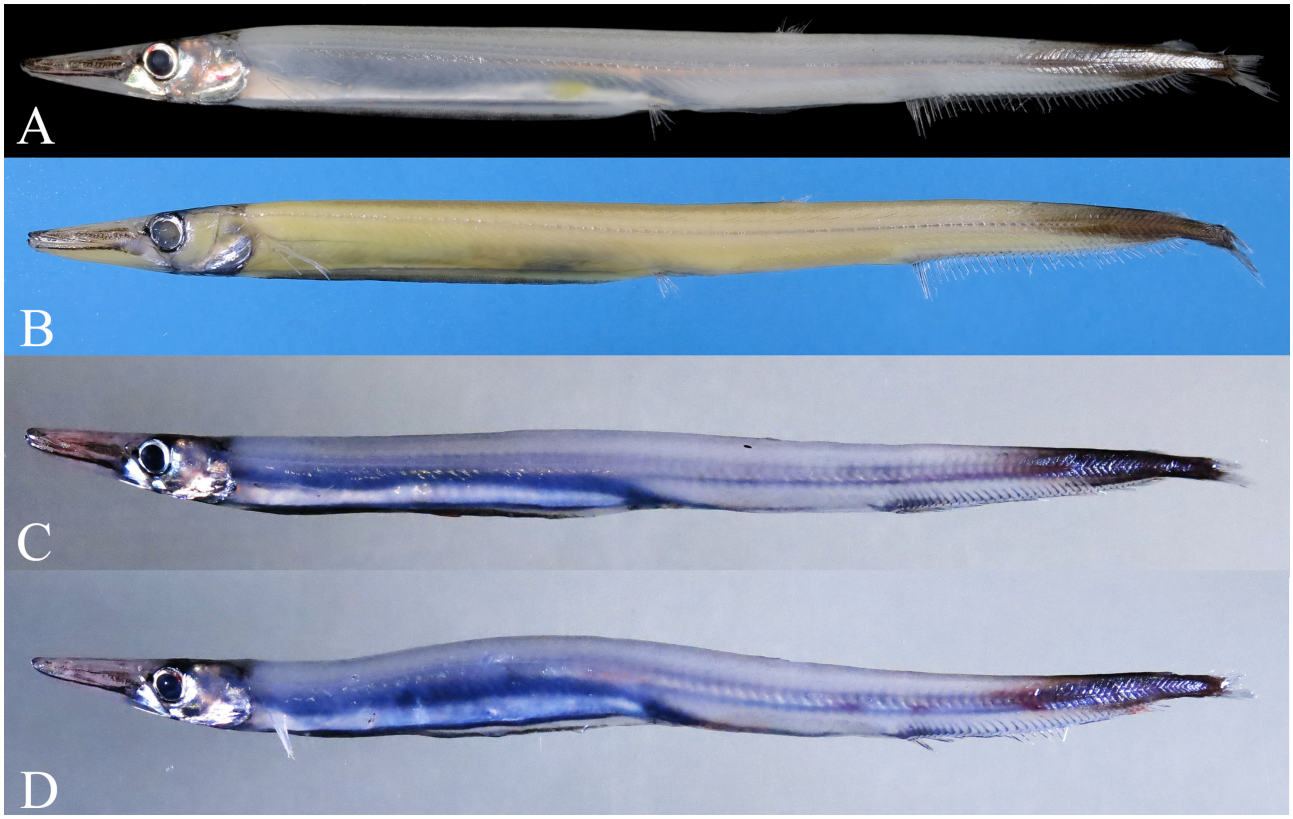


FIGURE 1. *Lestrolepis nigroventralis* **sp. nov.** A, B. NMMB-P28481, holotype, 234 mm SL. A. fresh, photo by K. Koeda. B. preserved. C. NMMB-P27930, paratype, 244 mm SL, fresh. D. NMMB-P27941, paratype, 228 mm SL, fresh.

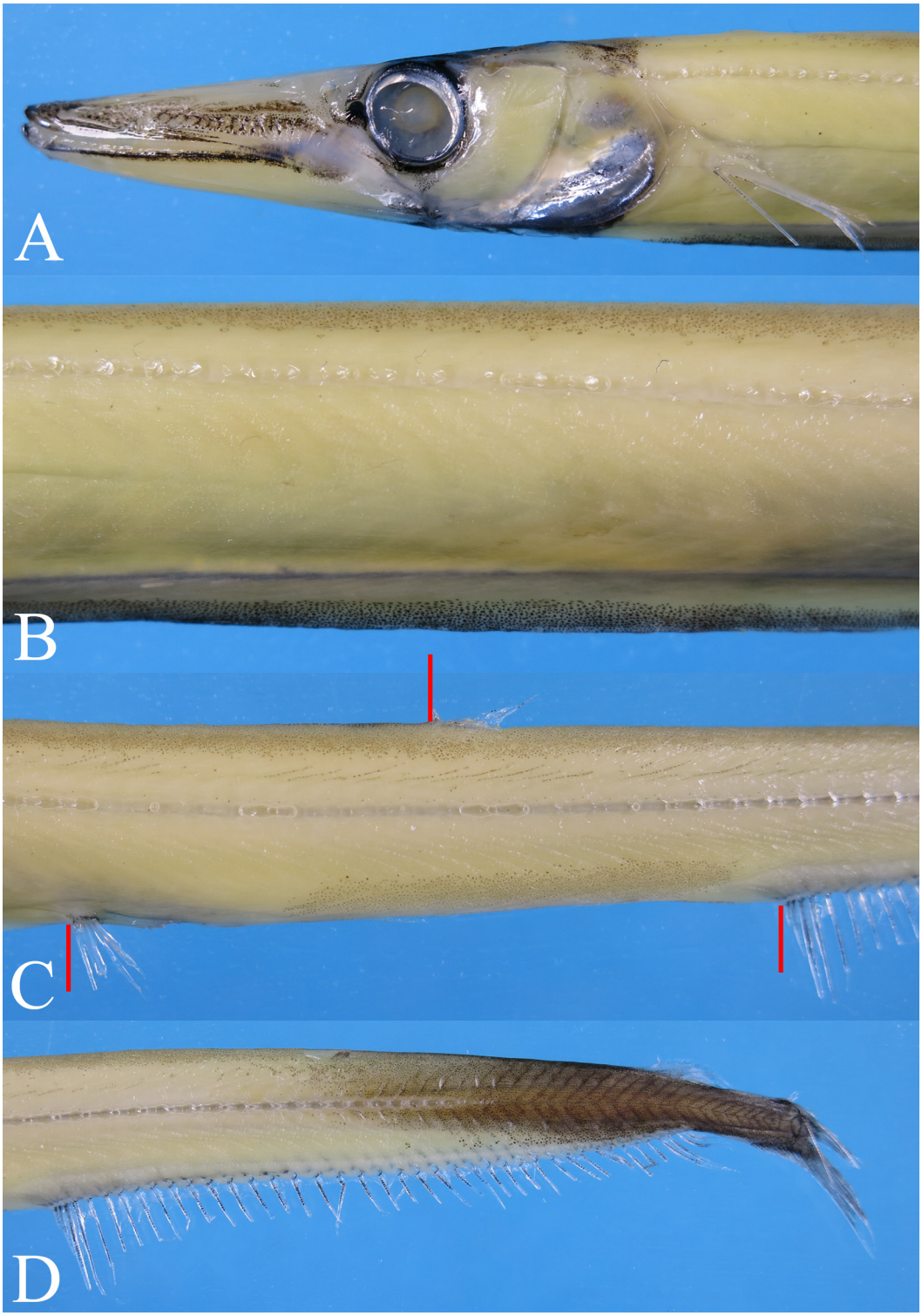


FIGURE 2. *Lestrolepis nigroventralis* **sp. nov.** A. NMMB-P28481, holotype, 234 mm SL, preserved. A. lateral view of head. B. mid-trunk showing the pigmentation. C. lateral view of trunk, bars point to origins of dorsal fin (above), pelvic fin (left) and anal fin (right). D. lateral view of caudal region.

Non-types. Collected from near the type locality: NMMB-P26455 (1, 185), 20 Jun. 2017. NMMB-P27929 (3, 180–234), 16 Jul. 2017. NMMB-P30803 (18, 102–192), 27 Mar. 2018. Collected from off Japan: NSMT-P13816 (2, 144–153), off Kanbara, Shizuoka City, Honshu, Suruga Bay, southern Japan, 17 Nov. 1968. NSMT-P48931 (1, 154), off Pacific cost of Tohoku District, Honshu, southern Japan, 5 Nov. 1995. NSMT-P65464 (1, 181), 37°45.9'N,

142°9.53’E, Pacific coast off Fukushima, Honshu, Japan, 647–676 m, otter trawl, 19 Oct. 2002. NSMT-P67563 (1, 145), 31°20.65’N, 128°10.88’E, East China Sea, 392 m, otter trawl, 8 Nov. 2003. NSMT-P91547 (1, 164+), 38°21.5’N, 141°56,4’E, Pacific coast off Miyagi, Honshu, southern Japan, 280 m, trawl, 23 Oct. 2007. NSMT-P102802 (1, 169), 36°58.44’N, 141°25.72’E, off Fukushima, Honshu, southern Japan, 251–252 m, otter trawl, 26 Oct. 2006.

Diagnosis. A species of *Lestrolepis* with relatively slender body, body depth 15–19 times in SL; DFO at about midline of V–A, V–D 46.8–55.0% of V–A; VFO at or slightly behind midline of the fish, prepelvic length 50.6–53.2% SL; vertebrae: prehaemal 32–35, prepelvic 33–35, preanal 53–57, caudal 60–66, and total 94–98; lateral-line scales 75–81; and abdomen ridge with broad black margin.

Description. Dorsal-fin rays 9; pectoral-fin rays 12–13; pelvic-fin rays 9; anal-fin rays 41–43. Lateral line incomplete, running to above middle of anal-fin base; 33–36 scales before VFO, 43–46 before DFO, 53–57 before AFO, 75–81 in total, 69–74 large scales followed by 4–11 smaller ones. Vertebrae: prehaemal 32–35; prepelvic 33–35; predorsal 43–46; preanal 53–57; caudal 60–66; and total 94–98. Gill rakers: 8–13 on upper limb (epibranchial) and 23–30 on lower limb (13–16 on ceratobranchial+9–14 on hypobranchial).

Body elongate and slender, strongly compressed, depth at pectoral fin 15–19 in SL. Caudal peduncle shorter than eye diameter. Abdomen ridge well-developed, with narrow adipose fin between pectoral and pelvic fins; ventral adipose fin well developed along margin between anus and anal fin.

Head moderately long and pointed, slightly triangular; its length 4.8–5.3 in SL. Mouth terminal, moderately large, its gape extends to middle of eye; lower jaw slightly upturned at tip. Eye large, its diameter 5.8–6.8 in HL. A black antorbital light organ in front of eye; a short luminescent duct along lower margin of orbit (inner side of first and second infraorbitals). Snout moderately long, its length 1.8–1.9 in HL. Seven infraorbital bones, the first slender, the fifth and sixth not especially expanded, the last small. Interorbital space narrow, its width 9.0–10.6 in HL. Four gill arches, all with gill filaments. The third and fourth arches mostly connected by membranes. Pseudobranch present, inside a deep pocket.

DFO well behind pelvic fin and middle of body, and at about middle of VFO and AFO, predorsal length 1.6 in SL. Pectoral fin at same level of posterior margin of gill cover, its upper base at about same level of lower margin of eye. VFO at or slightly behind middle of body, prepelvic fin 1.9–2.0 in SL. AFO at posterior third to fourth of body, preanal fin length 1.3–1.4 in SL. Anal-fin base long. Adipose fin above rear portion of anal-fin base. Anus behind pelvic-fin base, at about tip of the appresed pelvic fin.

Two or three small fangs at tip of upper jaw, followed by single row of small retrose teeth along upper jaw, gradually smaller on posterior portion. Vomerine teeth absence. Two rows of fangs on lower jaw, gradually smaller posteriorly, those in outer row short and fixed; those in inner row long, each with a knife-like tip, and depressible. Two rows of fangs on each palatine, those on outer row smaller than those on inner row. Teeth on tongue small and scattered, one row on each side. Gill rakers present on epibranchials, ceratobanchials and hypobanchials; shield shape, each with 1–3 small teeth. Teeth on pharyngeal arch slender, forming an oval patch with about 5 rows at middle.

Body devoid of scales, except for a single row of lateral-line scales originating from above pectoral-fin girdle and running to about one-sixth of SL before caudal fin. Lateral-line scales slightly higher than its width, gradually smaller and becoming narrower posteriorly; 3 or 4 pores on each side of lateral-line scales before dorsal fin.

Luminescent duct well developed at ventral abdomen cavity, originating from below opercle and divided into two branches from its origin to anus.

Coloration. Body translucent when fresh, creamy white when preserved. Chromatophores present around the orbital, frontal, and nape regions; fine black stripes on cheek. Anterior three-fourths of upper jaw and entire lower jaw covered with dense chromatophores. Upper fourth of body with dense grayish chromatophores, not extending downward to lateral line ventrally. No chromatophores on lateral-line. Bases of dorsal-, pelvic-, and anal- fin rays with black pigments. Scattered chromatophores on upper rays of pectoral fin, absent on the rest rays. Broad black margins on abdomen ridge. Lateral sides of tail (behind anus) mostly blackish in specimen >200 mm. Surface of cleithrum blackish; gill chamber, tongue, gill arches, and inner side of gill cover blackish. Scattered black chromatophores on branchiostegeal rays; branchiostegal membranes clear without pigments.

Size. A small species with adults reaching 249 mm SL.

Etymology. The specific name is derived from *niger*, means black and *ventral* means lower part of body, in referring the broad margin on abdomen ridge.

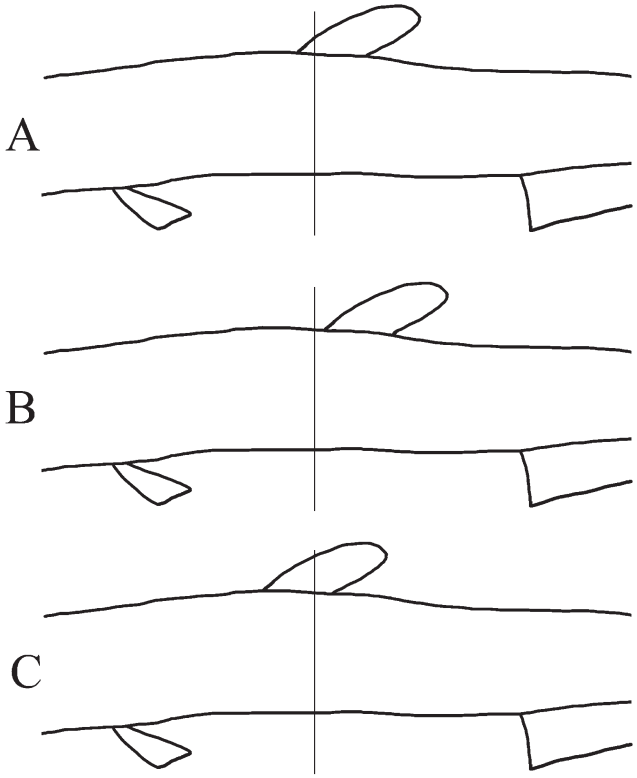


FIGURE 3. Demostration of orgin of dorsal fin and mid-point of origins of pelvic and anal fins (bar). A. *Lestrolepis nigroventralis* **sp. nov.** B. *L. intermedia*. C. *L. japonica*.

Distribution. Known from Taiwan and Japan; maybe widespread in the northwestern Pacific Ocean. In Taiwan, most specimens were collected by midwater trawl together with Sakura shrimp (*Lucensosergia lucens*) and other pelagic fishes, such as *Bregmaceros* spp. and myctophids.

Ecology. All specimens were collected by midwater trawl from surface to less than 100 meters; which suggests that this is a mesopelagic species and may have diurnal vertical migration. Some individuals are found to have myctophids or other fishes inside the stomach which suggests that the species feeds on fishes rather than sakura shrimps.

Comparison. *Lestrolepis nigroventralis* **sp. nov.** shares with *Ll. intermedia* from the western Atlantic Ocean in similar body proportion, fin formula, vertebral formula, and coloration. It can be distinguished from the later by having 32–35 (vs. 28–29) prehaemal vertebrae; 33–35 (vs. 30–32) prepelvic vertebrae; 43–46 (vs. 42–44) predorsal vertebrae; 53–57 (vs. 50–53) predorsal vertebrae; 75–81 (vs. 73–75) lateral-line scales, and a different COI gene sequence (K2P distance=0.063).

Although both species have their DFO at about midline of space between VFO and AFO, the DFO is usually slightly before the midline of V–A (V–D 47.6–55.0% of V–A) in *Ll. nigroventralis* (Fig. 3A), whereas the DFO is always slightly behind midline of V–A (V–D 51.4–59.5% of V–A) in *Ll. intermedius* (Fig. 3B). Uyeno *et al.* (1983) also mentioned their Atlantic specimens (n=11, 189–234 mm SL) have the V–D 11.8–13.8% SL, which agrees with our data (11.2–15.2%); whereas that of *Ll. nigroventralis* **sp. nov.** is clearly smaller (9.8–11.7% SL).

Lestrolepis nigroventralis can be easily separated from *Ll. japonica* which has the DFO clearly before middle of V–A (V–D 32.5–43.1% of V–A) (Fig. 3A vs. 3C), narrow rows of black dots with pale margin or very narrow black margin on abdomen ridge, different numbers of anal-fin rays and different lateral-line and vertebral formulae (Tables 1–6). Although previously including under the junior synonym of *Lestrolepis luetkeni* (Ege, 1933), *Ll. pofi* is recognized as a valid species herein which differs from *Ll. nigroventralis* by having 32–36 anal-fin rays and 82–89 total vertebrae (Ho & Golani, 2019).

***Lestrolepis japonica* (Tanaka, 1908)**
Japanese barracudina
Figures 3C, 4A–E; Table 1–8

Lestidium japonicum Tanaka, 1908:27 (type locality: Sagami Sea, Japan).
Lestrolepis japonica: Chen & Yu, 1986:324.

Materials examined. Collected from off Dong-gang, southwestern Taiwan, except for as indicated: NMMB-P3684 (3, 187–194), 28 May 2002. NMMB-P7923 (1, 202), 11 Jun. 2004. NMMB-P7028 (1, 193), 20 Feb. 2004. NMMB-P7089 (4, 170–196), Shiao-liu-qiou, Pingtung, 26 Dec. 2003. NMMB-P8026 (1, 190), Fang-shan, Pingtung, 17 Jun. 2004. NMMB-P11219 (4, 192–202), 5 Jul. 2007. NMMB-P11222 (9, 185–203), 30 Oct. 2010. NMMB-P11273 (4, 184–198), 15 Dec. 2009. NMMB-P12016 (4, 193–203), 18 Dec. 2011. NMMB-P12170 (2, 183–185), 31 Dec. 2010. NMMB-P13734 (1, 202), 2 Jul. 2011. NMMB-P16389 (4, 174–193), 23 Feb. 2012. NMMB-P20331 (1, 202), 25 May 2013. NMMB-P21167 (2, 200–203), 2 Apr. 2014. NMMB-P21888 (1, 205), 12 Dec. 2013. NMMB-P21992 (3, 164–200), 31 Dec. 2013. NMMB-P22080 (8, 185–222, stained), 5 Jan. 2015. NMMB-P22468 (1, 206), 30 Oct. 2015. NMMB-P22469 (6, 183–211, stained), 30 Jan. 2015. NMMB-P22847 (2, 88–110), 10 Mar. 2015. NMMB-P23817 (1, 178), 4 Feb. 2016. NMMB-P23818 (1, 193), 4 Feb. 2016. NMMB-P24620 (1, 170), 27 Jun. 2016. NMMB-P24623 (2, 129–150), 21 Sep. 2015. NMMB-P24629 (1, 168), 27 Jun. 2016. NMMB-P25538 (21, 139–187, stained), 4 Feb. 2016. NMMB-P25539 (1, 186), 8 Jan. 2017. NMMB-P25542 (2, 186–190, stained), 20 Jan. 2017. NMMB-P25543 (12, 168–191), 20 Jan. 2017. NMMB-P25544 (5, 123–140), 20 Jan. 2017. NMMB-P30788 (4, 85–130, stained), out of NMMB-P25545. NMMB-P25578 (30, 50–100), 20 Jan. 2017. NMMB-P27933 (17, 144–195), 6 Dec. 2017. NMMB-P27934 (16, 150–206), 6 Dec. 2017. NMMB-P27936 (20, 168–203), 6 Dec. 2017. NMMB-P30788 (4, 78–130, stained), out of NMMB-P25545. NMMB-P30799 (24, 103–210), 27 Mar. 2018. NMMB-P30800 (29, 158–224), 16 Jul. 2017.

Diagnosis. A moderately elongate species in *Lestrolepis* with body depth 13–16 times in SL; DFO clearly before midline of V–A, V–D 32.5–43.1% V–A; anal-fin rays 36–40; vertebrae: prehaemal 30–32, prepelvic 30–33, predorsal 36–40, preanal 48–51, caudal 52–58; and total 82–88; total lateral-line scales 66–72; and narrow band of black chromatophores along lower portion of abdominal ridge.

Description. Dorsal-fin rays 9; pectoral-fin rays 12–13 (mainly 13); pelvic-fin rays 9; anal-fin rays 36–40 (39); lateral line incomplete, running to above middle of anal-fin base; 31–32 scales before VFO, 38–40 before DFO, 49–50 before AFO, and 65–72 in total, 60–65 large scales along most of the canal, followed by 2–9 small scales in the rear portion. Vertebrae: prehaemal 30–32; caudal 52–58; prepelvic 30–33; predorsal 36–40; preanal 48–51; and total 82–88. Gill rakers: 9–15 on upper limb (epibranchial) and 24–31 on lower limb (13–19 on ceratobranchial+10–14 on hypobranchial).

Body elongate and slender, strongly compressed, depth at pectoral-fin depth 13–16 in SL. Caudal peduncle shorter than eye diameter; its depth 1.8–2.4% SL. Abdominal ridge with low adipose fin between pectoral and pelvic fins; ventral adipose fin well developed along margin between anus and anal fin.

Head moderately long and pointed, slightly triangular; its length 4.7–5.0 in SL. Mouth terminate, moderately large, its gape extends to middle of eye; lower jaw slightly upturned at tip. Eye large, its diameter 5.7–6.4 in HL. A light organ in front of eye (Fig. 4D); a short luminescent duct along lower margin of orbit (inner side of first and second infraorbitals). Seven infraorbital bones, the first slender, the fifth and sixth well-expanded posteriorly, the seventh small. Interorbital space narrow, its width 5.6–8.3 in HL. Four gill arches, all with gill filaments. The third and fourth arches mostly connected by membranes. Pseudobranchs present, inside a deep pocket.

DFO well behind pelvic fins and middle of body, predorsal length 1.6–1.7 SL, but clear before midline of VFO and AFO. Pectoral fin at same level as posterior margin of gill cover, its upper base about same level of lower margin of eye. Pelvic fin at or slightly behind middle of body, prepelvic fin length 1.8–1.9 in SL. Anal fin originating posterior fourth of body, preanal fin length 1.3–1.4 in SL. Adipose fin above rear portion of anal-fin base.

Two or three small fangs at tip of upper jaw, followed by single row of small retrose teeth along upper jaw, gradually smaller on posterior portion. Vomerine teeth absent. Two rows of fangs on lower jaw, gradually smaller posteriorly, those in outer row short and fixed; those in inner row long, each with a knife-like tip, and depressible. Two rows of fangs on each palatine, those on outer row smaller than those on inner row. Teeth on tongue small and scattered, one row on each side. Gill rakers present on epibranchial, ceratobanchial and hypobanchial; shield shape, each with 1–3 small teeth. Teeth on pharyngeal arch slender, forming an ovoid patch with about five rows at middle.

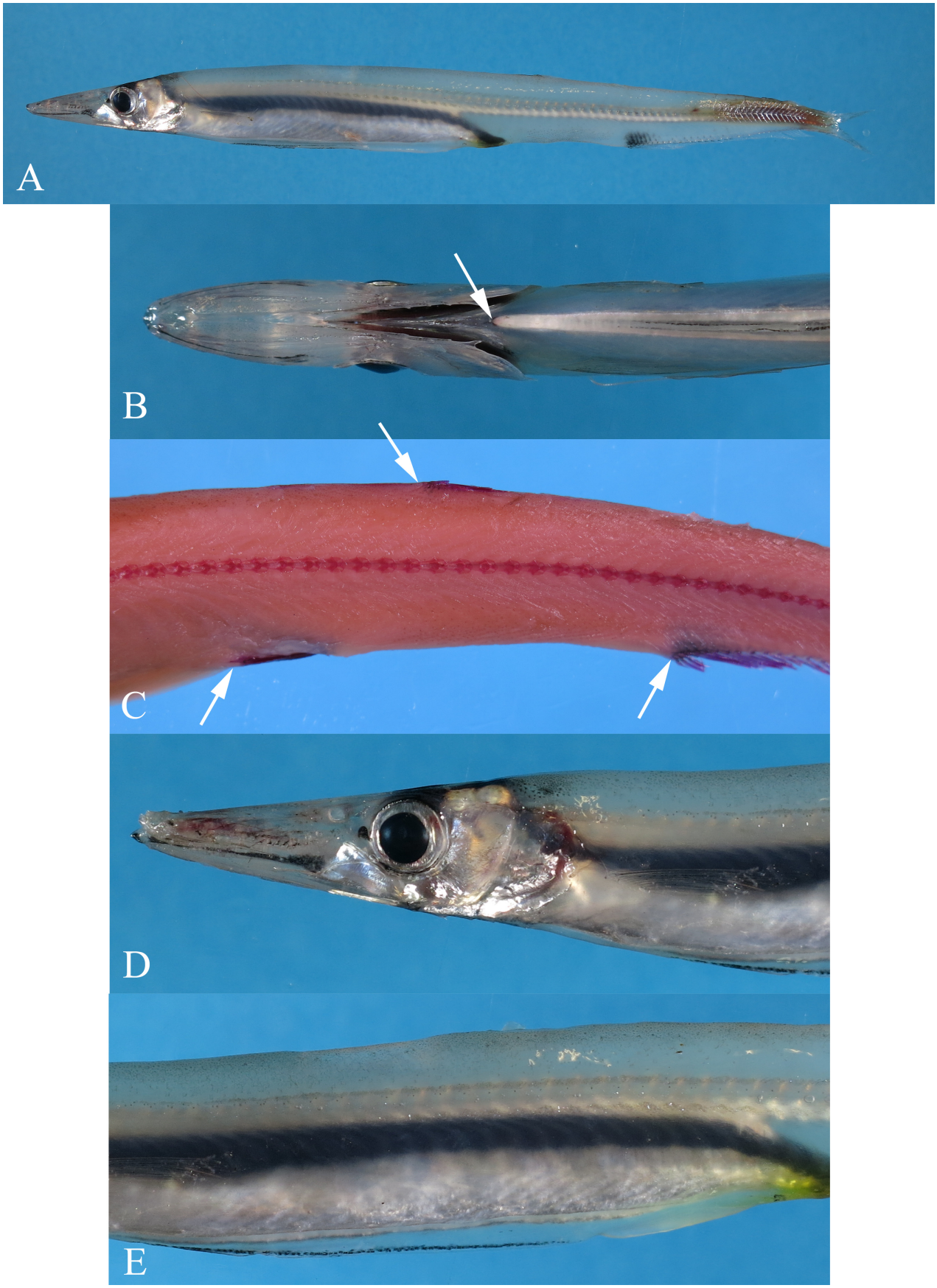


FIGURE 4. *Lestrolepis japonica*, NMMB-P25542. A–C. 190 mm SL. A. lateral view. B. ventral view of head, arrow points the origin of luminous organ. C. trunk, arrows point to origins of dorsal fin (above), pelvic fin (left) and anal fin (right); stained. D–E. 186 mm SL. D. lateral view of head. E. lateral view of trunk. Anterior to left.

TABLE 7. Morphometric data of three *Lestrolepis* species.

	Ll. nigroventralis **sp. nov.**			*Ll. intermedia*			*Ll. japonica*	
	Holotype	Selected types		Holotype	Non-types		Non-types	
SL (mm)	230	180–249 (n=11)		231	126–231 (n=10)		88–222 (n=29)	
%SL		Mean (Range)	SD		Mean (Range)	SD	Mean (Range)	SD
Head length	20.0	19.6 (18.9–20.7)	0.4	19.4	19.5 (18.5–20.2)	0.6	20.5 (18.0–21.8)	0.7
Head depth	5.3	5.2 (4.9–5.6)	0.2	4.8	4.9 (4.2–5.4)	0.4	5.4 (5.0–5.7)	0.3
Pectoral fin	6.0	7.8 (6.0–8.9)	0.9	-	8.2 (7.1–8.8)	0.8	13.1 (11.5–14.4)	0.5
Predorsal	62.8	62.7 (61.7–63.3)	0.5	60.7	61.3 (59.0–64.0)	1.3	9.3 (8.2–11.2)	0.8
Prepelvic	52.1	51.6 (50.6–52.6)	0.6	48.1	48.9 (47.1–51.1)	1.2	62.0 (60.2–63.4)	0.7
Preanal	73.5	73.3 (71.9–74.8)	0.8	72.7	71.2 (67.0–73.5)	2.4	53.4 (51.9–55.2)	0.8
V–A	21.4	21.7 (20.1–23.1)	0.8	24.7	22.1 (19.1–24.7)	1.2	94.2 (92.0–96.2)	0.9
V–D	10.7	11.1 (9.8–11.7)	0.5	12.7	12.5 (11.2–15.2)	0.5	21.8 (20.2–23.5)	1.0
Eye diameter	3.0	3.2 (2.9–3.6)	0.2	2.8	3.0 (2.7–3.4)	0.2	2.2 (1.6–2.7)	0.3
Snout length	10.5	10.7 (10.2–11.8)	0.4	10.3	10.7 (9.8–11.3)	0.5	3.8 (3.3–4.8)	0.3
Interorbital	1.9	2.0 (1.9–2.2)	0.1	2.0	2.1 (1.8–2.4)	0.1	10.6 (9.2–13.4)	0.7
Upper jaw	9.8	9.6 (9.2–10.2)	0.2	-	9.7 (9.3–9.9)	0.2	2.4 (2.1–2.6)	0.1
Lower jaw	12.6	12.7 (12.1–13.2)	0.3	11.9	12.8 (11.9–13.4)	0.5	9.6 (8.8–10.4)	0.4
Body depth	6.2	6.2 (5.3–6.8)	0.4	-	6.0 (5.5–7.1)	0.6	6.9 (5.9–8.6)	0.7
% Head length								
Head depth	26.3	26.4 (25.4–27.4)	0.8	24.8	25.1 (21.4–26.8)	1.6	26.5 (25.1–28.2)	1.0
Eye diameter	15.0	16.1 (14.8–17.3)	0.8	14.5	15.2 (14.3–16.5)	0.7	18.4 (15.9–20.6)	1.5
Snout length	52.4	54.4 (52.4–57.0)	1.5	53.1	55.1 (51.8–59.2)	2.4	50.8 (47.7–53.4)	1.5
Interorbital	9.4	10.3 (9.4–11.1)	0.8	10.3	10.8 (9.1–11.7)	0.8	11.5 (10.2–13.0)	0.7
Upper jaw	49.1	49.0 (47.2–50.4)	1.7	-	48.5 (46.6–49.5)	1.1	46.8 (44.0–50.0)	1.4
Lower jaw	62.8	64.8 (62.5–68.4)	1.9	61.4	64.7 (61.4–66.0)	1.6	64.1 (61.4–67.5)	1.6
% V–A								
V–D	50.0	51.0 (47.6–55.0)	2.4	51.4	55.0 (51.4–59.5)	2.9	39.1 (32.5–43.1)	2.7

Body devoid of scales, except for a single row of lateral-line scales originating from above pectoral-fin girdle and running to above about middle of anal-fin base. Lateral-line scales as high as it's wide, gradually smaller and becoming narrower posteriorly; 5–8 (mainly 6–7) pores forming an irregular cluster on each side of lateral-line scales before dorsal fin.

Luminescent duct well developed at ventral abdomen cavity, originating from below pectoral fin (Fig. 4B) and divided into two branches from its origin to anus.

Coloration. Body semitransparent when fresh, creamy white in preservation. Chromatophores present on the surface of first to the third infraorbital bones, upper margin of eye, anterior three-fourths of upper jaw, and along upper margin of lower jaw. Upper fourth of body covered by tiny and dense chromatophores, extending to upper margin of lateral line ventrally. Bases of dorsal, pectoral, and anal-fin rays with black pigments. Single row of large chromatophores forming a narrow black margin or slightly above the ridge with a narrow pale margin (Fig. 4E); ventral adipose fin densely covered by small chromatophores. Luminescent duct silver white with black pigments on its upper surface (e.g. can be seen through the semitransparent muscle). Chromatophores present on inner gill chamber and branchiostegal rays; branchiostegal membranes colorless; gill arches blackish; and mouth cavity white.

Size. Appear to be a small species with adults reaching 222 mm TL.

TABLE 8. Meristic data of three *Lestrolepis* species. * includes 2 specimens examined by Rofen (1966).

	Ll. nogroventralis **sp. nov.**		*Ll. intermedia*		*Ll. japonica*
	Holotype	Types+non-types	Holotype	Non-types	Non-types
Fin rays		n=47		n=12*	n=36
Dorsal fin	9	9	9	9	9
Pectoral fin	12;12	12–13	-	12	11–12
Pelvic fin	9	9	-	9	9–10
Anal fin	42	41–43	40	[37] 39–42	36–40
Lateral-line scales					
Prepelvic	34	33–36	-	31–32	31–32
Predorsal	33	43–46	-	42–43	38–40
Preanal	54	53–57	-	52–53	49–50
Total	77	75–81	-	73–75	65–72
Vertebrae					
Prepelvic	34	33–35	31	30–32	30–33
Predorsal	44	43–46	43	42–44	36–40
Prehaemal	33	32–35	29	28–29	29–32
Preanal	55	53–57	53	50–53	48–51
Caudal	62	60–66	64	61–67	54–58
Total	95	94–98	94	90–96	84–88
V–A	21	19–23	22	20–22	17–20
V–D	10	9–11	12	10–12	5–9

Distribution. Widespread in the western Pacific Ocean. It is very common in the bycatch of midwater and bottom trawl, and it is the most abundant species among the paralepidids in Taiwan; confirmed records from Japan, Taiwan, the Philippines, northwestern Australia, and South China Sea.

Remarks. The first author examined specimens collected from off Australia and found the specimens have a slightly longer and more pointed snout. However, the vertebral formula and body proportions are nearly identical and thus the population from Australia is recognized as same with those from the northwestern Pacific population. This is the most common and abundant paralepidid found in Taiwan, and it is usually collected by midwater trawl as bycatch of Sakura shrimp (*Lucensosergia lucens*) and sometimes by bottom trawl. Most individuals feed on small fishes rather than shrimps.

Lestidium Gilbert, 1905

Lestidium Gilbert, 1905:607 (type species: *Lestidium nudum* Gilbert, 1905).

Diagnosis. Body scaleless, except for the lateral line covered by a single row of scales; luminescent duct present, unbranched, originating from throat before the eye or under opercle; no light organ in front of eye; a luminescent duct along lower margin of orbit in some species; DFO from slightly before to well behind VFO; ventral adipose fin well developed between anus and anal fin; dorsal-fin rays 10; pectoral-fin rays 12–14; anal-fin rays 26–33; ventral adipose well-developed; vertebrae: prehaemal 36–41 and total 79–93. Dorsal surface light grayish to very dark; ventral ridge between pectoral and pelvic fins with pigments or not.

Remarks. The genus currently comprises five species, *Lt. atlanticum* from Atlantic Ocean, *Lt. bigelowi* from Indian Ocean, *Lt. nudum* from Hawaii, *Lt. orientale* **sp. nov.** from Taiwan and Japan; and *Lt. prolixium* from the western Pacific Ocean. Two other species from the western Pacific Ocean is being studied in a separated work (Ho, unpub. data). The generic status of *Lt. bigelowi* is still doubtful.

***Lestidium orientale* sp. nov.**
New English name: Oriental barracudina
Figures 5A–E; Tables 1–5, 9–10

Holotype. NMMB-P30812 (162 mm SL), off Dong-gang, Pingtung, SW Taiwan, northern South China Sea, mid-water trawl, 25 Jan. 2018 [from bycatch].

Paratypes. Thirty-nine specimens, 74–162 mm SL, collected from off Dong-gang, near the type locality: KAUM-I. 125200–125203 (4, 130–152), 25 Jan. 2018. NMMB-P11220 (1, 157, stained), 12 Jan. 2011. NMMB-P23823 (1, 167), NMMB-P23824 (1, 162, stained), NMMB-P23825 (1, 128, stained), NMMB-P23826 (1, 131), 4 Feb. 2016. NMMB-P25557 (7, 131–177, stained), NMMB-P25559 (1, 157, stained), NMMB-P25560 (1, 162, stained), NMMB-P25562 (3, 142–147), 20 Jan. 2017. NMMB-P30802 (18, 74–162), 15 Jan. 2018.

Non-types. Collected from Dong-gang, near the type locality: NMMB-P17858 (1, 119, stained). NMMB-P20913 (1, 122, stained). NMMB-P25553 (22, 94–161, stained).NMMB-P25554 (9, 149–121, stained). NMMB-P25556 (10, 125–157, stained). NMMB-P25558 (1, 159, stained). NMMB-P23827 (1, 130, stained). NMMB-P25546 (6, 126–150, stained). NMMB-P24628 (9, 85–148, stained). NMMB-P25845 (1, 132). NMMB-P24626 (2, 105–134, stained). NMMB-P30789 (1, 135). NMMB-P30801 (11, 95–145). NMMB-P30811 (1, 146, stained).

Diagnosis. A species of *Lestidium* with light organ duct extending to beyond anterior margin of eye. It is most similar to *Lestidium atlanticum* and can be distinguished by having relatively more prehaemal vertebrae (37–40 vs. 36–37), a shorter snout (snout length 9.7–10.4 vs. 10.4–11.5% SL), shorter jaws (upper jaw 8.6–10.1 vs. 9.9–11.3% SL; lower jaw 11.9–13.7 vs. 13.5–14.8% SL) and relatively deep head (head depth 31.2–33.9 vs. 27.6–31.5% HL).

Description. Dorsal-fin rays 10; pectoral-fin rays 12–14 (mainly 13); pelvic-fin rays 9; anal-fin rays 26–30 (mainly 27–28); lateral-line complete, running to the caudal-fin base, 35–37 scales before VFO, 34–36 before DFO, 52–54 before AFO, and 109–126 in total, 56–60 large ones, followed by 55–77 small ones. Vertebrae: prehaemal 37–40; caudal 41–44; prepelvic 34–37 (35–36); predorsal 33–36 (34–35); preanal 51–54; and total vertebrae 79–83. Gill rakers: 8–13 on upper limb (epibranchial) and 26–40 on lower limb (13–20 on ceratobranchial+11–22 on hypobranchial).

Body stout, compressed, depth at pectoral fin 11–15 in SL. Caudal peduncle shorter than eye diameter; its depth 1.9–2.9% SL. Abdominal ridge well-developed with low adipose fin; ventral adipose fin wall-developed along margin between anus and anal fin.

Head relatively stout and blunt, triangular in lateral view, its length 4.5–4.9 times in SL. Mouth terminate, moderately large, its gape extends to anterior margin of eye; lower jaw slightly upturned at tip. Eye large, its diameter 4.6–5.5 in HL. Seven infraorbital bones, first slender, the fifth and sixth well-expanded, the seventh small. No light organ around the eye. Interorbital space narrow, its width 8.1–9.5 in HL. Four gill arches, all with gill filaments. The third and fourth arches mostly connected by membranes. Pseudobranch present, inside a deep pocket.

DFO at about same vertical or slightly before the vertical of VFO, also slightly posterior to middle of the fish, predorsal length 1.7–1.8 times in SL. Pectoral fin at same level of posterior margin of gill cover, the uppermost ray at about same level of lower margin of eye. Pelvic fin well behind of middle of the fish, prepelvic length 1.6–1.7 in SL. Anal fin originating slightly behind posterior fourth of body, preanal length 1.2–1.3 in SL. Anal-fin base 5.3–6.9 in SL. Adipose fin above rear portion of anal-fin base.

Two or three fangs on upper jaw, followed by single row of small, stout retrose teeth. Vomerine teeth absent. Two rows of fangs on lower jaw, gradually smaller posteriorly, those in outer row short and fixed; those in inner row long, each with a knife-like tip, and depressible. Two rows of fangs on each palatine, those in inner row much longer than those in outer row. Teeth on tongue small, arranged in single scattered rows on each side. Gill rakers present on epibranchial, ceratobranchial and hypobranchial; shield shape, each with 1–3 small teeth. Teeth on pharyngeal arch slender, forming an oval patch with about 5 rows at middle.

Body devoid of scales, except for a single row of lateral-line scales originating from above pectoral-fin girdle and running to the caudal-fin base. Lateral-line scales slightly broader than its width, gradually smaller and becoming narrower posteriorly; 2–3 (mostly 3) pores on each side of lateral-line scales before the dorsal fin.

Luminescent duct well developed at ventral abdominal cavity, unbranched, originating from below the end of maxilla and extending to the anus.

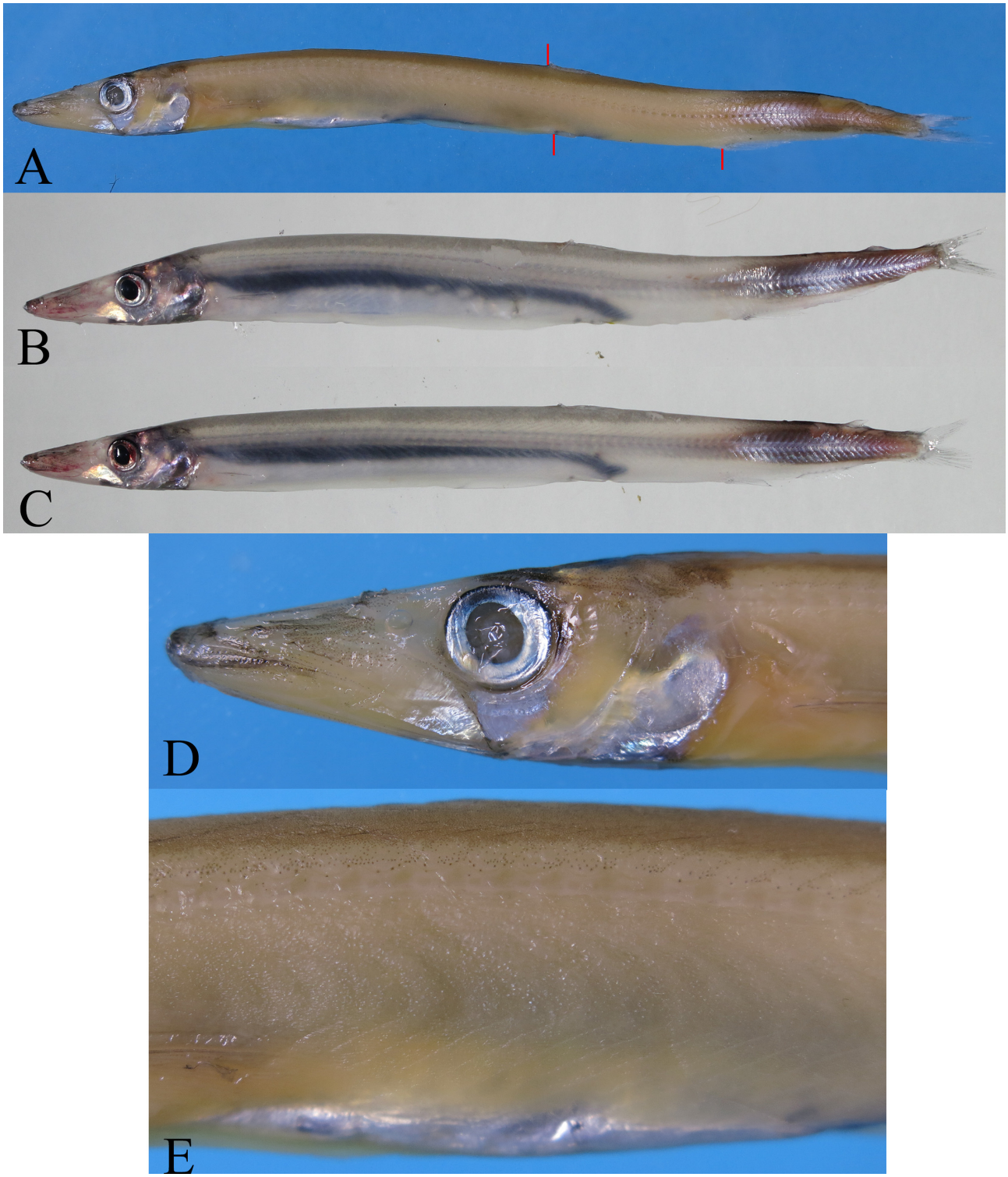


FIGURE 5. *Lestidium orientale* **sp. nov.** A. holotype, NMMB-P30812, 162 mm SL, preserved; bars indicate origins of dorsal fin (above), pelvic fin (left) and anal fin (right). B. NMMB-P23823, paratype, 167 mm SL. C. NMMB-P23824, partype, 162 mm SL. D. close-up of head, from holotype. E. close-up of mid-trunk showing the pigmentation.

TABLE 9. Morphometric data of four *Lestidium* species. Negative values means that VFO is behind DFO.

	Lt. atlanticum		*Lt. orientale* **sp. nov.**			*Lt. nudum*	*Lt. prolixum*	
	Non-types		Holotype	Selected types		Non-types	Non-types	
SL (mm)	104–181 (n=8)		162	131–177 (n=15)		224–247 (n=3)	225–276 (n=19)	
%SL	Mean (Range)	SD		Mean (Range)	SD	Mean (Range)	Mean (Range)	SD
Head length	22.2 (20.8–23.1)	0.8	20.6	21.1 (20.3–22.2)	0.6	21.8 (21.1–22.5)	21.1 (19.8–22.6)	0.7
Head depth	6.5 (6.3–6.7)	0.2	6.6	6.9 (6.6–7.1)	0.2	6.3 (6.2–6.5)	6.0 (5.6–6.4)	0.2
Pectoral fin	7.6	-	7.0	7.0 (7.0–7.1)	0.0	7.9 (7.9)	7.2 (6.5–8.3)	0.7
Predorsal	59.6 (58.7–60.4)	0.6	58.6	58.7 (57.7–59.9)	0.6	60.8 (60.5–61.1)	61.4 (59.5–62.7)	0.9
Prepelvic	58.5 (57.7–59.7)	0.7	59.9	59.5 (57–61.1)	0.7	54.2 (53.4–54.9)	57.1 (55.2–58.5)	0.9
Preanal	78.8 (77.8–79.9)	0.8	77.8	78.4 (77.8–79.2)	0.5	75.5 (74.9–75.9)	77.1 (76.4–77.9)	0.5
V–A	20.0 (18.7–21.2)	0.9	17.9	18.9 (17.8–21.1)	0.8	21.3 (21.0–21.4)	20 (19.2–21.2)	0.6
V–D	0.9 (0.6–1.2)	0.3	[-1.2]	[-0.8] ([-1.3] –[-0.7])	0.3	6.6 (5.8–7.7)	4.3 (3.8–5.4)	0.5
Eye diameter	3.9 (3.5–4.2)	0.2	4.0	4.0 (3.9–4.4)	0.1	3.7 (3.4–3.9)	3.6 (3.4–4.0)	0.2
Snout length	11.1 (10.4–11.5)	0.4	9.8	10.0 (9.7–10.4)	0.3	11.3 (11.3)	10.6 (10–11.2)	0.4
Interorbital	2.5 (2.2–2.8)	0.2	2.3	2.4 (2.3–2.5)	0.1	2.4 (2.4)	2.2 (2.0–2.3)	0.1
Upper jaw	10.4 (9.9–11.3)	0.5	9.3	9.3 (8.6–10.1)	0.4	10.5 (10.1–10.8)	9.7 (9.2–10.6)	0.4
Lower jaw	14.3 (13.5–14.8)	0.5	12.2	12.8 (11.9–13.7)	0.5	14.1 (13.3–14.6)	13 (12.2–13.7)	0.4
Body depth	7.2 (6.7–7.6)	0.5	7.5	7.6 (7.1–8.0)	0.3	6.9 (6.4–7.4)	6.5 (4.3–8.1)	0.7
% Head length								
Head depth	29.4 (27.6–31.5)	1.4	32.2	32.5 (31.2–33.9)	0.9	29.0 (27.6–29.7)	28.3 (26.7–29.9)	0.9
Eye diameter	17.6 (15.2–20.4)	1.6	19.5	19.1 (18.1–21.5)	0.7	16.9 (15.3–18.0)	17.2 (16.0–18.6)	0.7
Snout length	50.1 (49.7–50.8)	0.4	47.6	47.6 (45.6–49.8)	1.0	51.8 (50.2–53.7)	49.9 (47.8–51.7)	1.1
Interorbital	11.4 (10.2–13.4)	1.0	11.3	11.3 (10.6–12.3)	0.5	11.0 (10.7–11.3)	10.3 (9.4–11.4)	0.5
Upper jaw	46.6 (45.1–50.0)	1.8	44.9	44.1 (40.9–48.4)	1.8	48.3 (48.0–48.7)	45.9 (43.9–48.2)	1.2
Lower jaw	64.2 (62.0–65.2)	1.1	59.3	60.8 (58.1–62.7)	1.3	64.5 (63.2–65.2)	61.4 (59.8–63.0)	1.1
% V–A								
V–D	4.4 (3.1–6.5)	1.4	--	--		31.0 (27.7–35.8)	21.5 (18.4–25.5)	2.3

Coloration. Body translucent when fresh, creamy white when preserved. Chromotophores on 4th and 5th infra-orbital bones; top of head blackish. Anterior half of both jaws covered with chromotophores. Upper fourth of body covered with grayish chromotophores, extending to upper margin of lateral-line scales. Posterior fourth of body blackish with a broad middle silver band. Dorsal-fin rays and bases with black pigments. Pigments on anal-fin rays, absent on the fin base. No chromotophores on abdominal region. Scattered pigments around cleithrum and inner surface of gill cover.

Size. Appear to be a small species with largest adult examined at 167.0 mm SL.

Etymology. The specific name "*orientale*" means from the Eastern, in referring to the distribution around northwestern Pacific Ocean.

Remarks. *Lestidium orientale* **sp. nov.** is closely similar to *L. atlanticum* in that the luminescent duct extending forward below the posterior end of maxilla and VFO at about same vertical or slightly behind the vertical of DFO; whereas *L. prolixium* and *L. nudum* have the duct extending to below opercle only and DFO clearly behind a vertical of VFO. It differs from *L. bigelowi* in lacking light organs on lateral and ventral surfaces of body.

Lestidium orientale **sp. nov.** differs from *L. atalnticum* (restricted to the Atlantic population in present study) in having 37–40 (mainly 38–39) prehaemal vertebrae (vs. 36–37, mainly 37); snout length 9.7–10.4% (vs. 10.4–11.5%) SL or 45.6–49.8% (vs. 49.7–50.8%) HL; upper-jaw length 8.6–10.1% (vs. 9.9–11.3%) SL or 40.9–48.4% (vs. 45.1–50.0%) HL; lower-jaw length 11.9–13.7% (vs. 13.5–14.8%) SL or 58.1–62.6% (vs. 62.0–65.2%) HL; relatively deep head 6.6–7.1% (vs. 6.3–6.7%) SL or 31.2–33.9% (vs. 27.6–31.5%) HL; and a different COI gene sequence (K2P distance = 0.050–0.057).

The meristic data provided by Ege (1953) were divided into several geographic regions. He provided a broad range of meristics, i.e., 75–87 total vertebrae and 35–41 preheamal vertebrae, which is broader than most paralepidids. However, his data for Atlantic specimens are 80–83 total vertebrae (n=44) and 36–38 (mainly 37) preheamal vertebrae (n=22), wihch agree with our observation (Tables 4–5). His data of specimens taken from the Indo-west Pacific Ocean can be further divided into high vertebra populations (83–87 total vertebrae), moderately high vertebra populations (79–83), and low vertebra population (75–80). Our specimens fit to Ege's moderately high vertebra population and may be same with that. Moreover, we also recognized specimens from Taiwan and Australia with high vertebral counts as an undescribed species. We are not able to examine Ege's specimens and the low vertebra population is still unknown. Further investagation is required.

Lestidium prolixum Harry, 1953

Figures 6A–D; Tables 1–5, 9–10

Lestidium prolixum Harry, 1953a:204, figs. 25, 28 (Type locality: Kumano-Nada, off Shikoku, Japan, depth 200 fathoms). Post, 1972:150. Fukui & Ozawa, 2004:293.

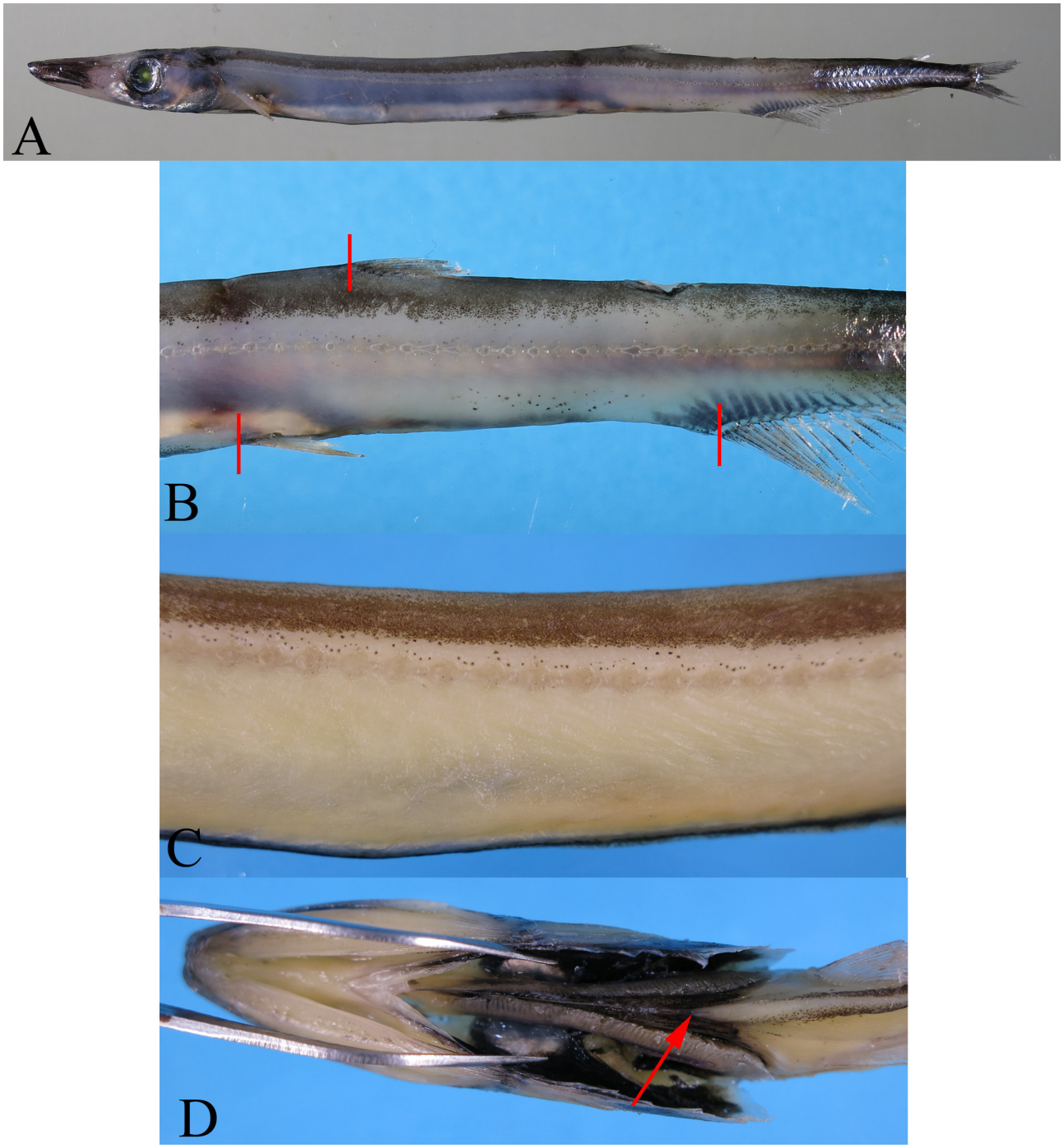
Specimens examined. Collected from off Dong-gang, southwestern Taiwan, except as indicated: NMMB-P16330 (1, 225), Nan-fang-ao, Yilan, NE Taiwan, 20 Jul. 2010. NMMB-P21908 (1, 259, stained), 1 Nov. 2014. NMMB-P22468 (2, 267–267, stained), 30 Jan. 2015. NMMB-P24622 (1, 264, stained), 17 Feb. 2016. NMMB-P24634 (1, 261), 18 Feb. 2011. NMMB-P25272 (1, 255), tail broken, 29 Mar. 2015. NMMB-P25552 (1, 276), 6 Feb. 2017. NMMB-P25761 (1, 235), 29 Mar. 2017. NMMB-P30787 (1, 230), 16 Jul. 2017. **Other localities.** Japan: NSMT-P67571 (1, 237), 30°25.46'N, 128°14.19'E, East China Sea, 500–512 m, otter trawl, 6 Nov. 2003. NSMT-P67588 (1, 227), 28°59.78'N, 127°9.35'E, East China Sea, 350 m, otter trawl, 5 Nov. 2003. NSMT-P75256 (1, 232), 37°35.71'N, 141°41.02'E, Pacific coast off Fukushima, Honshu, southern Japan, 277–284 m, trawl, 29 Oct. 2006. NSMT-P79558 (1, 243), NSMT-P79559 (1, 237), 37°36.8'N, 141°43.7'E, Pacific coast off Fukushima, Honshu, southern Japan, 306 m, trawl, 30 Oct. 2007. KAUM-I. 86327 (1, head broken), KAUM-I. 86328 (head broken), KAUM-I. 86329 (1, 176), KAUM-I. 86330 (1, 162), KAUM-I. 86331 (1, 163), KAUM-I. 86332 (1, 173), KAUM-I. 86333 (1, 170), KAUM-I. 86334 (1, 168), KAUM-I. 86335 (1, 177), R/V Kumamoto-maru, st. 54, 26°26.07'N, 124°07.49'E, East China Sea, 135–143, 17 May 2015. KAUM-I. 88753 (1, 164), Each China Sea, 18 May 2015.

Diagnosis. Lateral-line scales 145–158; anal-fin rays 31–33; vertebrae: prehaemal 36–41, prepelvic 35–38, predorsal 38–42, total 87–93; DFO slightly overlapped with pelvic fin to slightly behind tip of pelvic fin, D–V 3.8–5.4% SL and 18.4–25.5% V–A; gill chamber and branchial membranes uniformly blackish; large dots along upper margin of lateral line forming a wave-like boundary.

Description. Dorsal-fin rays 10; pectoral-fin rays 13–14; pelvic-fin rays 9; anal-fin rays 31–33. Vertebrae: prehaemal 36–41; caudal 50–53; prepelvic 35–38; predorsal 38–42; preanal 50–53; and total 87–93. Lateral line complete, running to the caudal-fin base, 35–37 scales before VFO, 39–42 before DFO, 54–57 before AFO, and 145–158 in total, 62–65 large ones, followed by 82–94 small ones. Gill rakers: 11–14 on upper limb (eipbranchial) and 30–39 on lower limb (17–21 on ceratobranchial+14–18 on hypobranchial).

Body elongate and slender, somewhat robust, strongly compressed, depth at pectoral fin 12–23 in SL. Caudal peduncle shorter than eye diameter; its depth 2.1–3.0% SL. Abdominal ridge well-developed with very low adipose fin; ventral adipose fin wall-developed along margin between anus and anal fin.

Head somewhat robust, moderately long and pointed, slightly triangular; its length 4.4–5.0 times in SL. Mouth terminal, moderately large, its gape extends to anterior margin of eye; lower jaw slightly upturned at tip. Eye large, its diameter 5.4–6.2 in HL. Seven infraorbital bones, first slender, the fifth and sixth well-expanded posteriorly, and the seventh small. A light organ between first and second infraorbitals. Interorbital space narrow and flat, its width 8.8–10.7 in HL. Four gill arches, all with gill filaments. The third and fourth arches mostly connected by membranes. Pseudobranch present, inside a deep pocket.



FIGRUE 6. *Lestedium prolixum*, NMMB-P25552, 276 mm SL. A. lateral view. B. lateral view of trunk showing origins of dorsal fin (above), pelvic fin (left) and anal fin (right). C. mid-trunk region showing the pigmentation, preserved. D. ventral view of head showing the coloration of gill cavity; arrow points to anterior end of abdomen luminous organ. Anterior to left.

DFO slightly overlapped with posterior portion of appressed pelvic fin to slightly behind of tip of the fin and well behind middle of the fish, predorsal length 1.6–1.7 in SL. Pectoral fin at same level of posterior margin of gill cover, the uppermost ray at about same level of lower margin of eye. Pelvic fin well behind middle of the fish, prepelvic fin 1.7–1.8 in SL. Anal fin originating at posterior fourth of body, preanal length 1.3 in SL. Adipose fin above rear portion of anal-fin base.

TABLE 10. Meristic data of four *Lestidium* species. Negative values means that VFO is behind DFO.

	Lt. atlanticum	*Lt. orientale* **sp. nov.**		*Lt. nudum*	*Lt. prolixum*
	n=8	Holotype	n=52	Non-type (n=3)	n=23 [Harry, 1951]
Fin rays					
Dorsal fin	10	10	10	10	10 [10]
Pectoral fin	12–13	13;13	12–14	13	13–14 [12]
Pelvic fin	9	9	9	9	9 [9–11]
Anal fin	28–30	28	26–30	33	31–33 [30–31]
Lateral-line scales					
Prepelvic	33–35	36	35–37	33	35–37
Predorsal	33–35	35	34–36	39–40	39–42
Preanal	51–52	54	52–54	54	54–57
Total	114–125	117	109–126	79–87	146–158 [152–160]
Vertebrae					
Prepelvic	33–35	36	34–37	34–35	35–38
Predorsal	34–36	35	33–36	40–41	38–42
Prehaemal	36–37	38	37–40	36	36–41
Preanal	52–53	54	51–54	55	54–57
Caudal	43–45	44	41–44	54	50–53
Total	80–82	82	79–83	90	87–93
V–A	16–18	18	15–19	20–21	18–20
V–D	0–1	(-1)	(-2)–0	5–6	3–5

Two or three fangs on upper jaw, followed by single row of small, retrose teeth, gradually smaller in posterior portion. Vomerine teeth absent. Two rows of fangs on lower jaw, gradually smaller posteriorly, those in outer row short and fixed; those in inner row long, each with a knife-like tip, and depressible. Two rows of fangs on each palatine, those in inner row much longer than those in outer row. Teeth on tongue small, arranged in single scattered row on each side. Gill rakers present on epibranchials, ceratobanchials and hypobanchiasl; shield shape, each with 3–5 small teeth. Teeth on pharyngeal arch slender, forming an oval patch with about 5 rows at middle.

Body devoid of scales, except for a single row of lateral-line scales originating from above pectoral-fin girdle and running to the caudal-fin base. Lateral-line scales slightly broader than its width, gradually smaller and becoming narrower posteriorly; 4 or 5 pores forming a cluster on each upper and lower margin of the scales.

Luminescent duct unbranched, well developed at ventral abdominal cavity, originating from below pectoral fin and running to anus.

Coloration. Body translucent when fresh, creamy white when preserved. Chromotophores on surface of first three infraorbitals, especially dense on the third. Dorsum largely blackish, not extending downward to upper broader of lateral line, a row of dots along upper margin of lateral line forming a continuous wave-like boundary. Pectoral fin mostly transparent, except for scattered chromotophores on the rays. Chromotophores on bases and rays of dorsal and anal fins and on base and first pelvic-fin ray. Abdomen ridge with broad blackish margin, black on either side of luminescent duct. Ventral adipose fin covered with scattered chromotophores. Branchiostegal rays with scattered chromotophores; branchiostgal membranes entirely black. Gill chamber and gill arches mostly black.

Size. Appear to be a large species with adults reaching 272 mm SL; by far the largest species among congeners found in Taiwan.

Distribution. Known from the type locality (Japan) and newly recorded in Taiwan. In Taiwan, the specimens were collected by bottom trawl at depths 200–500 m.

Remarks. *Lestidium prolixium* is the largest species among the congeners, and it has the most numerous lateral-line scales, 147–158 (up to 160 in the type series; Harry, 1953a).

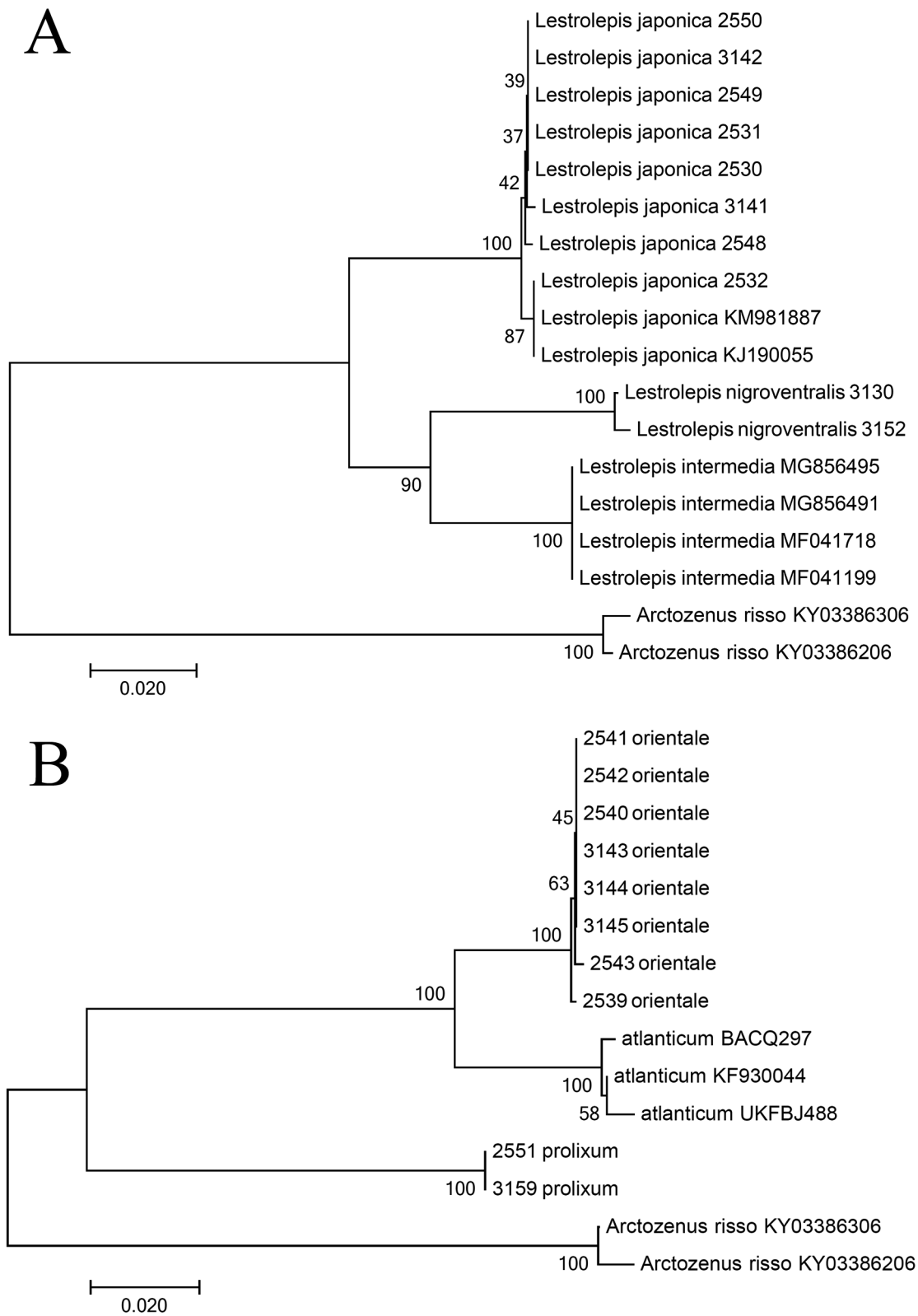


FIGURE 7. Neighbour-joining trees of *Lestrolepis* (A) and *Lestidium* (B) inferred from *COI* gene sequences with 1000 bootstrap replicates.

Genetic analysis

Two genera and six species with 29 sequences together with two sequences of *Arctozenus risso* were analyzed. A neighbor-joining tree (Figs. 7A, B) is generated for each genus. Specimens of each species forming a monophyletic clade and high bootstrap values (90 or 100%) in the tree which suggest that all these species are in independent specific ranking. In *Lestrolepis*, there are a total of 607 positions analyzed in the final dataset. The K2P distances among ingroup and outgroup are 0.208–0.230. The K2P distances are 0.000–0.005 among specimens of *Ll. japonica*, 0.003 in *Ll. nigroventralis* and 0.000 in *Ll. intermedia*. The K2P distances are 0.082–0.091 between *Ll. japonica* and *Ll. nigroventralis*, 0.074–0.078 between *Ll. japonica* and *Ll. intermedia*, and 0.063 between *Ll. nigroventralis* and *Ll. intermedia*. These results support the establishment of *Ll. nigroventralis* as a new species.

In *Lestididum*, there are a total of 603 positions analyzed in the final dataset. The K2P distances among ingroups and outgroup are 0.199–0.222. The K2P distances are 0.005–0.007 among specimens of *Lt. atlanticum*, 0.000–0.002 in *Lt. orientale*, and 0.000 in *Lt. prolixum*. The K2P distances are 0.050–0.057 between *Lt. atlanticum* and *Lt. orientale*, 0.171–0.180 between *Lt. atlanticum* and *Lt. prolixum*, and 0.162–0.164 between *Lt. orientale* and *Lt. prolixum*. These results support the establishment of *Lt. orientale* as a new species.

Comparative materials. ***Lestrolepis intermedia***: MCZ 32931 (231), holotype, x-ray film examined, Atlantic Ocean, Caribbean Sea, Cuba, 1861. MCZ 62045 (2, 175–192), Atlantic Ocean, 36°44'N, 74°40'W, 350–225 m, 14 Sep. 1983. MCZ 91583 (1, 178), Atlantic Ocean, North Sargasso Sea, 36°38'N, 74°42'W, 163–248 m, bottom trawl, 10 Mar. 1990. MCZ 91605 (3, 196–188), Atlantic Ocean, North Sargasso Sea, 35°58'N, 74°48'W, 204–242 m, bottom trawl, 11 Mar. 1990. MCZ 158601 (2, 210–223), Atlantic Ocean, United States, 39°44'59"N, 71°52'47" W, 232 m, Squid trawl, 24 May 2000. MCZ 162421 (1, twisted), Western Atlantic Ocean, United States, 36°13'N, 74°46'W, 224 m, otter trawl, 9 Mar. 1996. NSMT-P40152 (1, 231). ***Lestrolepis pofi***: as listed in Ho & Golani (2019). ***Lestidium atlanticum***: MCZ 62043 (1, 168), United States, Atlantic Ocean, 282–330 m, 8 Oct. 1983. MCZ 68503 (1, 144), Caribbean Sea, 0–68 m, 28 May 1966. MCZ 82660 (1, 134), North West Providence Channel, off Bahamas, Atlantic Ocean, 0–1874 m, 23 Oct. 1984. MCZ 158588 (1, 162), 36°40'25"N, 74°41'15"W, off Virginia, Atlantic Ocean, 203 m, 27 May 2000. MCZ 161677 (1, 104), United States, Atlantic Ocean, 0–411 m, 30 Jul. 2002. NTM S.18125 (2, 150–154). ***Lestidium nudum***: USNM 51615 (189), holotype, x-ray film examined only. BPBM23984 (1, 238), 21°10'N, 157°29'W, off Molokai, Penguin Bank, 181–185 m, shrimp trawl, 4 May 1968. BPBM 24037 (1, 247), 21°10'N, 157°25'W, off Molokai, Penguin Bank, 183 m, shrimp trawl, 7 Nov. 1968. BPBM24967 (1, 224), 20°35'N, 156°53'W, southeastern off Lanai, Kealaikahiki Channel, 380–420 m, shrimp trawl, 4 Nov. 1967.

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