

Yirrkala altiusculodorsalis sp. nov., a New Species from South China Sea

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Abstract: A rare Indo-Pacific snake-eel genus, *Yirrkala*, of tribe Sphagebranchini, subfamily Ophichthinae, family Ophichthidae, has 16 former species and 1 new species described in this article. Albeit it has such a great number of species, it is still known as “lack-description genus”, given that many species provisionally belong to this genus is still remain in opaque in status, whether belongingness or validity. The new species is under this genus according to its absent pectoral fins and dorsal fin, very elongated body, fragile dorsal fin and anal fin, dorsal fin origin posterior to rictus, posterior nares within mouth, short tubular anterior nares, and two preopercular pores, intermaxillary teeth present out of restriction of mandible. And it is unique in dorsal-fin length greater than half of maximum body height, dorsal-fin origin anterior to gill opening, body not patterned, median groove exceeding anterior-naris base. The difference between *Yirrkala misolensis* and *Yirrkala maculata* is reviewed. An overview of this genus is provided, and a key for distinguishing the species in this genus is also given.

Keywords: *Yirrkala*; *Yirrkala altiusculodorsalis*; New Species, Sand Eel.

1. Introduction

Genus *Yirrkala* is established by Whitley in 1940 with a new species *Yirrkala chaselingi*, and Whitley also present that *Sphagebranchus lumbricoides* and *Dalophis anceps* should also be included in this genus [1]. Then McCosker in 1977 suggested that there are approximately 12 species, *Yirrkala chaselingi*, *Yirrkala lumbricoides*, *Yirrkala tenuis*, *Yirrkala maculata*, *Yirrkala macrodon*, *Yirrkala gjellerupi*, *Yirrkala kaupii*, *Yirrkala moluccensis*, *Yirrkala misolensis*, *Yirrkala fusca*, and *Yirrkala natalensis* [2]. Then, *Yirrkala insolitus* [3], *Yirrkala moorei* [4], *Yirrkala ori*, and *Yirrkala calyptra* are found as new species, and *Yirrkala natalensis* is considered to be a synonym of *Yirrkala tenuis* [5]. *Yirrkala philippinensis* and *Yirrkala omanensis* was then put just under genus *Yirrkala* [4], but the former soon became disputable [5], both according to McCosker. However, *Dalophis anceps* has been laying aside due to absence of even any piece of evidence. Besides, *Yirrkala maculata* is also considered to be a junior synonym of *Yirrkala misolensis* [6], but this alteration lack evidence.

As a whole, it is considered that there are 17 valid species under genus *Yirrkala*, *Yirrkala chaselingi*, *Yirrkala lumbricoides*, *Yirrkala tenuis*, *Yirrkala maculata*, *Yirrkala macrodon*, *Yirrkala gjellerupi*, *Yirrkala kaupii*, *Yirrkala moluccensis*, *Yirrkala misolensis*, *Yirrkala fusca*, *Yirrkala natalensis*, *Yirrkala insolitus*, *Yirrkala moorei*, *Yirrkala ori*, *Yirrkala calyptra*, *Yirrkala omanensis*, and a new species, *Yirrkala hyselodorsalis* sp. nov..

The purpose of this article is describing a new species under the genus *Yirrkala*, and the supplement of the characters for diagnoses of this genus from this new species, besides, stating the overall features of this genus.

2. Material and Methods

All the samples are from trawls in the seas of China. There are totally 12 neotypes collected and preserved, total length ranges from 247 mm to 341 mm. And four of them are 4

specimens made into stained-hyalinized specimens. Unfortunately, the ossification of the bones is poor, the scanogram under X-ray being very opaque. Thus, all the inner characteristics and fin-rays counts are from those 4 stained-hyalinized specimens, and the measurements are not referred to these stained-hyalinized specimens. A 100000 mm tape scale is used for measuring the length; the values are accurate to the nearest 3 significant digits. A magnifier and an optical microscope are used to observe the minute structures, such as teeth, laterosensory pores, nares. All the measurements, counts, and structures are followed McCosker and Wu, including that the total length measured from tip of snout to tip of hypural, and lateral-line-laterosensory-pore count meaning the quantity of the laterosensory pores on lateral line, sensory pores almost foremost behind eyes on the skin covering the infraorbital bone called infraorbital pores [2,7]. Reference including paper and cyber material; articles and books. Keys to distinguish the genera is both summarized from reference and is according to the author's own measurement.

● Samples for comparison and distinguishing

Firsthand: “*Yirrkala altiusculodorsalis*, 341 mm TL, holotype, frozen, 116.22°E, 22.10°N, 90 m deep, 22 Mar, 2024, Junjie WU / 28 Mar, 2024, Ming BA” “PRVT-Fr 10001”; “*Yirrkala altiusculodorsalis*, 316 mm TL, paratype, preserved in alcohol, 116.22°E, 22.10°N, 90 m deep, 22 Mar, 2024, Junjie WU / 28 Mar, 2024, Ming BA” “PRVT-Pa 10002”; “*Yirrkala altiusculodorsalis*, 258 mm TL, neotype, preserved in alcohol, 116.22°E, 22.10°N, 90 m deep, 22 Mar, 2024, Junjie WU / 28 Mar, 2024, Ming BA” “PRVT-Pa 10003”; “*Yirrkala altiusculodorsalis*, neotype 247 mm TL, frozen, 116.22°E, 22.10°N, 90 m deep, 22 Mar, 2024, Junjie WU / 28 Mar, 2024, Ming BA” “PRVT-Fr 10004”; “*Yirrkala altiusculodorsalis*, 293 mm TL, neotype, frozen, 116.22°E, 22.10°N, 90 m deep, 22 Mar, 2024, Junjie WU / 28 Mar, 2024, Ming BA” “PRVT-Fr 10005”; “*Yirrkala altiusculodorsalis*, 325 mm TL, neotype, frozen, 116.22°E, 22.10°N, 90 m deep, 22 Mar, 2024, Junjie WU / 28 Mar, 2024, Ming BA” “PRVT-Fr 10006”; “*Yirrkala altiusculodorsalis*, 309 mm TL, neotype,

frozen, 118.45°E, 23.06°N, 80 m deep, 12 Oct, 2023, Junjie WU / 3 Oct, 2023, Ming BA” “PRVT-Fr 10007”; “*Yrrkala altiusculodorsalis*, 263 mm TL, neotype, stained-hyalinized and preserved in glycerine, 116.22°E, 22.10°N, 90 m deep, 22 Mar, 2024, Junjie WU / 28 Mar, 2024, Ming BA” “PRVT-St 10008”; “*Yrrkala altiusculodorsalis*, 270 mm TL, neotype, stained-hyalinized and preserved in glycerine, 116.22°E, 22.10°N, 90 m deep, 22 Mar, 2024, Junjie WU / 28 Mar, 2024, Ming BA” “PRVT-St 10009”; “*Yrrkala altiusculodorsalis*, 281 mm TL, neotype, stained-hyalinized and preserved in glycerine, 116.22°E, 22.10°N, 90 m deep, 22 Mar, 2024, Junjie WU / 28 Mar, 2024, Ming BA” “PRVT-St 10010”; “*Yrrkala altiusculodorsalis*, 279 mm TL, neotype, stained-hyalinized and preserved in glycerine, 116.22°E, 22.10°N, 90 m deep, 22 Mar, 2024, Junjie WU / 28 Mar, 2024, Ming BA” “PRVT-St 10011”; “*Yrrkala altiusculodorsalis*, 262 mm TL, neotype, stained-hyalinized and preserved in glycerine, 116.22°E, 22.10°N, 90 m deep, 22 Mar, 2024, Junjie WU / 28 Mar, 2024, Ming BA” “PRVT-Fr 10012”; “*Yrrkala altiusculodorsalis*, 319 mm TL, neotype, frozen, 118.31°E, 22.90°N, 110 m deep, 22 Feb 29, 2024, Junjie WU / 5 Mar, 2024, Ming BA” “PRVT-Fr 10012”; “*Yrrkala altiusculodorsalis*, 325 mm TL, neotype, frozen, 116.22°E, 22.10°N, 90 m deep, 22 Mar, 2024, Junjie WU / 28 Mar, 2024, Ming BA” “PRVT-Fr 10006”; “*Yrrkala misolensis*, tail rotted, frozen, about 360 mm TL, Xiaodnghai, 0 m depth 1 Jun, 2024, Hui WANG / 4 Jun, 2024, Ming BA” “PRVT-Fr sp111”; “*Callechelys kuro*, 382 mm TL, frozen, 116°E, 23°N, 110 m deep, Jul, 2023, Junjie WU / Jul, 2023, Ming BA” “PRVT-Fr sp 211”; “*Callechelys kuro*, 231 mm TL, frozen, 116°E, 23°N, 110 m deep, Jul, 2023, Junjie WU / Jul, 2023, Ming BA” “PRVT-Fr sp 212”;

Secondhand: *Yrrkala chaselingi*: Queensland, Australia: holotype, 610 mm TL (AM IB 481); *Sphagebranchius gjellerupi*: New Guinea, 1910: holotype, 153 mm TL (ZMA 104.146); *Yrrkala gjellerupi*: usp 5225, 160 mm, Fiji, Viti Levu, Savura River (18°05'S, 178°26'E), sampling site no. 13, collected by David Boseto and Sidney Malo, 28 January 2003. cas 217642, 3 (166–276 mm), collected 10 m upstream from usp 5225, site no. 14, on 28 January 2003; *Sphagebranchius lumbricoides*: Timor: holotype, 230 mm TL (BMNH 1867.11.28.300); *Ophichthys misolensis*: Misol Island: holotype, 283 mm TL (BMNH 1870.8.3.112); *Dalophis moluccensis*: Ceram: holotype, 405 mm TL (BMNH 1867.11.28.289); *Ophichthys tenuis*: locality unknown, possibly Mauritius: lectotype - 530 mm TL (BMNH 1965-121); *Ophichthys timorensis*: Timor: holotype -205 mm TL (BMNH 1867.11.28.322); *Muraena fusca*: Conuent. exhib. die ii Ozlob. 1790; *Yrrkala insolitus*: New Caledonia. MUSORSTOM 4: stn CP 148, 19°23,40'S, 163°31,90'E, 59 m, 14.09.1985: holotype, 258 mm TL (MNHN 1998-50); *Yrrkala ori*: SAIAB 17485, 353 mm TL, female, South Africa, KwaZulu-Natal, Durban, Addington Beach (29°86'40"S, 31°05'00"E), collected by sand dredge in 20 m, ORI, August 1982; *Yrrkala ori*: SAIAB 96727, 414 mm TL, male, a damaged specimen; and CAS 230224, 313 mm TL, male, collected with the holotype; *Yrrkala ori*: SAIAB 17284, 438 mm TL, male, South Africa, KwaZulu-Natal, 1 km off Durban bluff, 20 m; *Yrrkala calyptra*: AMS I.45310-001, 395 mm TL, a gravid female, Australia, Queensland, Fraser Island, Platypus Bay (24°21'S, 152°30'E), between Moon Point and Rooney Point. Collected by Sir Thomas Riley at a depth of “probably 10 fathoms” (~18 m), Dec. 1971; *Yrrkala calyptra*: AMS I.17454-002, 242 mm TL, male; CAS 41667, 358 mm

TL, a mature male; BPBM 33916, 314 mm TL, a gravid female; *Yrrkala philippinensis*: Holotype (unique): CAS-SU 30977; *Yrrkala misolensis*, TOU-AE7866, 351 mm TL; *Yrrkala moorei*: Holotype: CAS 46677, 434 mm TL, immature male, American Samoa, Aunu'u Id. (14°17'S, 170°34'W), collected using rotenone over a sandy bottom, 24 m, by R.C. Wass, Nov. 1975. *Yrrkala moorei*: Paratype: Marquesas Islands. BPBM 1 1857, 289 mm TL, Nuku Hiva Id., Hatuatua Bay (08°51'S, 140°00'W), dredged in 53-59 m by D. Devaney et al., 18 Sept. 1967; *Yrrkala moorei*: Paratype: Marquesas Islands. BPBM 11858, 307 mm TL, cleared and stained, Nuku Hiva Id., Ua Pou (15°40'S, 146°13'W), dredged in 84-93 m by D. Devaney et al., 18 Sept. 1967; *Yrrkala moorei*: Paratype: Marquesas Islands. BPBM 36172, 119 mm TL, Eiao Id. (07°59'S, 140°48'W), dredged in 55 m by J. Poupin, 19 Jan. 1991; *Yrrkala moorei*: Paratype: Marquesas Islands. USNM 306545. 410 mm TL, Nuku Hiva Id., Hatuatua Bay (08°51'S, 140°00'W), dredged in 42-59 m by H. Rehder et al., 18 Sept. 1967; *Yrrkala moorei*: Paratype: Marquesas Islands. ANSP 165122, 375 mm TL, collected with USNM 306545; *Yrrkala moorei*: Paratype: Marquesas Islands. MNHN 2001-1075, 259 mm TL, Nuku Hiva Id. (08°56'S, 140°06'W), dredged in 45-64 m by J. Poupin & B. Richer de Forges, 24 Aug. 1997; *Yrrkala moorei*: Paratype: Marquesas Islands. MNHN 2001-1076, 402 mm TL, Hiva Oa Id. (09°50'S, 139°02'W), dredged in 50 m, 29 Aug. 1997; *Yrrkala moorei*: Paratype: Marquesas Islands. MNHN 2001-1077, 243? mm TL (specimen severed by dredge), Nuku Hiva Id. (08°49'S, 140°03'W), dredged in 31-33 m by J. Poupin & B. Richer de Forges, 26 Aug. 1997; *Yrrkala moorei*: MNHN 2001-1073, 225 mm body length (tail missing, cut by dredge), Moto One Hatutaa Id. (07°47'S, 140°20'W). dredged in 450^154 m, 7 Sept. 1997; *Yrrkala moorei*: MNHN 2001-1074, 181 mm tail length (head and anterior trunk missing, cut by dredge), female with developing ova, Hiva Oa Id. (09°50'S, 139°00'W), dredged in 85 m, 29 Aug. 1997.

3. Results

3.1. Genus *Yrrkala*

Trunk very elongate, cylindrical; tail slightly compressed, slightly tapered posteriorly; trunk length less than tail. Paired fins completely absent; dorsal fin present, origin behind rictus; anal fin present; caudal fin rays completely hidden under skin. Head tapered; snout conical; gill opening lateroventral, unconstructed; anterior naris nearly round, short tubular; posterior naris elliptical, within mouth; preopercular pores two. Mouth inferior; teeth present on both jaws, vomer, and intermaxilla; teeth conical, small; median groove present. Neurocranium depth 3 or greater in length, but notably greater than 3; hyoid slender; branchiostegal rays more than attached on hyoid; supraoccipital crest absent; fifth ceratobranchial absent; third upper pharyngeal tooth plate and fourth upper pharyngeal tooth plate separate. Pectoral girdle reduced, containing supracleithrum, cleithrum, coracoid, and scapula. [1,2]

The author observed the behavior of *Yrrkala misolensis* and *Yrrkala altiusculodorsalis* living in fish tank with varied sands. Both of their behaviours are similar to common sand-burrowing eels. Both of them have two kinds of burrowing action, which are using head to dig firstly and using tail to dig firstly, and they prefer to choose the latter one. When use head to dig firstly, continuously swing trunk and tail, until completely enter the sands from head to tail. When use tail to

dig firstly, keep tip of tail at one point and slightly wag head, trunk and tail until tail enters the sands, trunk and head begins to not wag anymore, just draws back straight discontinuously, on and off, until completely enters the sands. They usually completely beneath sand, not expose any part of their body out of the sands. Except when predating in some rare

condition, they choose to completely exposed out of the sands. According to the incomplete induction, deducing the rest from this, many of the species under *Yirrkala* might behave like above.

Key to distinguish the species under genus *Yirrkala* [1-22]

- 1(24) Dorsal-fin origin posterior to gill opening
- 2(9) At least some part of skin patterned
- 3(4) Trunk not patterned, only a bar posteroinferior to eye.....*Y. calyptra*
- 4(3) Trunk patterned
- 5(6) Pattern only present on lateral line..... *Y. kaupii*
- 6(5) Pattern present on and above lateral line
- 7(8) Dark spots above lateral line completely merge into each other well before anus.....*Y. misolensis*
- 8(7) Dark spots above lateral line completely merge into each other above anus.....*Y. maculata*
- 9(2) Skin not patterned
- 10(11) Rictus anterior to posterior margin of eye.....*Y. gjelleruppi*
- 11(10) Rictus posterior to posterior margin of eye
- 12(15) Dorsal fin origin posterior to midpoint of body
- 13(14) Body depth less than 60 in total length.....*Y. insolitus*
- 14(13) Body depth greater than 60 in total length.....*Y. omanensis*
- 15(12) Dorsal fin origin anterior to midpoint of body
- 16(23) Distance from head to dorsal fin origin less than head length
- 17(18) Distance from gill opening to dorsal-fin origin greater than half head length.....*Y. moluccensis*
- 18(17) Distance from gill opening to dorsal-fin origin less than half head length
- 19(20) Anterior vomerine dentition in 2 rows..... *Y. chaselingi*
- 20(19) Vomerine dentition uniformly in 1 row
- 21(22) Tail length greater than 60% of total length.....*Y. philippinensis*
- 22(21) Tail length less than 60% of total length..... *Y. fusca*
- 23(16) Distance from head to dorsal fin origin greater than head length.....*Y. macrodon*
- 24(1) Dorsal-fin origin above or anterior to gill opening
- 25(26) Dorsal-fin origin above gill opening.....*Y. ori*
- 26(25) Dorsal-fin origin anterior to gill opening
- 27(28) A longitudinal brown stripe present on body above lateral line*Y. moorei*
- 28(27) Skin covering not patterned
- 29(30) Median groove on underside of snout end at anterior naris base.....*Y. lumbricoides*
- 30(29) Median groove on underside of snout exceed anterior naris base
- 31(32) Distance from posterior margin of head to dorsal-fin origin less than distance from rictus to dorsal-fin origin.....*Y. tenuis*
- 32(31) Distance from posterior margin of head to dorsal-fin origin greater than distance from rictus to dorsal-fin origin.....*Y. altiusculodorsalis*

3.2. *Yirrkala misolensis* and *Yirrkala maculata*

The species *Yirrkala misolensis* is formerly considered to be a senior synonym of *Yirrkala maculata* [6], but the author find that they at least have different pattern distribution, which specimen below and former description shows. *Yirrkala maculata* is described with brown patterns above lateral line completely fused into each other at anus, while those of *Yirrkala misolensis* fused into each other far in front of anus [12,17,22].



Fig 1. Left view of *Yirrkala misolensis*, PRVT-Fr sp111, after preserved black line points at the anterior margin of anus, showing the completely fused patterns above lateral line anterior to anus

The living depth of *Yirrkala misolensis* is remain in opaque. They are found from very shallow seas to deep seas. In

Hainan province of China, PRVT-Fr sp111 is collected from a beach with water covering not exceeding 5 cm. However, they are reported to live; however, in Taiwan province in China, they are collected from 200 m to 400 m [12]. The author tested the living temperature of PRVT-Fr sp111 before preserved, it could live in 15°C, corresponded to the temperature at about 400 m in tropical sea, while they are not found in shallow seas in mid-latitude regions. Thus, from a primary perspective, they would like to live in tropical waters, from deep to shallow. The former records should be correct.

3.3. *Yirrkala altiusculodorsalis* sp. nov.

Holotype:

Original label: “*Yirrkala altiusculodorsalis*, 341 mm TL, holotype, frozen, 116.22°E, 22.10°N, 90 m deep, 22 Mar, 2024, Junjie WU / 28 Mar, 2024, Ming BA” “PRVT-Fr 10001”

Paratype:

Original label: “*Yirrkala altiusculodorsalis*, 316 mm TL, paratype, preserved in alcohol, 116.22°E, 22.10°N, 90 m deep, 22 Mar, 2024, Junjie WU / 28 Mar, 2024, Ming BA” “PRVT-Pa 10002”

Type locality:

South China Sea, PRC, 116.22°E, 22.10°N, tropical sea, 90 m under surface, *Yirrkala altiusculodorsalis*.

Fin formula: D. 441~459 (approximately); A. 292~317 (approximately).

Etymology: Species’ scientific name is Latin. The first part, “altiuscul”, from “altiusculus”, means “comparatively high”; the second part, “dorsalis” means “dorsal-fin”; “o” is a connecting part. It is according to the neotypes’ comparatively high dorsal fin.



Fig 2. Left view of Holotype of *Yirrkala altiusculodorsalis*, with dorsal fin origin, gill opening, and anus marked. The lower scale is of unit cm

Diagnosis: Dorsal-fin length greater than half of maximum body height; distance between dorsal-fin origin and posterior margin of head greater than distance between dorsal fin origin and rictus; body uniformly dark brown; median groove exceeds anterior-naris base; intermaxillary dentition distant from other dentition; vomerine teeth anteriorly forming two

rows, then fused into one row.

Description: Trunk and tail very elongate; trunk a cylinder; tail a cylinder anteriorly, while tapered as a cone at posterior 1/4; tail length greater than trunk length; anus near midpoint of total, slightly anteriorly or posteriorly.

Table 1. Form of measurements of preserved specimens of *Yirrkala altiusculodorsalis* divided by total length. Unit: %; X: not present.

		Range	Holotype	Mean
Based on 4 stained-hyalinized specimens	Standard length (SL)	99.9~99.9	X	99.9
	Dorsal-fin length	1.73~2.21	X	2.10
	Anal-fin length	1.44~1.59	X	1.49
Based on 8 frozen specimens	Body depth (BD)	1.69~2.63	2.52	2.23
	Body width (WL)	1.82~2.52	1.88	2.21
	Dorsal-fin-base length	93.1~96.7	95.9	94.6
	Anal-fin-base length	44.8~49.4	44.9	47.3
	Snout length (SNL)	1.08~1.39	1.09	1.26
	Eye diameter (ED)	0.271~0.348	0.294	0.318
	Ocular distance (OD)	0.541~0.769	0.558	0.645
	Head length (HL)	5.92~7.88	7.04	6.96
	Head height (HH)	1.88~2.44	2.39	2.16
	Head width (HW)	1.54~2.15	1.94	1.74
	Trunk length (TRL)	40.7~47.6	43.9	43.7
	Mouth length (ML)	1.62~2.85	2.05	2.26
	Caudal length (CL)	48.2~52.2	48.4	49.7



Fig 3. Dorsal view of Holotype of *Yirrkala altiusculodorsalis*.

Head conical, tapering forward. Mouth very inferior, given intermaxillary teeth completely exposed from mouth; anterior naris short tubular, out of mouth, on underside of snout; posterior naris short elliptical, within mouth, under anterior margin of eye; median groove extends to anterior-naris base; gill opening lateroventral, simple, without duplication; many folds happen on skin covering gill and isthmus; Isthmus

narrow. Tongue fixed except tip; tip succulent. Intermaxillary teeth 3; 1 anteriorly; 2 posteriorly; all could be retracted backwards; length nearly the same or only one very shorter than others; longer ones thin fang-like, while shorter one irregular granular, both flexible; intermaxillary teeth very apart from other teeth. Vomerine teeth approximately 10~12 totally, long conical, nearly at same length, in 2 rows anteriorly and fused into 1 row posteriorly; 8 in two rows, only forming 2 longitudinal rows, jumbled and not forming rows latitudinally; 2-4 forming 1 longitudinal row. Mandibular teeth approximately 18~23 totally, conical, in 1 row, nearly at same size, but the latter ones are slightly smaller. Maxillary teeth approximately 20~28 totally, conical, in 1 row; latter 5-7 small ones on each side, overall, 10-13; former 5~10 enlarged and curving backwards on each side, overall 10~18.



Fig 4. Inner-oral view of Holotype of *Yirrkala altiusculodorsalis*. Left: upper jaw; Right: lower jaw.

Laterosensory pores small and hard to observe, slightly protuberant from skin. Cephalic laterosensory pores includes

infraorbital, postorbital, supraorbital, mandibular, preopercular and supratemporal; lateral-line laterosensory pores includes head, trunk, and tail. Infraorbital pores 4 on each side, all out of mouth; in an order from anterior to posterior; first one completely ventral, before eye, between base of intermaxillary teeth and vomerine teeth, and the tip of the longer intermaxillary teeth could exceed it after retract; second one under posterior margin of pupil; third one under posterior margin of eye; fourth one slight behind and above third one, at about what vomerine teeth fused from two rows into one row. Postorbital pores 2 on each side; in an order from top to bottom, while also the first one slightly anterior to the second one, anterior to the third one; first one slightly below the upper margin of orbit, very close to orbit; second one slightly above the lower margin of pupil, very close to orbit. Supraorbital pores totally 9; anteriorly 4 pairs, meaning 4 on each side; posteriorly 1 median; paired one in an order from anterior to posterior; first pair also called ethmoid pores, 1 on each side, completely ventral, in front of anterior naris, at a same latitudinal level of tip of median groove; second pair above anterior naris; third pair above posterior naris; fourth pair about above mid-point of pupil; last median one also called interorbital pore, about above posterior margin of orbit. Mandibular pores 4 on each side; in an order from anterior to posterior; all nearly completely ventral, but the latter more lateral than the former; following states at what the mouth closed; first one especially tiny, nearly on the tip of mandible; second one about under anterior margin of eye; third one about under posterior margin of eye; fourth one behind the mandibular dentition and slightly behind the maxillary dentition. Preopercular pores 2 on each side; in an order from top to bottom; first one on the extension line of gape; second one slightly below and in front of the first one. Supratemporal pore 1, median, anterior to dorsal-fin origin, posterior to rictus. Cephalic laterosensory pores in canal, while lateral-line laterosensory pores one the lower margin of canal; canal of lateral line on two sides connected with each other through a supratemporal branch transiting supratemporal pore, while the main body of the canal goes straight forward to connect with other part of canal involving cephalic laterosensory pores, and this straight part without any pores, only a canal left; no branches behind head. Lateral line one left side and right side usually slightly asymmetric; total lateral-line-laterosensory-pore count on one side 137~153; head lateral-line pores 9~10, first concave up, then concave down; trunk lateral-line pores 61~69; tail-lateral-line pores 67~75.



Fig 5. Ventral view of head of Fr-10005, whose median groove, anterior nares, and ventral pores are especially distinctive.

Paired fins absent; median fins present; caudal fin completely hidden under skin, leaving tail tip a tough finless median flap; dorsal fin and anal fin well-developed but considerably fragile; both dorsal fin height and anal fin height increase sharply at beginning and decrease uniformly and tardily; all the element are simple rays. Dorsal fin high, higher than half body depth; begins on head, above the second vertebra; ends with a low membrane connect with caudal flap; distance from rictus to dorsal-fin origin less than distance

from posterior margin of head to dorsal-fin origin; length of rays become higher and lower, forming a peak at approximately the 59th ray; rays overall dense, while the ending is denser than the beginning, denser than the centre. Anal fin high but slightly lower than dorsal fin, near half body depth; begins just behind anus; ends with a low membrane connect with caudal flap; length of rays become higher and lower, forming a peak at approximately the 13th ray; rays overall dense, while the ending is denser than the beginning, denser than the centre.

Preal anal vertebrae 66~68; postanal vertebrae 71~78; total 138~145 Depth of neurocranium about 3.088 in length; first dorsal ray above second vertebra, first pterygiophore anteriorly extends to the interstice between first vertebra and second vertebra. 67

Coloration:

Frozen: Skin nearly uniformly dark brown, abruptly imperceptibly darker at dorsal-fin base, gradually slightly lighter ventrally. Head before opercular lighter, especially around eye and rictus nearly white; a narrower brown ring surrounds the white ring around eye; a wider white area surrounds the brown ring, and they on each side connect with each other from dorsal side of head; snout light brown; a triangular area involving the fourth pair of supraorbital pores and interorbital pores brown; among them, area below eye khaki, which is the gap of the color rings. Inner oral beige. Fins completely khaki. Around laterosensory pores are golden; laterosensory pores are white.

Alive: Similar to living ones, but the patterns on head are brown extremely inapparent.

Preserved in alcohol: Head pale grey; others completely khaki.

Hyalinized-stained: Bones purple, stomach orange, other inner tissue translucent with bluish-green patination, while the skin is transparent with only light grey.



Fig 6. Head of Holotype frozen and Paratype before preserved in alcohol of *Yirrkala atiusculodorsalis*. A: Left view of holotype; B: Left view of paratype; C: dorsal view of paratype.

Distribution: In tropical seas, from southern Taiwan Strait to northern South China Sea, at depth approximately 100 m, faraway from estuaries.

Remarks: The shorter intermaxillary tooth might be broken, given the fracture texture. And the short one might be same as the long ones before broken.

The author first considered *Yirrkala altiusculodorsalis* sp. nov. belong to the genus *Letharchus*, distributed in Atlantic Ocean and Eastern-Pacific Ocean, according to their high dorsal fin, anterior dorsal-fin origin, slender body and short head. However, they are shift into genus *Yirrkala* due to the long neurocranium, whose depth slightly greater than 3 in length (vs. 3 or less in *Letharchus*); tail length nearly equals half of total length (vs. tail length prominently less than half of total length *Letharchus*); median groove long (vs. median groove absent in *Letharchus*); distance from snout tip to dorsal fin origin greater than distance from dorsal fin origin to anterior tip of gill opening (vs. less in *Letharchus*), and less developed ethmoid section of supraorbital pores (vs. usually developed in *Letharchus*) [7,23].

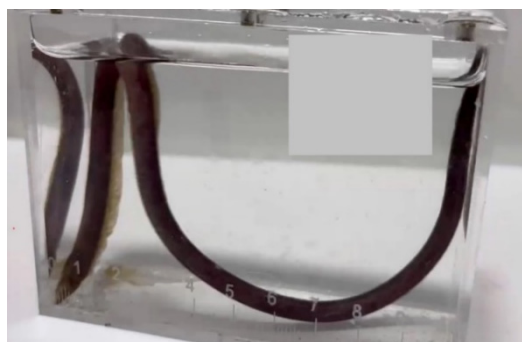


Fig 7. Living specimen stretching dorsal fin, not preserved. Scale unit: cm

This species is very similar to *Yirrkala tenuis*. As aforementioned, they could be distinguished given that the new species has a dorsal-fin origin the distance from it to rictus of which is less than from dorsal-fin origin to posterior margin of head (vs. greater in *Y. tenuis*); and also brown are successively darker dorsally, (vs. darker brown colour in *Y. tenuis* are formed by very intensive tiny brown dots visible using naked eyes, while not deserved to be called patterns); caudal length in total length might less than 2 (vs. must greater in *Y. tenuis*) [6,16].



Fig 8. lateral view of neotype “PRVT-St 10009”

The author also formerly thought the neotypes are belonged to *Callechelys kuro*, especially the patterns on heads are very similar, but they have very apparent differences, too. Also due to the long neurocranium, depth slightly greater than 3 in length (vs. 3 or less in *Callechelys kuro*); nearly no duplicated wrinkles above the lateral line on head and completely no on anterior trunk (vs. both apparently present in *Callechelys kuro*); mandibular pores 4 on each side (vs. 5 in *Callechelys kuro*); median groove slightly exceeds anterior margin of anterior nares (vs. does not exceed in *Callechelys kuro*); skin nearly uniformly dark brown (vs. reddish on side in *Callechelys kuro*); no bright yellow on skin (vs. bright yellow on anterior nares and haphazardly near the rictus in *Callechelys kuro*); more preanal vertebrae, 66–68 (vs. 70–72 in *Callechelys kuro*) [2,12,24,25].

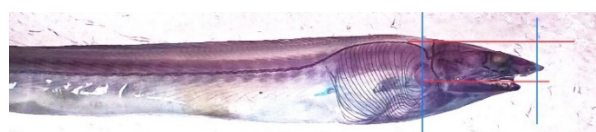


Fig 9. lateral view of anterior part of neotype “PRVT-St 10009”. Red lines: latitudinal ends of neurocranium; blue lines: longitudinal tips of neurocranium. The inner margin of the rectangle represents the range of neurocranium, showing a longer neurocranium than *Callechelys*.

4. Prospect

This genus lacks overall description, especially *Yirrkala maculata* and *Yirrkala macrodon*. Their effectiveness and classification status still require more detailed verification. Besides, the whole genus lacks molecular evidence based on accurate description of whether inner or outer appearance, except *Yirrkala misolensis* [12]. And also, other species lack of fin-rays count. Besides, the distribution range also remains in unclear. Therefore, more characters are necessary to be collected and juxtaposed for the taxonomy of the genus *Yirrkala*.

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