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Ostichthys kinchi, a new species of soldierfish from New Ireland, Papua New Guinea, western Pacific Ocean (Teleostei: Holocentridae)

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Abstract

A new species of soldierfish, *Ostichthys kinchi* from off northern New Ireland, Papua New Guinea, is described on the basis of a single male specimen collected with a trawl in 191-290 m depth near Kavieng. The new species is characterised by the following characters: scales above lateral line to mid-base of spinous portion of dorsal fin 3½; no half-scale present anterior to first lateral-line scale; dorsal profile of head nearly uniformly convex; anterior end of each nasal bone in large specimen without sharp, forwardly directed spines; a small spine at corner of preopercle, which is only slightly larger than other serrations; pectoral-fin rays 17; lateral-line scales 28; gill rakers 7 + 9 ; last dorsal-fin spine slightly longer than penultimate spine; body depth 2.1 in SL; head length 2.4 in SL; snout very short, 6.5 in head length; least depth of caudal peduncle 4.8 in head length. The new species is compared with other species in the genus. A revised key to the species of *Ostichthys* is presented.

Keywords: Squirrelfishes, New species, Identification key, New Guinea.
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Introduction

The squirrelfishes of the family Holocentridae are a group of tropical and warm temperate marine fishes occurring in the upper 640 metres of all oceans. Recently, they were arranged in their own order Holocentriformes (Nelson et al. 2016: 304, based on Betancur-R et al. 2013: 13). Within the Holocentridae, two valid subfamilies are recognised, Holocentrinae and Myripristinae (Nelson 1955: 127), based on swim bladder characteristics: in the Myripristinae, the swim bladder is in direct relationship with the auditory bulla and the sacculus in particular through antero-lateral projections, while no such relationship exists in the Holocentrinae. Externally, the Myripristinae have a more elongate body and the third anal-fin spine shorter (Randall et al. 1982: 1). The Myripristinae contains the genera *Myripristis* Cuvier 1829, *Corniger* Agassiz in Spix & Agassiz 1831, *Ostichthys* Cuvier [ex Langsdorff] in Cuvier & Valenciennes 1829, *Plectrypops* Gill 1862 and *Pristilepis* Randall, Shimizu & Yamakawa 1982 (see Randall et al. 1982; Eschmeyer et al. 2017). Eschmeyer and Fong (2017) recognised 85 valid species in the Holocentridae, and 44 valid species in the Myripristinae. The genus *Ostichthys* is characterised by having well-developed nasal bones as adults which extend anteriorly to the median upper lip, a long premaxillary groove, 29 vertebrae, and the vomerine teeth in a subtriangular to elliptical patch (Randall et al. 1982). The genus was revised by Randall et al. (1982), and then very recently by Greenfield et al. (2017), who distinguished 14 valid species from the western Atlantic and Indo-West Pacific: *Ostichthys acanthorhinus* Randall, Shimizu & Yamakawa 1982, now known from the northern and eastern Indian Ocean; *O. archiepiscopus* (Valenciennes 1862) from Réunion and Mauritius, Ryukyu Islands, Japan and Ogasawara Islands, and Hawaiian Islands; *O. brachygnathus* Randall & Myers 1993 from Guam; *O. convexus* Greenfield, Randall & Psomadakis 2017 and *O. daniela* Greenfield, Randall & Psomadakis 2017, from Myanmar; *O. delta* Randall, Shimizu & Yamakawa 1982 from the Comores, Réunion and Samoa; *O. hypsipterygion* Randall, Shimizu & Yamakawa 1982 from the Ryukyu Islands; *O. japonicus* (Cuvier in Cuvier & Valenciennes 1829) from the Andaman Sea and western Pacific; *O. kaianus* (Günther 1880) from the Indian Ocean and western Pacific; *O. ovaloculus* Randall & Wrobel 1988 from the Society Islands; *O. sandix* Randall, Shimizu & Yamakawa 1982 from the Hawaiian and Society islands; *O. sheni* Chen, Shao & Mok 1990 from Taiwan; *O. sufensis* Golani 1984 (described by Golani 1984, as subspecies *O. hypsipterygion sufensis*) from the Gulf of

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Aqaba, Red Sea; *O. trachypoma* (Günther 1859) from the western Atlantic. The species of holocentrid fishes from the Ryukyu Islands were reviewed by Eguchi and Motomura (2016); they reported three species of *Ostichthys* from the archipelago, including *O. hypsipterygion*, *O. japonicus* and *O. kaianus*.

Species of the genus *Ostichthys* live near the bottom on the lower continental and insular shelf the upper slopes. They have been collected at depths of 37-640 metres. Very little is known about their biology; however, like other holocentrids, they are predatory, mainly feeding on fishes and crustaceans. With their large eyes, they are very well adapted to detect their prey visually and hunt under poor light conditions, in shallower water at night, in deeper water during the day.

A single specimen of an undescribed species of the genus was collected during the KAVIENG 2014 expedition in northern New Ireland Province, Papua New Guinea. As the species is apparently extremely rare, and possibly locally endemic in New Ireland, it is described herein, bringing the total number of species known in the genus to 15.

Material and Methods

The holotype of the new species is deposited in the National Taiwan University, University Museum, Taipei, Taiwan (NTUM). Comparative materials are listed below. Abbreviations of museum collections (see below) follow Fricke and Eschmeyer (2017a).

Methods follow Randall et al. (1982); fin-ray counts follow Fricke (1983). The starting point for length measurements is the middle of the upper lip. The standard length (measured from the tip of the upper lip to the middle of the urohyal/caudal fin base) is abbreviated SL, the head length HL. The identification key is based on Randall et al. (1982) and Greenfield et al. (2017), but was updated according to subsequent findings.

Species classification and nomenclature follows Eschmeyer et al. (2017). Reference and journal citations follow Fricke (2017) and Fricke and Eschmeyer (2017b). The map was composed using QGIS 2.12.2.

Comparative material (genus *Ostichthys*): *Ostichthys acanthorhinus* Randall, Shimizu & Yamakawa 1982: BMNH 1982.4.6.26 (1), Indonesia; *O. archiepiscopus* (Valenciennes 1862): MNHN A-8095 (1 syntype), La Réunion; MNHN 0000-2589 (1 syntype), La Réunion; MNHN 1987-1753 (1), La Réunion; USNM 204034 (1), La Réunion; *O. delta* Randall, Shimizu & Yamakawa 1982: BPBM 20050 (holotype), La Réunion; MNHN 1980-1534 (2 paratypes), La Réunion; USNM 223716 (1 paratype), La Réunion; *O. hypsipterygion* Randall, Shimizu & Yamakawa 1982: BPBM 26362 (1 paratype), Okinawa, Ryukyu Islands; *O. japonicus* (Cuvier in Cuvier & Valenciennes 1829): IRDNC uncat. (1), Grande Terre, New Caledonia; MNHN 1891-0661 (1), China, Shanghai; MNHN 1980-0425 (1), Vanuatu; MNHN 2004-0145 (1), Madagascar; *O. kaianus* (Günther 1880): MHNRUN 357 (1), La Réunion; MNHN 1962-0319 (1), La Réunion; MNHN 2003-2654 (2), Chesterfield Islands, New Caledonia; MNHN 2003-2677 (2), Chesterfield Islands, New Caledonia; *O. sandix* Randall, Shimizu & Yamakawa 1982: MNHN 2006-0262 (3), Solomon Islands; *O. sufensis* Golani 1984: HUJ 11286 (holotype), Egypt, Gulf of Aqaba, Red Sea; BPBM 26362 (1 paratype), Okinawa, Ryukyu Islands; HUJ 11287 (1 paratype), Egypt, Gulf of Aqaba, Red Sea; *O. trachypoma* (Günther 1859): BMNH 1842.12.12.66 (1 syntype), West Indies; BMNH 1859.3.14.22 (1 syntype), Cuba.

Results

Systematic ichthyology: The present paper follows the classifications provided by Nelson et al (2016) and Laan et al. (2014):

Superclass Gnathostomata
  Subclass Actinopterygii
    Division Teleosteomorpha

Subdivision Teleostei
Cohort Euteleostei
Superorder Acanthopterygii
Order Holocentriformes
Family Holocentridae Bonaparte 1833
Genus *Ostichthys* Cuvier in Cuvier & Valenciennes 1829

Ostichthys kinchi new species

(Figs. 1-3)

Common name: New Ireland soldierfish

Figure 1. *Ostichthys kinchi* n. sp., NTUM 11370, holotype, 182.7 mm SL, western Pacific Ocean, Papua New Guinea, New Ireland Province, 7 km northwest of Kavieng. Lateral view, left side (preserved specimen). Photograph: Barry C. Russell.

Holotype. NTUM 11370, 182.7 mm SL, western Pacific Ocean, Papua New Guinea, New Ireland Province, Kavieng District, 7 km northwest of Kavieng, 02º32.31'S 150º44.206'E - 02º30.31'S 150º44.04'E, 191-290 m depth, trawl, R/V Alis, St. CP4503-1 (PNG 3593), 7 Sept. 2014, 10:10-11:02 h.

Diagnosis. Scales above lateral line to mid-base of spinous portion of dorsal fin $3^1/_2$; no half-scale present anterior to first lateral-line scale; dorsal profile of head nearly uniformly convex; anterior end of each nasal bone in large specimen without sharp, forwardly directed spines; a small spine at corner of preopercle, which is only slightly larger than other serrations; pectoral-fin rays 17; lateral-line scales 28; gill rakers 7 + 9 ; last dorsal-fin spine slightly longer than penultimate spine; body depth 2.1 in SL; head length 2.4 in SL; snout very short, 6.5 in head length; least depth of caudal peduncle 4.8 in head length.

Description. D XII,12; A IV,11; P1 16,i (total 17); P2 I,11; C (iv),i,17,i,(iii). Measurements of the holotype are given in Table 1.

Gill rakers 7 + 9. Pseudobranchial filaments 20. Branchiostegal rays 7, the first slender, medial to the second. Lateral-line scales 28; no half scale anterior to upper half of first pore. Scales above lateral line to origin of dorsal fin 4, below 2nd to 11th dorsal-fin spines $3^1/_2$. Scales below lateral line to origin of anal fin $7^1/_2$.

Figure 2. *Ostichthys kinchi* n. sp., NTUM 11370, holotype, 182.7 mm SL, western Pacific Ocean, Papua New Guinea, New Ireland Province, 7 km northwest of Kavieng. Lateral view, left side (fresh specimen). Photograph: Jhen-Nien Chen.

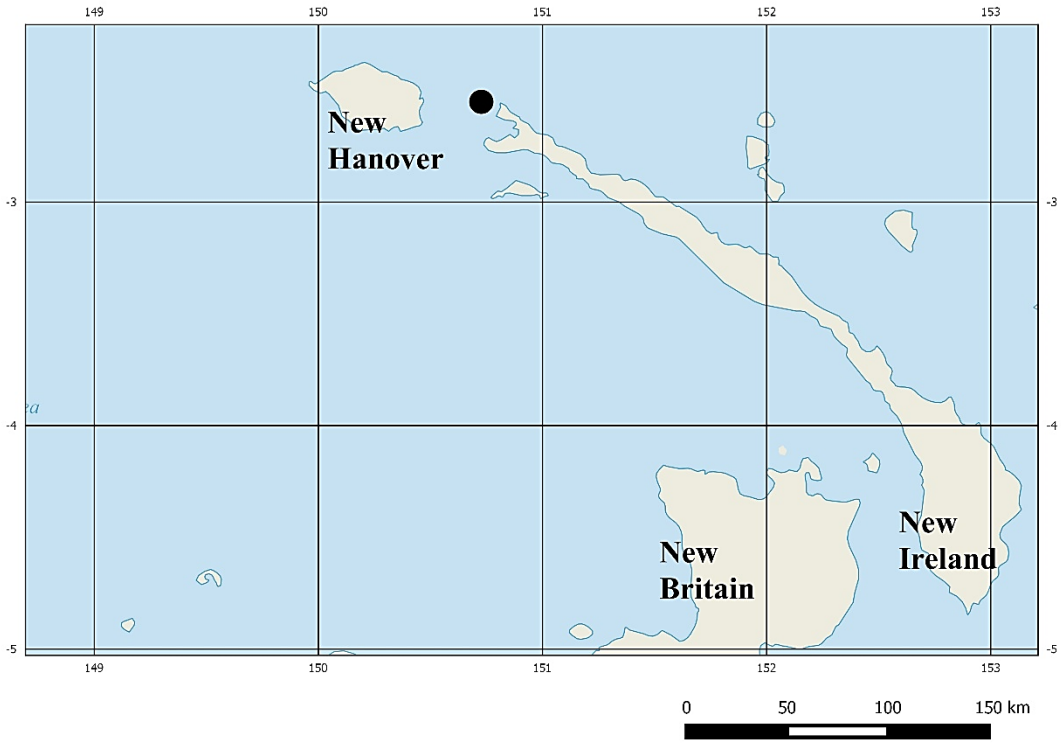

Figure 3. Distribution of *Ostichthys kinchi* n. sp. (circle) in the eastern Bismarck Sea, Papua New Guinea, western Pacific Ocean.

Circumpeduncular scales 12. Median predorsal scales 6; median prepelvic scales 13.

Body moderately deep, depth 2.1 in SL, compressed, body width 1.8 in body depth; head length 2.4 in SL; dorsal profile of head nearly uniformly convex; snout very short, 6.5 in head length; eye large, orbit diameter 3.1 in head length; interorbital space convex, interorbital distance 6.0 in head length; caudal peduncle slender and longer than deep, least depth 4.9 in head length, length 3.5 in head length.

Mouth large, lower jaw slightly projecting, maxilla extending posteriorly to posterior end of pupil, posterior end of maxilla very broad, combined height of maxilla and supramaxilla 3.9 in head length; upper jaw length

Table 1. Morphometric characters of *Ostorhinchus kinchi* n. sp., NTUM 11370, holotype, 182.7 mm SL, western Pacific Ocean, Papua New Guinea, New Ireland Province, Kavieng District, 7 km northwest of Kavieng.

Characters	Measurement (mm)
Standard length	182.7
Body depth	86.8
Body width	46.4
Head length	76.8
Snout length	12.4
Orbit diameter	25.0
Interorbital distance	12.6
Upper jaw length	47.1
Least depth of caudal peduncle	16.0
Caudal-peduncle length	19.9
Snout to origin of dorsal fin	75.6
Snout to origin of anal fin	138.9
Snout to origin of pelvic fins	95.5
Length of first dorsal-fin spine	17.4
Length of longest dorsal-fin spine	38.3
Length of 11th dorsal-fin spine	6.7
Length of 12th dorsal-fin spine	9.5
Length of longest dorsal-fin ray	28.2
Length of third anal-fin spine	26.9
Length of longest anal-fin ray	25.2
Caudal-fin length	35.6
Caudal concavity	16.2
Pectoral-fin length	48.3
Length of pelvic-fin spine	31.2
Pelvic-fin length	40.9

1.6 in head length; teeth in villiform bands in jaws, broader and thickened anteriorly; knoblike anterior end of lower jaw fitting into toothless symphyseal notch in upper jaw when mouth is closed; villiform teeth on vomer in a slightly bent patch, apex anteriorly; villiform teeth in a narrow band on palatines, widening anteriorly, with a round, spoon-like end; tongue edentate; nasal fossa large, nearly oval, directly in front of orbit; gill rakers long, longest next to one at angle, its length 1.6 in orbit diameter; gill filaments short, the longest on first gill arch 3.4 in orbit diameter.

External bones of head rugose, ridged and spiniform, free margins of suborbitals, opercle, subopercle, interopercle, double margin of preopercle and lower edges of the two lowermost branchiostegal rays with numerous spinules; front of each nasal bone in large holotype with a broad, blunt, rounded knob, but without spines; a prominent, stout spine posteriorly on opercle; a very small spine at corner of preopercle that it not much longer than other serrations on margin of preopercle; suborbital depth below centre of eye 3.5 in orbit diameter; length of longest postorbital bone 2.6 in orbit diameter.

Scales coarsely ctenoid, ctenii arsing from low ridges on posterior surface of scales; scales of body of holotype with 18-34 ctenii; anterior scales with a higher number of ctenii than posterior; scales dorsally on head extending forward to a vertical slightly anterior to upper end of preopercular margin; preopercle with four nearly horizontal rows of scales; base of opercle with a single row of five scales; spinous portion of dorsal fin without scales; soft portion and anal fin with a basal scaly sheath, scales not adhering to fins; base of caudal and pectoral fins with small scales; pelvic fin with a mid-ventral posterior projection from the base of 3 moderately large scales; the posterior scale rounded, with two small lateral scales.

Origin of dorsal fin over second lateral-line scale; fourth dorsal-fin spine longest, 2.0 in head length; last dorsal fin significantly longer than penultimate spine, its length in 4.0 longest dorsal spine; space between last dorsal-fin spine and first dorsal-fin ray about half as broad as space between last two dorsal-fin spines; longest

Table 2. Comparison of *Ostorhinchus kinchi* n. sp. characters with similar species in a group with relatively small scales and reduced head spines (values different from those of *Ostorhinchus kinchi* n. sp. and given in bold face; + present, - absent).

Characters	*O. kinchi* n. sp.	*O. convexus*	*O. daniela*	*O. hypsipterygion*	*O. japonicus*	*O. ovaloculus*	*O. sandix*	*O. sheni*	*O. sufensis*
Dorsal-fin rays	XII,12	XII,13	XII,13	XII,13	XII-XIII, 12-14	XI,16	XII,13	XII,13	XII,13
Anal-fin rays	IV,11	IV,11	IV,11	IV,11	IV,10-12	IV,10	IV,11	IV,11	IV,11
Pectoral-fin rays	17	16-17	16	15	16-17	15	16-17	16-17	15
Lateral-line scales	28	28-29	28	28-29	28-30	38	28	28-29	28
Predorsal scales	6	5-6	5	6-7	7-8	6	5	6-7	6
Gill rakers (upper limb)	7	8	8	8	7-10	6	7-9	6-7	7
Gill rakers (lower limb)	9	13	13	13	12-14	13	15-16	11-13	13
Spine on corner of preopercle	+	–	–	–	–	–	–	–	–
Snout length in HL	6.5	6.2-6.8	6.5	4.8-5.6	4.6-5.6	3.65	4.3-4.7	5.4-6.35	4.7-5.5
Length of last dorsal spine compared to penultimate spine	slightly longer	shorter	shorter	slightly shorter	longer	equal	equal	equal or shorter	equal

dorsal-fin ray 2.0 in head length; origin of anal fin below base of last two dorsal-fin spines; first anal-fin spine very small; third anal-fin spine longest and very stout, 2.9 in head length; third to fourth anal-fin ray longest, 3.0 in head length; caudal fin small, 2.2 in head length; caudal fin forked, caudal concavity 4.7 in head length; pectoral fins longer than pelvic fins, third to fourth rays longest, 1.6 in head length; origins of pelvic fins below lower pectoral-fin base; first and second pelvic-fin rays longest, 1.9 in head length.

Colour in preservative. Head, body and fins light brown, eyes bluish grey.

Distribution. The species is only known from the type locality, in Kavieng District, New Ireland Province, Papua New Guinea. The species was collected at a depth of 191-290 m.

Etymology. This new species is named in honour of Dr. Jeff Kinch, Principal of the National Fisheries College in Kavieng, and founder of the Nago Island Mariculture and Research Facility (NIMRF), which hosted the 2014 Kavieng marine biodiversity expedition. Dr. Kinch was instrumental in the success of the expedition, which discovered several new fish and numerous new invertebrate species.

Comparisons. *Ostichthys kinchi* n. sp. is a member of a group with relatively small scales (scales above lateral line to middle of spinous portion of dorsal fin 3½), and reduced head spines (anterior end of nasal bones in adults without a forward-directed spine; no spine at corner of preopercle notably larger than spinules along entire margin); other species in this group are *O. convexus*, *O. daniela*, *O. hypsipterygion*, *O. japonicus, O. ovaloculus, O. sandix, O. sheni* and *O. sufensis. O. kinchi* n. sp. mainly differs from the other species in the group by its lower-limb gill rakers 9 (other species 11-16); snout very short, snout length 6.5 in head length (other species 3.65-6.35 except *O. convexus* and *O. daniela*); corner or preopercle in adult with a small spine, which is not much longer than the surrounding serrae (other species without a spine). Species in the group are compared in Table 2. A key to the species of *Ostichthys* is presented below to distinguish *O. kinchi* n. sp. from the other species.

Key to species of the family genus *Ostichthys* Cuvier [ex Langsdorff] in Cuvier & Valenciennes 1829

1 Scales above lateral line to middle of spinous portion of dorsal fin 3½……..2
– Scales above lateral line to middle of spinous portion of dorsal fin 2½……11
2 Anterior end of nasal bones without a forward-directed spine (except juveniles); gill rakers 6-11 + 9-17; no spine at corner of preopercle notably larger than spinules along entire margin…… 3
– Anterior end of each nasal bone with a sharp forward-directed spine projecting to or beyond median upper lip; gill rakers 10-12 + 16-18; a short stout spine at corner of preopercle……*Ostichthys acanthorhinus*
3 Lateral-line scales 38; dorsal-fin elements XI, 16……..*O. ovaloculus*
– Lateral-line scales 28-30; dorsal-fin elements XII, 12-14……..4
4 Lower-limb gill rakers 9; snout very short, snout length 6.5 in head length; corner or preopercle in adult with a small spine (not much longer than surrounding serrae)……*O. kinchi* n. sp.
– Lower-limb gill rakers 11-16; snout longer, snout length 3.65-6.35 in head; corner of preopercle in adult without a spine……5

5 Height of 2nd suborbital bone (measured vertically below eye centre) high, about half of orbit; last dorsal spine definitely longer than penultimate spine, twice or three times longer than it; pectoral rays 16-17, usually 17……*O. japonicus*
– Height of 2nd suborbital bone low, about one-third to one-fourth of orbit; last dorsal spine subequal to penultimate spine; pectoral rays 15-17, usually 15-16…… 6
6 Lower gill-rakers 15–16; pectoral-fin rays 16–17, mostly 16……..……7
– Lower gill-rakers 11–13; pectoral-fin rays 15–16, mostly 15……...8
7 Caudal-peduncle depth 4.2–4.4 in head length; longest dorsal-fin spine 2.2–2.3 in head length……..*O. sandix*
– Caudal-peduncle depth 4.7–4.9 in head length; longest dorsal-fin spine 1.9–2.3 in head length……...*O. sheni*
8 Pectoral-fin rays 15; snout length 4.8–5.6 in head length……9
– Pectoral-fin rays 16–17; snout length 6.2–6.8 in head length……10
9 Anterior ends of palatine-tooth patches reaching level of vomerine-tooth patch……*O. sufensis*
– Anterior ends of palatine-tooth patches not reaching level of vomerine-tooth patch……...*O. hypsipterygion*
10 Head slopes more steeply, lower margin of maxilla to top of eye about 2.2 in head length; caudal-peduncle length 8.3% SL; body red with distinct white lines along body……..*O. daniela*
– Head more convex, lower margin of maxilla to top of eye 1.6–2.0 in head length; caudal peduncle length 10.5-12.1% SL; body red and silver with faint white lines……..*O. convexus*
11 Anal-fin soft rays usually 10; lateral-line scales 27……12
– Anal-fin soft rays usually 11-12; lateral-line scales 28-30……..……...13
12 Dorsal spines XI; tooth patch on vomer nearly triangular; head length 2.5-2.65 in SL; longest dorsal-fin spine 2.05-2.3 in head length; third anal-fin spine 1.8-2.05 in head length……*O. delta*
– Dorsal spines XII; tooth patch on vomer V-shaped; head length 2.45 in SL; longest dorsal-fin spine 2.6 in head length; third anal-fin spine 1.8-2.05 in head length……..*O. brachygnathus*
13 A half scale directly anterior to upper half of first pored scale of lateral line; pectoral rays 14-16, modally 15; lateral-line scales 28-30, modally 29……...14
– No half scale directly anterior to first lateral-line scale; pectoral rays 15-17, modally 16; lateral-line scales 28-30, modally 28……...*O. kaianus*
14 Last dorsal spine shorter than penultimate spine and not closely applied to soft portion of fin; dorsal profile of head straight; snout not short, 3.7-4.3 in head; gill rakers 7-9 + 13-15……*O. archiepiscopus*
– Last dorsal spine longer than penultimate spine and closely applied to soft portion of fin; dorsal profile of head moderately convex; snout short, 4.6-5.6 in head; gill rakers 8-11 + 14-17……...*O. trachypoma*

Discussion

This is an interesting finding of a deep-water soldierfish from northern New Ireland. The type locality is located on the Pacific slope of northern New Ireland; judging from the co-occurring fish fauna, the bottom must have consisted of fine sand, probably adjacent to a rocky reef. Other species collected at St. CP4503 included: (1) *Antigonia rubicunda* Ogilby 1910 (family Caproidae), (2) *Arnoglossus* sp. (family Bothidae), (3) *Callionymus petersi* Fricke 2016 (family Callionymidae), (4) *Chelidoperca* sp. (family Serranidae), (5) *Rhinobatos manai* White, Last & Naylor 2016 (family Rhiobatidae), (6) *Samariscus* sp. (family Samaridae), and (7) *Scorpaenopsis cotticeps* Fowler 1938 (family Scorpaenidae). Among these, *Callionymus petersi*, *Ostichthys kinchi* n. sp. and *Rhinobatos manai* are apparently endemic to New Ireland, and possibly also the undescribed species of *Chelidoperca*. Such a high number of endemics is quite remarkable.

Within the genus *Ostichthys*, the new species is most similar to *O. sheni* from Taiwan. Other species in the complex occur in the Ryukyu Islands (*O. hypsipyterygion*), Taiwan (*O. sheni*), from southern Japan and East Asia to northern Autralia (*O. japonicus*), Society Islands (*O. ovaloculus*) and Hawaiian Islands (*O. sandix*), Myanmar (*O. convexus* and *O. daniela*), and the Gulf of Aqaba, Red Sea (*O. sufensis*). The species complex thus mainly occurs in the western and central Pacific, with an exception in the Gulf of Aqaba.

Though the depth range between 180 and 300 metres was extensively sampled during the KAVIENG2014 Expedition, only a single specimen of *O. kinchi* n. sp. could be procured. This species is obviously either very

rare, or it occurs in a habitat that cannot be sampled with dredges or trawls, like crevices of deep rocky reefs. Such habitats are virtually impossible to sample, and it is a very rare but lucky chance to obtain one of their inhabitants. The ichthyofauna of deep rocky reefs is therefore currently underestimated; many new discoveries can be expected if we somehow find a way to collect fishes in these habitats.

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