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Revision of the leiognathid fishes of the genus *Secutor*, with two new species

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2新種をふくむヒイラギ科ウケグチヒイラギ属魚類の分類学的検討

望月　賢二*・林　公義**

インド-西太平洋に分布するヒイラギ科 Leiognathidae ウケグチヒイラギ属 *Secutor* を検討した結果，在来の3種 (*interruptus, indicius, insidiator*) に加えて2種類の未記載種 (*hanedai* sp. nov., *megalolepis* sp. nov.) をふくめた5種が確認された。これらの5種は，頬部の鱗の有無，側線鱗数，横列鱗数，成長にともなう体型の変化，体背部の斑紋などにより区別することができた。腹腔内に見られる発光器の形態には，種間で顕著な差異は認められなかった。

Introduction

According to MONKOLPRASIT (1973), the geuns *Secutor* consists of three species, i.e. *S. insidiator* (BLOCH), *S. ruconius* (HAMILTON-BUCHANAN) and *S. indicius* MONKOLPRASIT. JONES (1985), who reported only two species, *S. ruconius* and *S. insidiator*, from Australia, considered *S. indicius* as a doubtful species, though he examined the specimens of MONKOLPRASIT.

We have examined the specimens of the genus from the Indo-West Pacific region, and we find their mistakes on identification. We can clearly classify fishes of the genus into five species by some morphological characters, mainly scale counts and number of antero-orbital spines. In the present paper, we describe the species with two new species.

Methods

Measurements and counts mainly followed HUBBS and LAGLAR (1949). In all species of the genus, number of the pored scales on lateral line were clearly counted as number of scale pockets by shape of membrane of the scale pockets except for several to about ten pockets near the posterior end of caudal peduncle; all scale pockets to the posterior end of caudal peduncle were counted as lateral line scales in the present study. Body depth was measured at the origin of dorsal fin base.

Soft X-ray was used to examine internal characters. Cyanine blue was used to examine scales and/or scale pockets on head and body. A luminescent organ into the body cavity was isolated and examined.

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Key wards: **Leiognathidae, morphology, *Secutor***　キーワード：**ウケグチヒイラギ属，ヒイラギ科，分類**

Abbreviations of the museums and organization are as follows; AMS: Australian Museum, Sydney; FAKU: Department of Fisheries, Faculty of Agriculture, Kyoto University, Japan; FUMT: Department of Fisheries, University Museum, the University of Tokyo, Japan; MNHN: Muséum National d'Histoire Naturelle, Paris; MVM: the Museum of Victoria, Melbourne, Australia; QMB: Queensland Museum, Brisbane, Australia; SEAFDEC: Southeast Asian Fisheries Development Center, Bangkok, Thailand; URM: Museum, University of the Ryukyus, Japan; YCM-HLP: HANEDA Luminous Pisces Collection, Yokosuka City Museum, Japan. Fish markets are abbreviated to F.M..

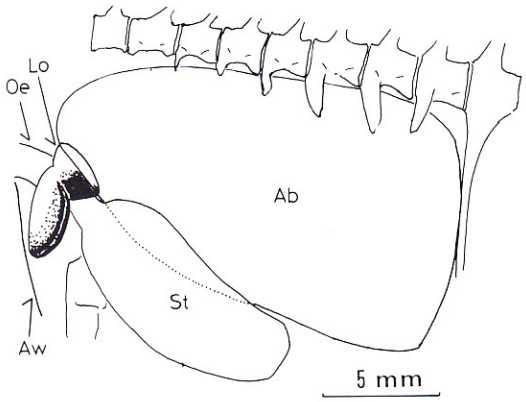

Fig. 1 Luminescent organ and air bladder of *Secutor indicius*, FUMT-P 21673–1, 67.5mm SL. Ab: air bladder; Aw: wall of abdominal cavity; Lo: luminescent organ; Oe: oesophagus; St: stomach.

Genus *Secutor* GISTEL, 1848

(Japanese name: Ukeguchi-hiiragi-zoku)

Secutor GISTEL, 1848: 9 (type species: *Zeus insidiator* BLOCH, 1787, by the orginal description).

Deveximentum FOWLER, 1904: 517 (type species: *Zeus insidiator* BLOCH, 1787, by the original description).

Diagnosis. Mouth protractile upward. Lower jaw ascends at angle of approx. 90° when mouth closed. Shape of luminescent organ with a constriction between its dorsal and ventral halves; upper part connected with air-bladder (Fig. 1). Teeth on both jaws minute, arranged in 1–2 irregular rows, scarcely in narrow band.

Remarks. *Chanda ruconius* HAMILTON-BUCHANAN, 1822, has been considered to belong to this genus (WEBER and de BEAUFORT (1931), MONKOLPRASIT (1973), JONES (1985)). However, according to the original description, mouth of the fish was nearly terminal, not protractile upward, and position of the fins clearly differs from all species described here. All species of *Secutor* have a black line from the ventral margin of orbit to the chin, and this character is considered to be a important diagnostic characters of the genus. Similar dark lines were drawn in the figure of the original description. However, the line was continued to the antero-ventral margin of orbit by a short branch line and it was also continued to snout directly. These characters are different from those of *Secutor* species. After all, the characters described in the original description did not correspond to those of *Secutor* but to those of *Leiognathus*. Considering that any type specimens of *S. ruconius* are not reserved (JONES, 1985), the fish should not be included in the genus *Secutor*.

Lower jaw of *Leiognathus hataii* ABE et HANEDA, 1972, ascends at an angle slightly less than 90°, and YABUMOTO (1981) included the species in *Secutor*. However, mouth of this species form a horizontally directed tube, not upward, when fully protruded, according to the original description and re-examination of the present authors. Therefore, the species should not be included in *Secutor* but in *Leiognathus*.

MCFALL-NGAI and DUNLAP (1984) reported that size and shape of the luminescent organ were significantly different between male and female in three species of the genus. In the present study, we did not find such differences though number of specimens examined their luminescent organ are not many.

Key to species of genus *Secutor*

1a Cheek with scales. Anterior part of body, including isthmus to chest, covered with

scales (Fig. 2A, B). Lateral line scales 43–60. ---------- 2

1b Cheek without scales. Anterior part of body, including isthmus to chest, without scales (Fig. 2C, D, E). Lateral line scales 60–111. ---------- 3

2a Lateral line scales 43–49. Scale rows above and below lateral line 6–7 and 13–15 respectively. Scale rows between pectoral and pelvic fin bases 9–11. Antero-orbital spine 1. ---------- *S. megalolepis* sp. nov.

2b Lateral line scales 54–60. Scale rows above and below lateral line 9–14 and 18–26 respectively. Scale rows between pectoral and pelvic fin bases 10–16. Antero-orbital spines 1–2. ---------- *S. interruptus*

3a Lateral line scales 84–111. Scale rows between pectoral and pelvic fin bases 24–31. Gill rakers on lower arch 17–22 and total gill rakers 24–30. Antero-orbital spine 1. --- 4

3b Lateral line scales 60–70. Scale rows between pectoral and pelvic fin bases 33–42. Gill rakers on lower arch 16–19 and total gill rakers 22–26. Antero-orbital spines 2. ---------- *S. hanedai* sp. nov.

4a Body depth not markedly increasing with growth, 41.1–50.2% of SL. Dark markings on dorsal half of body about 15 irregular vertical series consisted of dots and short lines. ---------- *S. indicius*

4b Body depth markedly increasing with growth from about 40% of SL in about 40 mm SL to about 60% of SL in about 100 mm SL. Dark markings on dorsal half of body about 10–13

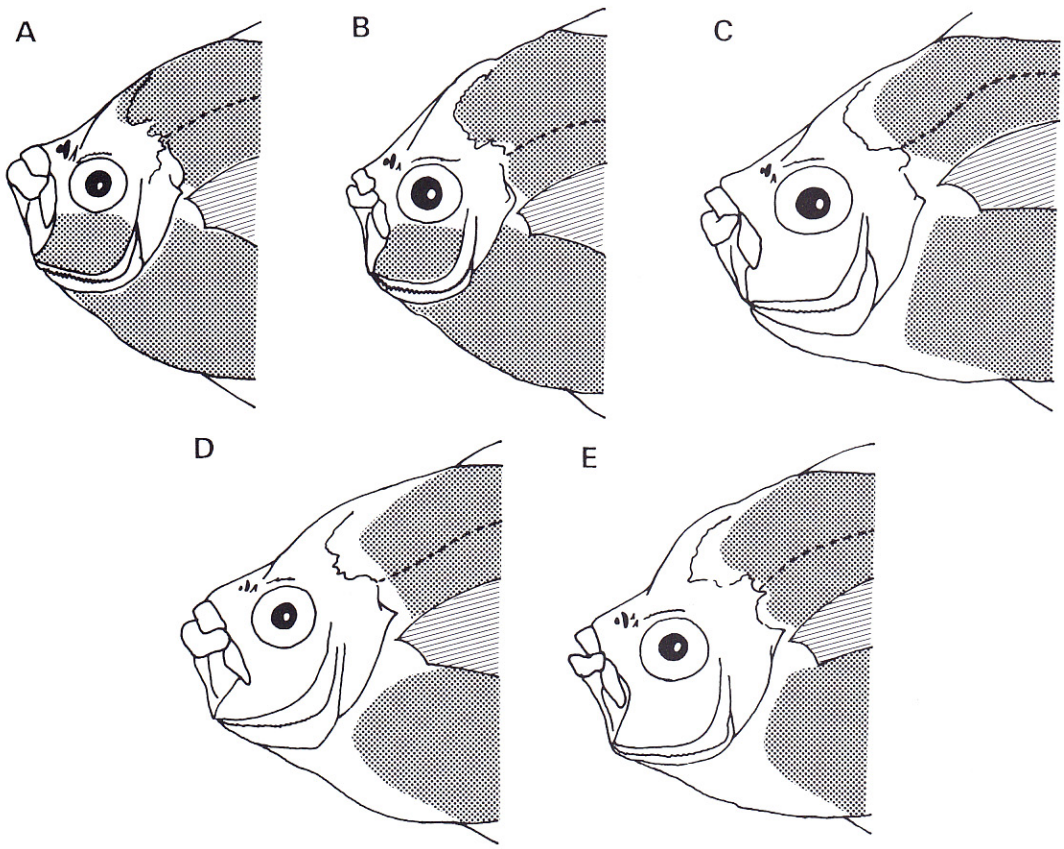

Fig. 2 Distribution of scales on the head and the anterior part of body of *Secutor*. A: *S. megalolepis* sp. nov.; B: *S. interruptus*; C: *S. indicius*; D: *S. insidiator*; E: *S. hanedai* sp. nov. Dotted areas: with scales; open areas: without scales.

regular transverse series consisted of dots, or dots and short lines. ---------- *S. insidiator*

Secutor megalolepis sp. nov.
(Figs 2A; 3A; 4; 8A, B)

Secutor ruconius: MONKOLPRASIT, 1973: 12–14, fig. 2; JONES, 1985: 608–611, fig. 19 (in part).

Holotype. URM 14964–2, 47.7 mm SL, Songkhla F. M., Thailand, Apr. 7, 1984.

Paratypes. YCM-HLP 179, 3 specimens, 37.7–44.3 mm SL, Sandakan F.M., North Borneo, Mar., 1937; YCM-HLP 214–2, 1 specimen, 30.8 mm SL; YCM-HLP 217, 5 specimens, 34.1–40.7 mm SL, Djakarta F.M., Indonesia, Dec. 8, 1969; FUMT-P 8733, 4 specimens, 18.9–22.7 mm SL, Bang Phe, Thailand, beach seine, Feb. 25, 1985; FUMT-P 21652, 1 specimen, 33.8 mm SL, brackish water lower than 5‰, Songkhla Lake, Thailand, small set net, Nov. 26, 1985; URM 12018, 1 specimen, 45.6 mm SL, Yannawa F.M., Bangkok, Thailand, Oct. 8, 1983; URM 14660, 1 specimen, 44.0 mm SL, Songkhla F.M., Thailand, Apr. 8, 1984; URM 14964–1, 1 specimen, 41.5 mm SL, Songkhla F.M., Thailand, Apr. 7, 1984.

Materials examined only for their scientific name and collecting data. YCM-HLP 561, 601; FUMT-P 8716–8725, 8734, 8735, 8737–8741; URM 8989 12536; AMS I 22966–002; QMB I 11616, I 20536, I 23204.

Diagnosis. Cheek with scales. Body completely with scales; isthmus to chest with scales. Scales on head and body bigger than those of congeners; lateral line scales 43–49; scale rows above lateral line 6–7, below lateral line 13–15, between bases of pectoral and pelvic fins 9–11, and on cheek 6–8. Body high, body depth 58.6–62.6% of SL. Antero-orbital spine 1. Gill rakers 4–6 on upper arch, 1 on joint, 15–19 on the lower, and 21–25 in total number.

Description. In the followings, characters of the holotype are shown first and are followed by those of the paratypes, and means are shown in parentheses.

Dorsal fin rays VIII, 16, VIII, 16 (VIII, 16); anal fin rays III, 14, III, 14 (III, 14); pectoral fin rays 16, 15–16 (15.9); lateral line scales 45, 43–49 (45.3); scale rows above lateral line 7, 6–7 (6.8), below lateral line 14, 13–15 (13.5); scale rows between pectoral and pelvic fin bases 9, 9–11

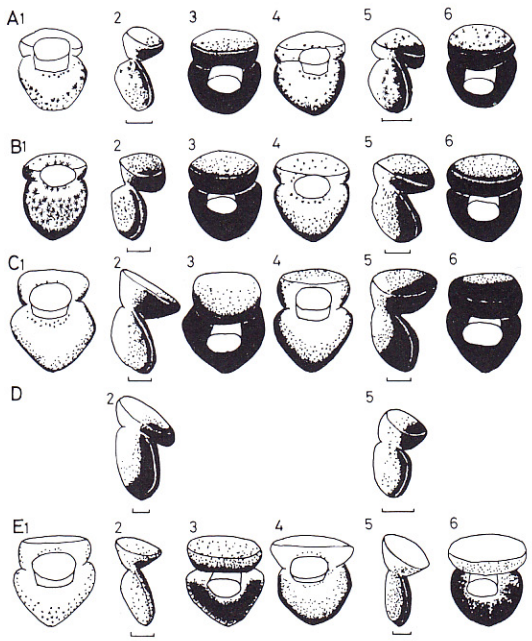

Fig. 3 Luminescent organs of *Secutor*. A1–3: *S. megalolepis* sp. nov., YCM-HLP 601–1, 44.1mm SL, female; A4–6: *S. megaloepis* sp. nov., YCM-HLP 601–2, 35.2mm SL, male; B1–3: *S. interruptus*, YCM-HLP 602–1, 53.6mm SL, female; B4–6; *S. interruptus*, YCM-HLP 602–2, 52.8 mm SL, male; C1–3: *S. indicius*, FUMT-P 21673–2, 64.5mm SL, female; C4–6: *S. indicius*, FUMT-P 21673–3, 65.8mm SL, male; D2: *S. insidiator*, YCM-HLP 191–1, 51.3mm SL, female; D4: *S. insidiator*, YCM-HLP 192–3, 50.8mm SL, male; E1–3: *S. hanedai* sp. nov., FUMT-P 8709–1, 64.5mm SL, female; E4–6: *S. hanedai* sp. nov., FUMT-P 8709–2, 63.2mm SL, male. 1,4: anterior view; 2, 5: left side view; 3, 6: posterior view. Bars: 1mm.

(9.6); scale rows on cheeks 8, 6–8 (6.9); antero-orbital spine 1, 1 (1); gill rakers 4, 4–6 (4.8) on upper arch, 1, 1 (1) on joint, 17, 15–19 (16.6) on lower arch, 22, 21–25 (22.4) in total number.

Body depth 59.5, 56.8–62.6 (60.4) % of SL. Head length 27, 5, 27.7–31.0 (29.2)% of SL. Eye diameter 10.6, 9.9–13.2 (11.6) % of SL. Snout length 7.7, 7.8–10.2 (9.0) % of SL. Length of dorsal fin base 57.3, 56.4–62.3 (58.2) % of SL. Length of anal fin base 53.7, 50.2–57.5 (54.0) % of SL. Distance between pelvic fin base and origin of anal fin base 14.0, 11.6–17.9 (15.0) % of SL. Length of 2nd anal fin spine 11.3, 11.2–13.6 (11.9) % of SL in 9 paratypes. Length of 3rd anal fin spine 8.7, 9.0–10.2 (9.6) % of SL in 4 paratypes. Length of 2nd dorsal fin spine 18.8% of SL in a paratype.

Body rounded, deep, strongly compressed. Head naked except for scaly cheek. Body, including isthmus to chest, completely with scales. Scales on cheek and body bigger than congeners. Pelvic fin just below or scarcely behind posterior end of pectoral fin base; origin of dorsal fin base just above pelvic fin base. Posterior tip of pectoral fin just above origin of soft part of anal fin. Shape of luminescent organ: see Fig. 3A–6.

Color in alcohol. Tip of spinous dorsal black; the other part colorless. Anal, pectoral, pelvic and caudal fins colorless. Dark markings on dorsal half of body consist of about 10 vertical lines; anterior 4 lines wider than the posterior ones, distances between the four wider than those of the posterior ones; outlines of anterior 4 lines not clearer, more irregular than those of *S. interruptus* (Fig. 8). In some specimens the pattern more irregular (Fig. 8B). A black line from lower margin of orbit to chin. Posterior part of luminescent organ black, anterior and dorsal parts scattered with melanophores (Fig. 3A). Dorsal and anterior part of air bladder silvery white of guanine, the other parts transparent.

Distribution and habitat. This species is distributed in the southwestern Pacific from the Gulf of Thailand to north and western Australia (Fig. 4). This species inhabits at least in brackish water and coastal marine water less than 50 meters deep, for example in brackish waters less than 5‰ in the Songkhla Lake, Thailand, and at 2 meters deep of the Burunett River, Australia.

Etymology. This species is named *megalolepis* (Greek *megalo* meaning great, Greek *lepis* scale) with reference to the big scales on cheek and body.

Secutor interruptus (VALENCIENNES)

(Figs. 2B; 3B; 4; 8C, D, E)

Equula interrupta VALENCIENNES, in CUVIER and VALENCIENNES, 1835; 102–103 (type locality; Pondicherry, India).

Equula profundus: de VIS, 1884: 544 (type locality: Cape York, Queensland coast, Australia); WHITLEY, 1932: 115–116 (in part; at least some of the description based on the type specimen).

Equula ruconius: DAY, 1875–78: 242–243, pl. LI, C.

Secutor ruconius: JONES, 1985: 608–611, fig. 19 (in part); SHEN, 1984: 57, pl. 57, 318–14.

Materials examined. YCM-HLP 182, 562, 10 specimens, 39.9–60.2 mm SL, Cebu Is., the Philippines, Apr.-May, 1968; YCM-HLP 191–2 and 3, 2 specimens, 40.9, 41.1 mm SL, Bombay F.M., India, Feb. 16, 1960; YCM-HLP 214–1 and 3, 2 specimens, 42.1, 39.4 mm SL. Djakarta, Indonesia, Mar., 1960; YCM-HLP 300, 1 specimen, 60.5 mm SL, the Ramu River, Papua New Guinea, R/V Tagula, Oct., 1969; YCM-P 25001, 7 specimens, 56.8–63.7 mm SL, Penghu F.M., Pescador Isls., Taiwan, bottom trawl, May 12, 1989; FUMT-P 20520, 1 specimen, 33.0 mm SL,

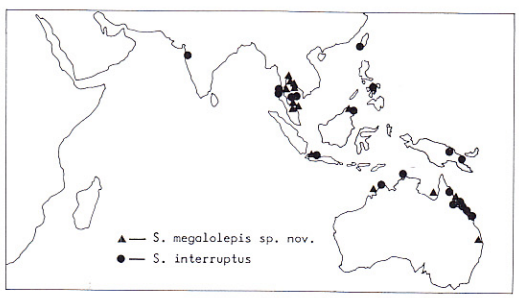

Fig. 4 Distribution of *Secutor megalolepis* sp. nov. and *S. interruptus*.

about 30–40 m deep, off Nakhonsithammarat, the Gulf of Thailand, otter trawl, R/V Paknam of SEAFDEC, Nov., 1985; FUMT-P 21650, 21651, 2 specimens, 50.5, 31.1 mm SL, 31–32 m deep, from 09° 20.3'N, 100° 18.9'E to 09° 17.1'N, 100° 16.1'E, the Gulf of Thailand, otter trawl, R/V Paknam of SEAFDEC, Nov. 24, 1985; URM 14296, 2 specimens, 43.8, 49.3 mm SL, Ranong F.M., Thailand, Feb. 29, 1984; URM 14349, 2 specimens, 44.7, 57.9 mm SL, coastal waters of Kapoe, Ranong, Thailand, set net, Mar. 1, 1984.

Materials examined only for their scientific name and collecting data. YCM-HLP 602; FUMT-P 21672; AMS I 20402–044, I 20904–079–3, I 22979–001, IA 4915; QMB I 15722, I 16559, I 17881, I 22746.

Diagnosis. Cheek with scales. Body completely with scales. Scales on head and body bigger than those of congeners, except for *S. megalolepis*; lateral line scales 54–60; scale rows above lateral line 9–14, below lateral line 18–26, between bases of pectoral and pelvic fins 10–16, and on cheek 7–10. Body high, body depth 53.4–65.5% of SL. Antero-orbital spines 1–2.

Description. In the followings, means are shown in parentheses.

Dorsal fin rays VIII, 16; anal fin rays III, 14; pectoral fin rays 15–18 (16.5); lateral line scales 54–60 (56.8); scale rows above lateral line 9–14 (11.0), below lateral line 18–26 (21.1); scale rows between pectoral and pelvic fin bases 10–16 (12.7); scale rows on cheeks 7–10 (8.2); antero-orbital spines 1–2; gill rakers 3–7 (4.9) on upper arch, 1 on joint, 17–21 (17.3) on lower arch, 18–28 (23.3) in total number.

Body depth 53.4–65.5 (57.9) % of SL. Head length 22.8–31.8 (28.2) % of SL. Eye diameter 9.7–12.6 (11.0) % of SL. Snout length 6.8–9.7 (8.1) % of SL. Length of dorsal fin base 54.4–60.0 (57.4) % of SL. length of anal fin base 49.3–56.0(52.9) % of SL. Distance between pelvic fin base and origin of anal fin base 11.9–19.3 (15.2) % of SL. Length of 2nd anal spine 9.2–13.2 (11.3) % of SL in 20 specimens. Length of 3rd anal fin spine 7.9–10.2 (8.9) % of SL in 12 specimens. Length of 2nd dorsal fin spine 17.5, 17.9 % of SL in 2 specimens.

Body rounded, deep, strongly compressed. Head naked except for scaly cheek. Body, including isthmus to chest, completely with scales. Scales on cheek and body bigger than congeners except for *S. megalolepis*. Pelvic fin just below or scarcely behind pectoral fin base; origin of dorsal fin base just above tip of pelvic fin. Shape of luminescent organ: see Fig. 3B1–6.

Color in alcohol. Tip of spinous dorsal black; the other part colorless. Anal, pectoral, pelvic and caudal fins colorless. Dark markings on dorsal half of body similar to those of *S. megalolepis*; there are about 9–12 lines, or sometimes short lines and dots in vertical series; several anterior lines, or dots and short lines in the series wider than posterior ones, distances between the anterior lines wider than those of the posterior ones; outlines of lines and dots clearer than those of *S. megalolepis*. The pattern is various in some specimens and localities (Fig. 8C, D, E). A black line from lower margin of orbit to chin. Posterior part of luminescent organ black, anteroior and dorsal parts scattered with melanophores (Fig. 3B). Dorsal and anterior parts of air bladder silvery white.

Distribution and habitat. This species is distributed in the West Pacific from southern Taiwan to northern Australia, the west coast of Malay Peninsula and India (Fig. 4). This species inhabits at least in brackish water and coastal marine water less than about 60 meters deep, because the materials examined in this study were collected in the Ramu River, Papua New Guinea, and the Starke River and Murray River, Australia, near a beach of Thailand, in the estuary of Papua New Guinea, and in coastal waters at depths between 12–60 meters by bottom trawls. Both young and adults were collected from rivers and coastal waters.

Remarks. We can examined the photograph of the type specimen of *S. profundus* (QMB I 9818), and identify the fish as *S. interruptus* by size of the scales in two parts, i.e. above origin of anal fin

base and the posterior part of body.

This species is including three types discriminated by some morphological characters. The first is represented by the materials caught in the Gulf of Thailand (FUMT-P 20520, 21652 and 21672) and collected at Penghu Fish Market, Taiwan (YCM-P 25001). It has smaller number of gill rekers (3–4 on upper arch, 1 on joint, 14–16 on lower arch, and 18–21 in total number) and a single antero-orbital spine. The second type is represented by the materials from the Philippines, Indonesia, Papua New Guinea, the western coast of Thailand, and India (YCM-HLP 182, 191–2, 3, 214–1, 300, 562, 602; URM 14296, 14349). Its gill raker number is 4–7 on upper arch, 1 on joint, 17–20 on lower arch and 22–28 in total number, and they have generally two antero-orbital spines, rarely single. Differences between them are clear. And their habitat are estimated to be different from each other. The first was collected both in the rivers and the coastal waters at depths between 12–60 meters. On the other hand, the second was not caught in the deeper coastal waters where bottom trawls were operated but in rivers and very shallow coastal waters by set net or rotenone. The characters of the third type represented by the Australian specimens (AMS I 20402–044, I 20904–079–3, I 22979–001, IA 4915; QMB I 15722, I 16559, I 17881, I 22746) are middle between them. Gill rakers are 5–6 on upper arch, 1 on joint, 15–17 on lower arch, and the antero-orbital spine 1–2. These differences among the three types should be studied further.

Secutor indicius Monkolprasit

(Figs. 1; 2C; 3C; 5; 6; 8F)

Secutor indicius Monkolprasit, 1973: 14–17, Fig. 3, 4 (type locality: Songkhla, southern Thailand): Gloerfelf-Tarp and Kailola, 1984: 170–171.

Secutor insidiator: Shen, 1984: 58, pl. 58, 318–15a, b; Mochizuki *et al.*, 1985: 7, pl. 14, fig. 1.

Materials examined. YCM-HLP 181, 2 specimens, 88.8, 85.2 mm SL, Cebu F.M., the Philippines, Apr. 1968; YCM-HLP 199, 2 specimens, 90.2, 92.2 mm SL, Cebu Is., the Philippines, Apr. 2, 1968; YCM-HLP 216, 2 specimens, 60.7, 62.7 mm SL, Djakarta, Indonesia, Dec. 8, 1969; YCM-HLP 223, 3 specimens, 80.3–87.8 mm SL, Makassar, Celebes Is., Indonesia; YCM-HLP 229, 1 specimen, 86.7 mm SL, the Ramu River, Papua New Guinea, R/V Tagula, Oct. 1969; YCM-HLP 441, 1 specimen, 64.8 mm SL, Cebu Is., the Philippines; FUMT-P 8726, 8727, 2 specimens, 39.6, 41.6 mm SL, 20m deep, around Ko Samet, the Gulf of Thailand, otter trawl, July 4, 1985.

Materials examined only for their scientific name and collecting data. YCM-HLP 232, 234, 563, 564, 565; YCM-P 25002; FUMT-P 8710–8715, 8728–8732, 8736, 21673–21678.

Of the specimens, YCM-HLP 234 (4 specimens), YCM-P 25002 (7 specimens) and FUMT-P 8728–8732 (5 specimens), 21673 (11 specimens) and 21678 (3 specimens) were also examined their body depth.

Diagnosis. Cheek without scales; isthmus to chest and anterior part of body naked (Fig. 2C). Scales on body minute; lateral line scales 87–111; scale rows above lateral line 18–22, below lateral line 39–48, between bases of pectoral and pelvic fins 24–31. Body moderately elongate in both young and adult, body depth 41.1–50.2% of SL; body depth is not markedly increasing with growth (Fig. 5). Antero-orbital spine 1.

Description. In the followings, means are shown in parentheses.

Dorsal fin rays VIII, 16; anal fin rays III, 14; pectoral fin rays 17–19 (17.9); lateral line scales 87–111 (96.5); scale rows above lateral line 18–22 (20.5), below lateral line 39–48 (43.6); scale rows between pectoral and pelvic fin bases 24–31 (26.1); antero-orbital spine 1; gill rakers 5–7 (6.4) on upper arch, 1 on joint, 19–22 (20.1) on lower arch, 26–30 (27.5) in total number.

Body depth 41.1—50.2 (44.5)% of SL. Head length 24.2–29.3 (26.5) % of SL. Eye diameter 8.5–9.9 (9.2) % of SL. Snout length 7.5–8.7 (8.1) % of SL. Length of dorsal fin base 55.6–61.5 (58.9) % of SL. Length of anal fin base 50.0–53.8

(51.8) % of SL. Distance between pelvic fin base and origin of anal fin base 14.2–19.4 (17.3) % of SL. Length of 2nd anal spine 8.7–11.1 (9.6) % of SL in 10 specimens. Length of 3rd anal fin spine 6.4–8.8 (8.2) % of SL in 10 specimens. Length of 2nd dorsal fin spine 13.5–14.9 (14.1) % of SL in 4 specimens.

Body moderately elongate in both young and adult; body depth is not markedly increasing with growth (Fig. 6). Head and anterior part of body, including isthmus to chest, naked (Fig. 2C). Scales on body very small. Pelvic fin just below or scarcely behind pectoral fin base; origin of dorsal fin base just above tip of pelvic fin. Posterior tip of pectoral fin just above origin of soft part of anal fin. Shape of luminescent organ: see Fig. 3C1–6.

Color in alcohol. Dark markings on dorsal half of body consist of about 15 irregular vertical series consisted of dots and short bars; in some specimens small irregular dark markings appear between the vertical series, or some parts of the vertical series do not appear (Fig. 8F). Tip of spinous dorsal black, the other part colorless. Anal, pectoral, pelvic and caudal fins colorless. Posterior part of luminescent organs black, anterior and dorsal parts scattered melanophores (Fig. 3C1–6). Dorsal and anterior parts of air bladder silvery white of guanine, the other part transparent.

Dr. Y. HANEDA recorded his observation on the label of YCM-HLP 234 that luminescent organ in fresh specimens is silvery white instead of light yellow like lemon in *Secutor hanedai*.

Distribution and habitat. This species is distributed in the tropical West Pacific except for Australia, i.e. the Philippines, the Gulf of Thailand, Indonesia, Celebes, and Papua New Guinea. This fish was caught mainly by bottom trawl between 18–72 meters and exceptionally in the Ramu River, Papua New Guinea (YCM-HLP 229, 86.7 mm SL), except for the materials collected in fish markets.

Remarks. See the remarks of *S. insidiator*.

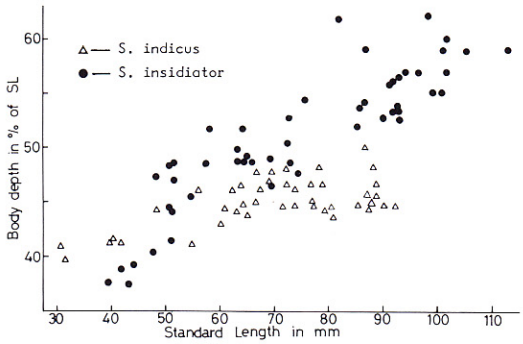

Fig. 5 Ontogenetic changes of body depth in *Secutor indicius* and *S. insidiator*.

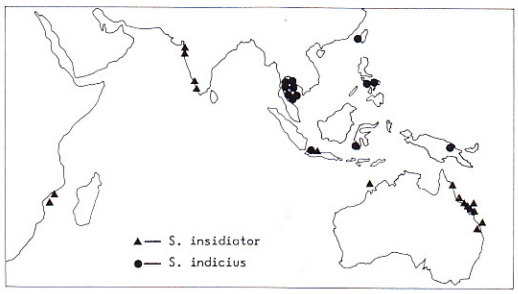

Fig. 6 Distribution of *Secutor insidiator* and *S. indicius*.

Secutor insidiator (BLOCH)

(Figs. 2D; 3D; 5; 6; 9A, B, C, D)

Zeus insidiator BLOCH, 1787: 41–42 (type locality: Suratte, India).

Equula insidiatrix: VALENCIENNES, in CUVIER and VALENCIENNES, 1835: 98–101.

Leiognathus insidiator: BLEEKER, 1983: pl. 483.

Secutor insidiator: JONES, 1985: 605–608, fig. 18.

Secutor ruconius: MOCHIZUKI *et al.*, 1985: 7, pl. 14, fig. 2.

Materials examined. YCM-HLP 191–1, 192, 4 specimens, 50.6–81.9 mm SL, Bombay F.M., India, Feb. 16, 1960; YCM-HLP 213–1, 1 specimen, 51.1 mm SL, Djakarta, Indonesia, Mar. 1960; YCM-HLP 221, 5 specimens, 39.5–51.0 mm SL, Djakarta, Indonesia, Dec. 8, 1969; FAKU 108331–108333, 3 specimens, 100.9–112.9 mm SL, off Beira, Mozambique, Nov. 11, 1971; FAKU S2229–S2232, 4 specimens, 91.7–100.8 mm SL, Zanbezi, Mozambique, Nov. 11, 1971.

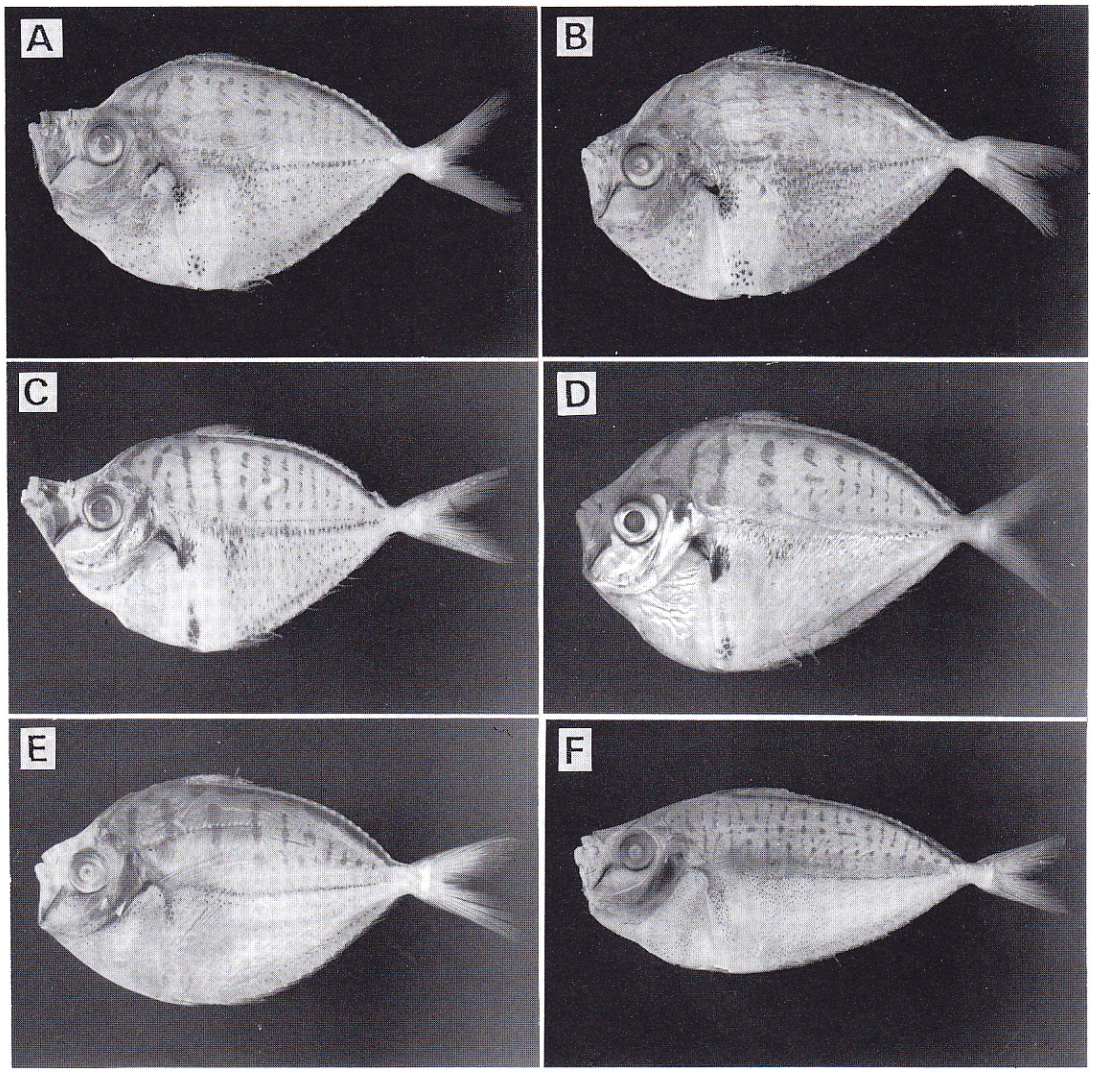

Fig. 8 *Secutor megalolepis* sp. nov. (A, B), *Secutor interruptus* (C, D, E) and *Secutor indicius* (F). A: URM 14964, holotype, 47.7mm SL, Songkhla F.M., Thailand; B: URM 12018, paratype, 45.6mm SL, Yannawa F.M., Bangkok, Thailand; C: URM 14349–1, 44.7mm SL, coastal waters of Kapoe, Ranong, Thailand; D: URM 14396–2, 49.3mm SL, Ranong F.M., Thailand; E: YCM-P 25001–1, 62.2mm SL, Penghu F.M., Taiwan; F: YCM-P 25002, 87.4mm SL, Penghu F.M., Taiwan.

Materials examined only for their body depth, scientific name and collecting data. MNHN A.6733, 1 of 2 specimens, 65.9 mm SL and A.6771, 2 of 3 specimens, 73.3, 73,6 mm SL, Malabar, India, examined by VALENCIENNES, in CUVIER and VALENCIENNES, 1835; AMS I 20826–015, I 20904–079, I 21609–002, IA 4911–4914, E 2526; QMB I 3514, I 15757, I 17871, I 20537.

Diagnosis. Cheek without scales; anterior part of body, including isthmus and chest, naked (Fig. 2D). Scales on body minute; lateral line scales 84–107; scale rows above lateral line 18–22, below lateral line 38–47, between bases of pectoral and pelvic fins 22–28. Body moderately elongate in young, body depth about 40% of SL in about 40

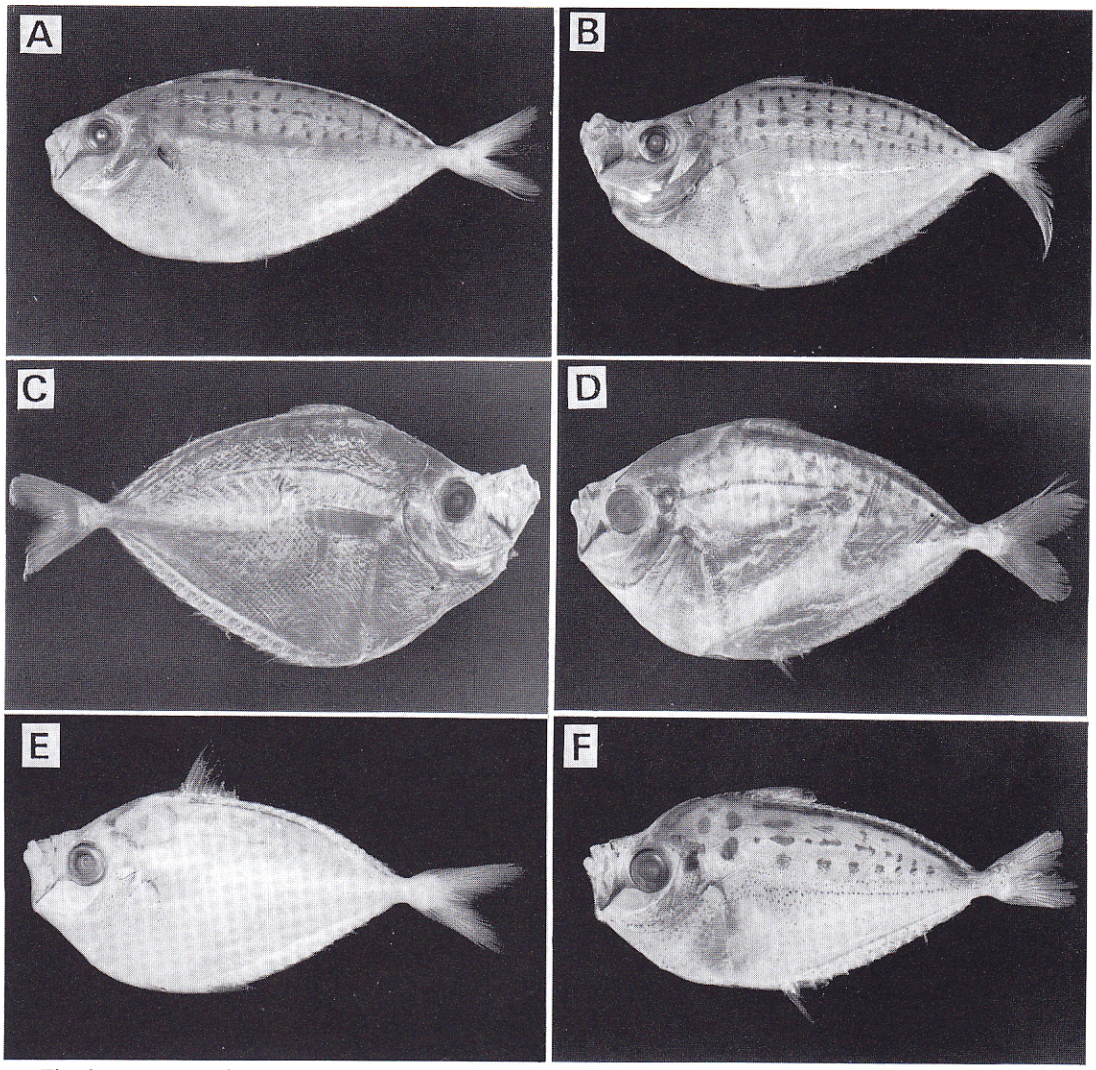

Fig. 9 *Secutor insidiator* (A, B, C, D), *Secutor hanedai* sp. nov. (E, F). A: AMS I20826–015–3, 62.9mm SL, Palm Is., Queensland; B: AMS I 20826–015–2, 86.5mm SL, Palm Is,. Queensland; C: AMS IA 4911, 101.5mm SL, NR Bowen, Queensland; D: FAKU S2230, 100.8mm SL, off Zanbezi, Mozambique; E: FUMT-P 8701, paratype, 66.5mm SL, 6km off Hua Hin, the Gulf of Thailand; F: YCM-HLP 180–1, holotype, 57.0mm SL, Sandakan F.M., Borneo.

mm SL; body depth markedly increase with growth to be oval in large sized specimens, about 60% of SL in about 100 mm SL (Fig. 5). Antero-orbital spine 1, exceptionally 2. Dark markings on dorsal half of body about 10–13 regular transverse series consisted of dots, or dots and short bars.

Description. In the followings, means are shown in parenthese.

Dorsal fin rays VIII, 16; anal fin rays III, 14; pectoral fin rays 17–18 (17.6); lateral line scales 84–107 (91.4); scale rows above lateral line 18–22 (19.8), below lateral line 38–47 (42.8); scale rows between pectoral and pelvic fin bases 22–28 (24.8); antero-orbital spine 1, exceptionally 2; gill rakers 5–7 (6.6) on upper arch, 1 on joint, 17–22 (18.9) on lower arch, 24–29 (26.4) in total number.

Body depth 37.4–61.9 (49.3) % of SL. Head length 24.9–30.7 (27.8) % of SL. Eye diameter 8.6–11.4 (10.0) % of SL. Snout length 6.5–9.6 (8.3) % of SL. Length of dorsal fin base 53.7–61.1 (58.4) % of SL. Length of anal fin base 45.6–54.8 (51.2) % of SL. Distance between pelvic fin base and origin of anal fin base 13.4–20.3 (17.1) % of SL. Length of 2nd anal spine 7.6–9.9 (8.8) % of SL in 10 specimens. Length of 3rd anal fin spine 6.0–8.4 (7.1) % of SL in 6 specimens. Length of 2nd dorsal fin spine 12.7–19.4 (15.6) % of SL in 5 specimens.

Body moderately elongate in young, body depth about 40% of SL in about 40 mm SL; body depth markedly increase with growth to be oval in large sized specimens, about 60% of SL in about 100 mm SL (Fig. 5). Head, isthmus to chest, and the other anterior part of body naked (Fig. 2). Scales on body very small. Pelvic fin just below or scarcely behind pectoral fin base; origin of dorsal fin base just above tip of pelvic fin. Posterior tip of pectoral fin just above origin of soft part of anal fin. Shape of luminescent organ: see Fig. 3D2, 5.

Color in alcohol. Dark markings on dorsal half of body about 10–13 regular vertical series consisted of dots, or dots and short bars; in some specimens from the west coast of Africa, number of the vertical series of dark markings fewer, anterior markings bigger, its arrangement slightly irregular. Tip of spinous dorsal black, the other part colorless. Anal, pectoral, pelvic and caudal fins colorless. Posterior part of luminescent organs black, anterior and dorsal parts scattered melanophores (Fig. 3D2, 5). Dorsal and anterior parts of air bladder silvery white of guanine, the other part transparent.

Distribution and habitats. This fish distributed in coastal waters of the Indian Ocean and the northern and northwestern areas of Australia. The distribution area is roughly separated from that of *S. indicius* (Fig. 6). This fish was collected in the mouth of the Brunett River, inside of a harbor, coastal waters at depths between 20–52 meters by bottom trawls. These information indicated that the fish lives at least in brackish water to coastal waters shallower than about 50 meters.

Remarks. This species closely similar to *S. indicius* in many morphological characters, and JONES (1985) considered that the latter was a doubtful species. However, change of body depth with growth in the former quite differ from those of the latter (Fig. 5), and they are easily and clearly discriminated from each other by comparison of large sized materials between the two species. Maximum size of the former may also differ from that of the latter, i.e. that of the former is over 110 mm SL instead of 92.5 mm SL in the latter. The difference of patterns of dark markings on dorsal half of body is also clear between them in materials over 40 mm SL. Therefore, *S. indicius* is not a doubtful species.

The distribution pattern of the two species shown in the figure 6 and the morphological similarity might be indicated that they have a common ancestor and speciated each other by zoogeographical separation in the Indian Ocean to around Australia and the central West pacific.

Secutor hanedai sp. nov.
(Figs. 2E; 3E; 7; 9E, F)

Secutor insidiator: MONKOLPRASIT, 1973: 10–12, fig. 1.

Secutor sp.: MOCHIZUKI *et al.*, 1985: 7, pl. 14, fig. 3.

Holotype. YCM-HLP 180–1, 57.0 mm SL, Sandakan F. M., North Borne, Mar. 10, 1937.

Paratypes. YCM-HLP 180–2, 1 specimen, 61.7 mm SL, Sandakan F.M., North Borneo, Mar. 10, 1937; YCM-HLP 213–2 and 3, 2 specimens, 49.1, 48.8 mm SL, Djakarta F.M., Indonesia; FUMT-P 8695, 8697, 8699, 8701–8703, 7 specimens, 56.6–70.3 mm SL, 6 km off Hua Hin, the Gulf of Thailand, shrimp trawl, Nov. 19, 1985; URM 13225, 4 spemimens, 53.5–55.0 mm SL, Angsira, Thailand, push net, Dec. 2, 1983; URM 14024, 1 specimen, 67.4 mm SL, Paknam F.M., Feb. 11, 1984; URM 14204, 1 specimen, 27.9 mm SL, mangrove area, Nagao Canal, Ranong, Thailand, Feb. 28, 1984; MVM 46327, 1 specimen, 45.4 mm SL, the East Indian Archipelago, donated on

June 26, 1885, one of BLEEKER's collection A.

Materials examined only for their scientific name and collecting data. YCM-HLP 603; FUMT-P 8696, 8698, 8700, 8704–8706, 8708, 8709, 21679.

Diagnosis. Cheek without scales. Anterior part of body, including isthmus to chest, naked (Fig. 2E). Lateral line scales 60–70; scale rows above lateral line 16–22, below lateral line 42–53, between bases of pectoral and pelvic fins 33–42. Body moderately elongate in both young and adult, body depth 46.5–54.1% of SL. Gill rakers on lower arch 16–19 and total gill rakers 22–26. Antero-orbital spines 2, rarely tip of one of them bicuspid.

Description. In the followings, characters of the holotype are shown first and are followed by those of the paratypes, and means are shown in parentheses.

Dorsal fin rays VIII, 16, VIII, 16 (VIII, 16); anal fin rays III, 14, III, 14 (III, 14); pectoral fin rays 15, 15–18 (16.3) in 13 paratypes; lateral line scales 64, 60–70 (64.6); scale rows above lateral line 18, 16–22 (19.2) in 9 paratypes, below lateral line 44, 42–53 (47.8); scale rows between pectoral and pelvic fin bases 33, 33–42 (36.5); antero-orbital spines 2, 2 (2), rarely tip of one of them bicuspid in paratypes; gill rakers 6, 5–7 (6.0) on upper arch, 1, 1 (1) on joint, 16–19 (17.1) on lower arch, 23, 22–26 (24.1) in total number.

Body depth 51.4, 46.5–54.1 (49.7) % of SL. Head length 27.0, 25.9–31.5 (27.7) % of SL. Eye diameter 11.1, 9.4–12.1 (10.3) % of SL. Snout length 7.9, 7.0–8.8 (7.9) % of SL. Length of dorsal fin base 57.2, 56.6–61.7 (59.0) % SL. Length of anal fin base 52.3, 49.4–54.6 (51.6) % of SL. Distance between pelvic fin base and origin of anal fin base 17.4, 16.3–20.5 (17.7) % of SL. Length of 2nd anal fin spine broken in holotype, 12.1–16.1 (13.8) % of SL in 9 paratypes. Length of 3rd anal fin spine broken in holotype, 16.2–18.3 (17.4) % of SL in 3 paratypes.

Body moderately elongate in both young and adult. Head, isthmus to chest, and the other anterior part of body naked (Fig. 2E). Scales on body very small. Pelvic fin just below or scarcely behind pectoral fin base. Origin of dorsal fin base just above tip of pelvic fin. Posterior tip of pectoral fin just above origin of soft part of anal fin. Shape of luminescent organ; see Fig. 3E1–6.

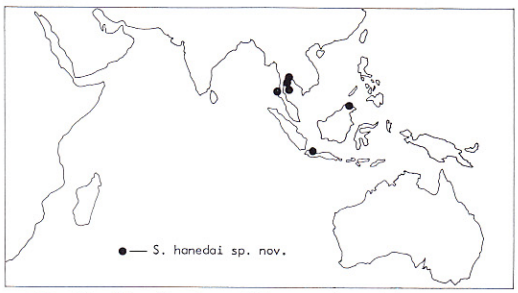

Fig. 7 Distribution of *Secutor hanedai* sp. nov.

Color in alcohol. Dark markings on dorsal half of body consist of about 9 vertical series of dots; those in anterior 4 series bigger than posterior ones and distance between anterior 4 series wider than those between posterior ones. Tip of spinous dorsal black, the other part colorless. Anal, pectoral, pelvic and caudal fins colorless. Posterior part of luminescent organ, except for central and/or marginal areas in some specimens, black; anterior and dorsal parts scattered with melanophores (Fig. 3E1–6). Dorsal and anterior parts of air bladder silvery white of guanine, the other part transparent.

Color of luminescent organ in fresh materials is light yellow like lemon (see in the description of *S. indicius*).

Distribution and habitat. This species is distributed in the central West Pacific and the west coast of Malay Peninsula shown in the figure 7. This fish was caught in mangrove area and coastal waters at depths between 10–40 meters by bottom trawls.

Etymology. This species is named in honor of Dr. YATA HANEDA who studied the luminescent organism including the leiognathid fishes for a long time and made the HANEDA Luminous Pisces Collection of the Yokosuka City Museum.

Remarks. One specimen of BLEEKER's Collection A examined by the present authors (MVM

46327) is identified as this species, but the figure in BLEEKER (1983) is not identified as this species but *S. insidiator* by the body shape and color patterns.

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