

## EXYRIAS AKIHITO, A NEW SPECIES OF CORAL-REEF GOBY (GOBIIDAE) FROM THE WESTERN PACIFIC

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**ABSTRACT.** – *Exyrias akihito*, is described from 16 specimens, 23.5-111.2 mm SL, collected at the Great Barrier Reef of Australia, Papua New Guinea, Indonesia, Philippines, Yaeyama Islands of southern Japan, and from a photographic record from Palau. It is most similar to the wide-ranging Indo-Pacific *E. belissimus*, differing in having longer filamentous dorsal spines, usually 17 (vs. 18) pectoral rays, and in colour. Unlike the other three members of the genus, which frequent silt or mud bottoms of estuaries or turbid inshore reefs, the new species is found in relatively clear water in the vicinity of coral reefs to depths of at least 43 m.

**KEY WORDS.** – Fish taxonomy, Gobiidae, *Exyrias*, western Pacific.

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### INTRODUCTION

The gobiid genus *Exyrias* Jordan & Seale and its monotypic relative *Macrodonogobius* Herre were reviewed by Murdy (1985). He recognized three species of *Exyrias*: *E. belissimus* (Smith) from the east coast of Africa (also known from the Red Sea according to Dor, 1984) to the Samoa Islands; *E. ferrarisi* described as new from the Philippines, but now also reported from Indonesia (Allen & Adrim, 2003), and *E. puntang* (Bleeker) from the eastern Indian Ocean and western Pacific. These three gobies are relatively large, bottom-dwelling species, frequently found in shallow, turbid waters of estuaries and near-shore reefs. The present paper describes a fourth species from the western Pacific that has sometimes been confused with *E. belissimus*. It was first collected by a team from the Australian Museum on the northern Great Barrier Reef of Australia in 1979. Subsequent collections have been made in recent years at Papua New Guinea, Indonesia, Philippines, and the Yaeyama Islands of southern Japan. The second author's underwater photograph of the species in Palau, reproduced here, provides the record for this richest archipelago of Micronesia. The new species is typically found in clearer water on sand or sand-rubble substrata in the vicinity of sheltered coral reefs.

### MATERIALS AND METHODS

Lengths of specimens are given as standard length (SL) measured from the anterior end of the upper lip to the base

of the caudal fin (posterior edge of hypural plate); head length is measured from the same anterior point to the posterior edge of the opercle flap; head depth is taken vertically at the level of the preopercle margin and the head width is also taken at this point; body depth is taken at two locations: between the origin of the pelvic fins and the base of the first dorsal fin, and between the origin of the anal fin and the base of the second dorsal fin; snout length is measured from the anterior end of the upper lip to the anterior margin of the eye; eye diameter is the horizontal fleshy diameter; interorbital width is the least fleshy width; upper-jaw length is taken from the anterior edge of the upper lip to the posterior end of the maxilla; lower-jaw length is taken from the anterior edge of the lower lip to the posteriormost extension of the lower jaw; caudal-peduncle depth is the least depth, and caudal-peduncle length is the horizontal distance between verticals at the posterior base of the anal fin and the caudal-fin base; lengths of fin spines and rays are measured to their bases; caudal-fin length is the horizontal length from the posterior edge of the hypural plate to a vertical at the tip of the longest ray; pectoral-fin length is the length of the longest ray; pelvic-fin length is measured from the base of the outermost ray to the tip of the longest ray; counts of scales in longitudinal series begin at the posterior upper attachment of the opercular membrane, continue posteroventrally to the fifth transverse scale row (starting from the mid-dorsal line), and then in a straight line midlaterally to the last scale, which is generally beyond the caudal-fin base (i.e. includes 2-3 scales on base of fin); transverse scale counts are taken from the origin of the second dorsal fin ventroposteriorly to the anal fin base;

also a second count is made from the anal-fin origin dorsoposteriorly to the second dorsal-fin base; predorsal scales are counted between the first dorsal-fin origin to where they end just posterior to the interorbital space.

Counts and proportions appearing in parentheses apply to the range of values for paratypes. Selected proportional measurements are expressed as percentage of the standard length (SL) in Table 1. Type specimens have been deposited at the Australian Museum, Sydney (AMS), Biological Laboratory of the Imperial Household, Tokyo (BLIH), Bernice P. Bishop Museum, Honolulu (BPBM), National Science Museum, Tokyo (NSMIT), and Western Australian Museum, Perth (WAM).

***Exyrias akihito*, new species**

(Figs. 1-6; Table 1)

*Exyrias belissimus* (in part) – Murdy, 1985: 4, Pl. 1B, Fig. B (Java).

*Exyrias* sp. 1 – Kuitert & Tono-zuka, 2001: 669, Figs. A-D (Java, Bali, and Sulawesi).

*Exyrias* sp. – Allen & Adrim, 2003: 58 (Bali and Manado, Sulawesi).



Fig. 1. Holotype of *Exyrias akihito*, male, NSMT-P 71648, 67.1 mm SL, 28 m, Amitori Bay, Iriomote Island, Yaeyama Islands, Okinawa Prefecture, Japan (Y. Ikeda).

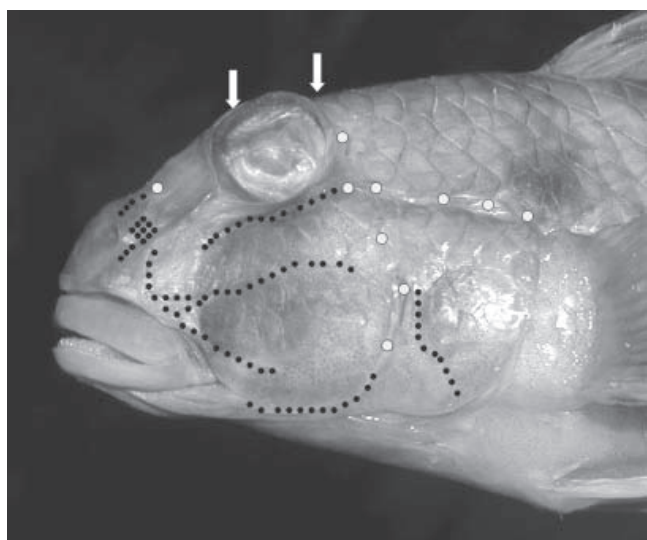


Fig. 2. Head of paratype of *Exyrias akihito*, 81.3 mm SL, showing cutaneous papilla system (solid dots) and pores (pale dots and arrows).

*Exyrias* sp. – Allen et al, 2003: 321, middle left fig. (Indonesia and Philippines).

*Exyrias* sp. – Hayashi & Shiratori, 2003: 94 (Japan).

*Exyrias* species – Kimura & Matsuura, 2003: 183, upper fig. (Bitung, Sulawesi).

*Exyrias* sp. – Senou, Suzuki, Shibukawa & Yano, 2004: 240, upper and lower figs. (Ishigaki, Iriomote Islands, Japan).

**Material examined.** – Holotype - NSMT-P 71648, 67.1 mm SL, Amitori Bay, Iriomote Island, Yaeyama Islands, Okinawa Prefecture, Japan, 28 m depth, Y. Ikeda, K. Sugiyama & K. Hagiwara coll., 30 Jun.2001.

Paratypes – AMS I.20956-028, 100.3 mm SL, Tijou Reef (approximately 13°04'S 143°57'E), Great Barrier Reef, Queensland, 3-12 m, rotenone, AMS party coll., 23 Feb.1979; AMS I.22581-011, 2 ex., 38.4-111.2 mm SL, Escape Reef (approximately 15°49'S 145°50'E), Great Barrier Reef, Queensland, 10-14 m, AMS party coll., 29 Oct.1981; BLIH 19830335, 29.7 mm SL, El Nido, Palawan Island, Philippine Islands, H. Masuda & A. Ono coll., 6-25 Mar.1983; BLIH 19960130, 38.4 mm SL, Amitori Bay, Iriomote Island, Yaeyama Islands, Okinawa Prefecture, Japan, Y. Ikeda & A. Iwata coll., 9 Jul.1996; BLIH 20010003, 34.9 mm SL, same locality as BLIH 1996130, 35 m, K. Yano coll., 18 Jun.2000; BLIH 20010004, 25.2 mm SL, same locality as BLIH 19960130, 26 m, Y. Ikeda, K. Sugiyama & K. Hagiwara coll., 1 Jul.2001; BLIH 20010005, 38.2 mm SL, same locality and as BLIH 19960130, 27 m, Y. Ikeda, K. Sugiyama & K. Hagiwara coll., 1 Jul.2001; BLIH 20010006, 39.0 mm SL, same locality as BLIH 19960130, 27 m, Y. Ikeda, K. Sugiyama & K. Hagiwara coll., 28 Jun.2001; BLIH



Fig. 3. Underwater photograph of *Exyrias akihito*, about 50 mm total length, 15 m, off Lawadi Village, Milne Bay Province, Papua New Guinea (G. Allen).

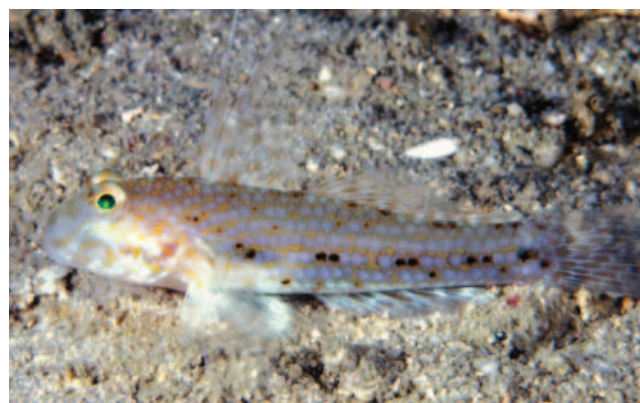


Fig. 4. Underwater photograph of *Exyrias akihito*, about 60 mm total length, Seribu Islands, Java (J. Randall).

20010010, 23.5 mm SL, Funauki Bay, Iriomote Island, Yaeyama Islands, Okinawa Prefecture, Japan, 43 m, K. Yano coll., 27 May.2001; BPBM 28781, 37.2 mm SL, Pulau Pari, off Pulau Tikus, Seribu Islands, Java, Indonesia, outer reef in 23 m depth, quinaldine, J. E. Randall coll., 5 Nov.1982; WAM P.31214-001, 66.6 mm SL, Padoz Reef (approximately 5°10'S, 145°49'E) Madang Lagoon, Papua New Guinea, 15-18 m, rotenone, G. R. Allen coll., 16 Oct.1996; WAM P.32255-003, 2 ex. specimens, 27.2-33.9 mm SL, Kawe Island (approximately 0°02'S, 130°08'E), Raja Ampat Islands, Papua Province, Indonesia: large bay on east side of island, 8-14 m, quinaldine, G. R. Allen coll., 18 Nov.2002; WAM P.32615-001, 81.3 mm SL, male, Lawadi Village (10°15.81'S, 150°43.14'E), Milne Bay Province, Papua New Guinea, outer reef in 15 m, quinaldine and hand net, G. R. Allen coll., 20 Nov.2003.

Comparative material. – *Exyrius bellissimus*: BPBM 29677, 4: 43-55 mm, Pulau Pari, Seribu Islands, Java, Indonesia; BPBM 15767, 87 mm, Madang, Papua New Guinea; BPBM 32567, 3: 36-77 mm, Nagada Harbour, Papua New Guinea; BPBM 1283, 116 mm, Shortland Island, Solomon Islands; BPBM 15696, 2: 50-51 mm, Yacht Harbor, Guadalcanal, Solomon Islands; BPBM 21855, 2: 57-73 mm, Salu Islet, Singapore, 2: 57-73 mm; BPBM 29386, 85 mm, Low Isles off Port Douglas, Queensland; BPBM 9740, 2: 62.5-69 mm, Uru Island, Palau; BPBM 9754, 3: 19-58 mm, Uru Island, Palau; BPBM 31405, 2: 66.5-74.5 mm, Auluptagel, Palau; BPBM 9956, 3: 54-82 mm, Phonpei, Caroline Islands; BPBM 29384, 25 mm, Phonpei, Caroline Islands, W side of Phonpei Passage; WAM



Fig. 5. Underwater photograph of *Exyrius akihito*, about 70 mm total length, Palau, 15 m (J. Randall).



Fig. 6. Underwater photograph of *Exyrius bellissimus*, about 80 mm total length, 10 m, Milne Bay Province, Papua New Guinea (G. Allen).

P29928-019, 7: 36-77 mm, Cocos-Keeling Islands; WAM P31650-001, 94 mm, Cassini Island, Kimberleys, Western Australia; WAM P30309-010, 69 mm, Cassini Island; WAM P27662-030, 74 mm, Clerke Reef, Rowley Shoals, Western Australia; WAM P29054-003, 77 mm, West Island, Ashmore Reef, Timor Sea; WAM P30412-007, 2: 44-49 mm, Bohaydulong Island, Bodgaya Islands, Sabah; WAM P31546-004, 30 mm, Gam Island, Raja Ampat Islands, Irian Jaya.

**Diagnosis.** – Pectoral rays 17; segmented caudal-fin rays 17; branched caudal-fin rays typically 13, rarely 12, 14, or 15; longitudinal scale series 28 (28-30); dorsal-fin spines elongate and filamentous, the second longest, 1.59-2.07 in SL; generally light bluish grey in life with small yellow to brownish orange spots on head and body, those on body mostly conjoined to form longitudinal stripes along scale rows; four pairs of dark brown spots on lower side of body, followed by a single spot at caudal-fin base; a few smaller dark brown spots on body, mostly in a row dorsally and one ventrally; dorsal and caudal fins covered with numerous, relatively large, orangish to yellowish brown spots.

**Description.** – Dorsal-fin rays VI-I,10; anal-fin rays I,9; pectoral-fin rays 17; pelvic-fin rays I, 5; segmented caudal-fin rays 17; branched caudal-fin rays 14 (12-15); longitudinal scale series 28 (28-30); transverse-scale count from origin of second dorsal fin ventroposteriorly to anal-fin base 9; transverse-scale count from anal-fin origin dorsoanteriorly to first dorsal-fin base 9; predorsal-scale count 8 (7-8); vertebrae 10 + 16.

Mouth terminal; jaws extending to a vertical at anterior edge of pupil; jaw teeth small and conical, densely packed in several rows, those in outermost row the largest; tongue broad with straight anterior margin, broadly attached anteriorly to floor of mouth. Anterior extent of gill opening reaching to below middle of opercle. Arrangement of cutaneous papilla system and cephalic sensory pores as shown in Fig. 2.

Body moderately elongate and laterally compressed, more strongly compressed posteriorly; body depth at pelvic-fin base 4.05 (3.67-4.15) in SL; body depth at anal-fin origin 4.17 (3.68-4.82) in SL. Head laterally compressed, its width slightly less than its depth at level of preopercular margin. Head length 3.37 (3.24-3.44) in SL. Snout length 2.47 (2.17-3.31), eye diameter 3.75 (3.38-4.23), and interorbital width 20.74 (15.69-30.94), all in head length. Distance between



Fig. 7. *Exyrius bellissimus*, 77 mm SL, Pohnpei, Caroline Islands (J. Randall).

Table 1. Proportional measurements of selected type specimens of *Exyrias akihito* expressed.

	Holotype NSMT-P 71648	Paratype WAM P.32615	Paratype AMS I.22581	Paratype AMS I.20956	Paratype BLIH 20010006	Paratype BPBM 28781
Standard length (mm)	67.1	81.3	111.2	100.3	39.0	37.2
Head length	29.7	30.1	29.1	29.3	30.9	30.0
Head width	18.4	18.6	17.2	18.2	15.7	17.7
Head depth	22.1	21.4	31.2	23.2	20.7	20.8
Body depth at pelvic origin	24.7	26.2	27.2	27.3	24.1	25.4
Body depth at anal origin	24.0	24.5	26.1	27.1	20.7	24.4
Caudal-peduncle depth	15.4	14.5	15.6	16.1	14.5	15.5
Caudal-peduncle length	18.9	20.5	21.6	23.1	24.4	26.3
Snout length	12.0	12.9	13.3	13.5	9.3	10.2
Orbit diameter	7.9	7.2	6.9	6.9	9.1	8.9
Interorbital width	1.4	1.9	1.9	1.6	1.6	1.0
Upper jaw length	10.7	9.2	9.8	9.9	8.5	8.7
Lower jaw length	11.9	10.8	10.5	11.1	10.8	9.7
Snout to 1st dorsal origin	31.2	33.0	32.0	31.0	33.1	34.2
Snout to 2nd dorsal origin	53.7	53.4	55.6	52.4	54.6	54.4
Snout to anal fin origin	56.3	57.9	59.3	57.7	53.6	55.6
Snout to pelvic fin origin	32.4	31.5	31.5	30.9	32.3	31.0
Longest dorsal spine	62.8	56.5	50.6	48.4	55.0	49.7
Longest soft dorsal ray	28.9	33.2	30.1	29.8	22.8	26.7
Longest soft anal ray	30.0	30.9	28.7	30.1	24.1	23.9
Pectoral-fin length	34.8	33.6	31.3	31.0	32.2	33.7
Pelvic-fin length	28.5	25.2	28.2	25.0	27.0	27.0
Caudal-fin length	46.2	44.4	44.5	47.0	43.6	45.6

snout and origin of first dorsal fin 3.20 (2.92-3.23), between snout and origin of second dorsal fin 1.86 (1.80-1.91), between snout and origin of anal fin 1.78 (1.69-1.87), and between snout and origin of pelvic fins 3.09 (3.10-3.22), all in SL.

Membranes of first dorsal fin deeply incised (especially between first and second spines), the dorsal spines elongate and filamentous, second spine longest, 1.59 (1.77-2.07) in SL; longest (penultimate) ray of second dorsal fin 3.46 (3.01-4.39), longest ray (penultimate) of anal fin 3.34 (3.24-4.19), pectoral-fin length 2.87 (2.96-3.23), pelvic-fin length 3.50 (3.55-4.01), caudal-fin length 2.16 (2.13-2.29), all in SL.

Color of holotype in alcohol after three and a half years of preservation: generally yellowish tan with four pairs of dark brown spots on scale row at level of upper edge of pectoral-fin base; a single dark brown spot at caudal-fin base in line with double dark spots; fins translucent tan. Most of the paratypes are similar in colour except for the most recently collected specimens (WAM P.32615-001), which differ as follows: overall pale brown, the scale edges a little darker with characteristic row of paired dark brown spots (each pair within a brown blotch) and single dark brown spot at caudal-fin base; the latter spot closely followed by two more dark

spots; a series of blackish blotches dorsally on body below base of dorsal fins; an irregular row of smaller dark brown spots on lower side of body; a row of still smaller spots on upper side of body; a broad dark brown bar below eye, and a prominent dark brown spot on opercle; dorsal and caudal fins greyish brown with traces of numerous spots; anal and paired fins grey-brown.

Color in life (from underwater photographs of Figs. 2-4): orange-yellow to brownish yellow with pale bluish grey to pale blue spots, most conjoined to form longitudinal series along scale rows; edges of scales narrowly dark brown, especially dorsally on body; four pairs of small dark brown to black spots on scale row at level of upper edge of pectoral-fin base, these spots surrounded by a zone of orange-yellow or brownish yellow; a single dark brown to black spot on caudal-fin base in line with double dark spots, followed by one or two lesser dark spots on base of fin; a row of small dark brown spots along back at base of dorsal fins, another on lower side, and a few still smaller dark brown spots along upper side, all surrounded by yellow or brownish orange; head with yellow to brownish orange spots, mostly forming irregular rows, some projecting obliquely downward and forward from eye; dorsal and caudal fins translucent bluish grey with round to oval yellowish to orangish brown spots,

mostly with slightly darker edges, many as large or larger than pupil; anal fin pale translucent greenish or yellowish with similar but fewer and more elongate spots, mainly in basal half of fin; second dorsal and anal fins sometimes with a narrow pale blue margin; paired fins pale greenish or yellowish to nearly white. Senou et al. (2004: 240, upper fig.) illustrated a large adult in color. The pale blue spots are relatively larger, the edges of the scales more conspicuously dark brown, the double dark spots much less distinct, and the dusky-edged orange-yellow spots in the median fins more numerous and relatively smaller, most smaller than pupil. A photograph in Hayashi & Shiratori (2003: 94, lower fig.) shows a broad dusky bar below the eye (still containing orange-yellow spots).

**Etymology.** – The new species is named *akihito* in honour of the Emperor of Japan, in recognition of his significant contribution to our knowledge of gobiid systematics. Many of the type specimens of *E. akihito* were supplied by the Biological Laboratory of the Imperial Household in Tokyo. The name *akihito* is treated as a noun in apposition.

**Comparisons.** – *Exyrias akihito* is easily differentiated from the other members of the genus by its extremely elongate dorsal-fin spines. It is also distinguished on the basis of its paler coloration, particularly the numerous yellow or brownish orange spots on the head and body.

This new goby is most similar to *E. belissimus* (Figs. 7-8), with which it has been confused in the past. For example, Murdy (1985, Pl. 1 fig. B) illustrated a juvenile of the new species as *E. belissimus*. The latter species has the same double-row of dark brown spots on the side (though vertically elongate and often obscured by dark brown bars, especially in adults), and the dorsal spines are filamentous. However, they are not as long as those of *E. akihito*. The third or fourth dorsal spine is longest in *E. belissimus*. It measures 20.2-36.9% SL in eleven Bishop Museum specimens from 44.7-87.0 mm. The second dorsal spine is longest in *E. akihito*, 49.7-62.8% SL in the six type specimens of Table 1.

There is also a clear modal difference in the number of pectoral-fin rays. All type specimens of *E. akihito* possess 17 rays, compared to the usual count of 18 for *E. belissimus*. Murdy (1985) reported an average count of 17.8 for *E. belissimus*, however he included at least three specimens of the new species (AMS I.20956-028 and AMS I.22135-001) in the Material Examined for *E. belissimus*. Therefore, it is possible that Murdy's mean count for pectoral-fin rays may have included one or more specimens of *E. akihito*. We have counted 25 specimens of *E. belissimus*; 22 have 18 rays, and one each has 16, 17, and 19 rays. There is also an average difference in the number of branched caudal-fin rays. Murdy (1985) gave the mean as 14.2 for *E. belissimus* (n = 12), 14.5 for *E. ferrarisi* (n = 2), and 13.7 for *E. puntang* (n = 10). The

average count of branched caudal-fin rays for 16 specimens of *E. akihito* is 13.1.

**Distribution and habitat.** – *Exyrias akihito* is currently known from the northern Great Barrier Reef, Papua New Guinea, Indonesia (Bali, Java, north Sulawesi, and Raja Ampat Islands), Philippines (Palawan), and the Yaeyama Islands of southern Japan. It is typically found in clear water in the vicinity of coral reefs, usually on sand or rubble bottoms, at depths between 10-43 m. By contrast, the three other species of *Exyrias* are generally found in shallow water with soft silt or mud bottoms in estuaries or on turbid coastal reefs. An exception in depth is a specimen speared by the second author in the lagoon off Madang, Papua New Guinea at a depth of 50 m.

#### ACKNOWLEDGMENTS

We are very grateful to Yuji Ikeda, of BLIH, for sending us most of the type specimens of *E. akihito* that were utilized in this study. He recognized the species as new and was planning to describe it, but agreed to forward us the BLIH specimens as well as loan material from other institutions when he learned of our study. The first author is also grateful to Rob Vanderloos, owner of the charter dive boat *Chertan*, for his generosity in providing an opportunity to join the dive cruise at Milne Bay on which a paratype was collected. Roger Steene of Cairns, Australia assisted with fish collections on this same cruise.

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