

Revision of the genus *Pseudolabrus* (Labridae) from the East Asian waters

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Abstract A taxonomic review of the common East Asian labrid species, "*Pseudolabrus japonicus*" (Houttuyn) indicates that it comprises two distinct species to which we have applied the names, *Pseudolabrus sieboldi* sp. nov. and *Pseudolabrus eoethinus* (Richardson). The original description of "*P. japonicus*" agrees with no known Japanese labrid species and may be regarded as a nomen dubium. *Pseudolabrus sieboldi* differs from *P. eoethinus* in coloration of the head and body, and some meristic and morphometric characters. *Pseudolabrus sieboldi* occurs on the southern coasts of the Sea of Japan, but *P. eoethinus* is absent there; both species are widely distributed on the Pacific coasts of southern Japan.

Key words. — *Pseudolabrus*; revision; Labridae; East Asia.

In a review of the Japanese labrid fishes, Jordan and Snyder (1902) first applied the name *Pseudolabrus japonicus* (Houttuyn) to the common labrid fish called "sasanohabera" in Japan. Since then the name *japonicus* has been almost universally accepted. *Pseudolabrus japonicus* is the only species of the genus in the Northern Hemisphere (Russell, 1988) and is very common in the rocky shores of the East Asian temperate region. Ojima (1983) and Araga (1984) suggested that *P. japonicus* includes two intraspecific populations but they did not show any morphological differences between the populations.

Underwater observations by us at rocky shore of Arakashi, Ehime Prefecture, Shikoku, Japan, recently have revealed two different populations among the individuals formerly identified as *P. japonicus*. The two populations showed morphological as well as sexual dichromatic differences. Moreover, underwater observations (Matsumoto et al., 1997) have showed them to be reproductively isolated from each other, suggesting there

are two separate species.

In this paper, we taxonomically review the two species which have been treated by previous authors as *P. japonicus*. We show that the original description of *P. japonicus* does not fit any known labrid species from Japan, and propose the names, *P. sieboldi* sp. nov. and *P. eoethinus* (Richardson, 1846), for the two species recognized by us.

Methods of counting and measuring followed those of Hubbs and Lagler (1958), except for the following: lateral line scales and scales above and below lateral line follow the methods of Russell and Randall (1980); cheek scales were counted as the maximum number of scale rows in a line radiating from the eye (Fig. 1). We examined 227 specimens of *P. sieboldi* and 124 specimens of *P. eoethinus*, and counted and measured 61 specimens of the former and 65 specimens of the latter for comparison. Meristic differences between the two labrid species were analyzed by the Mann-Whitney *U*-test; morpho-

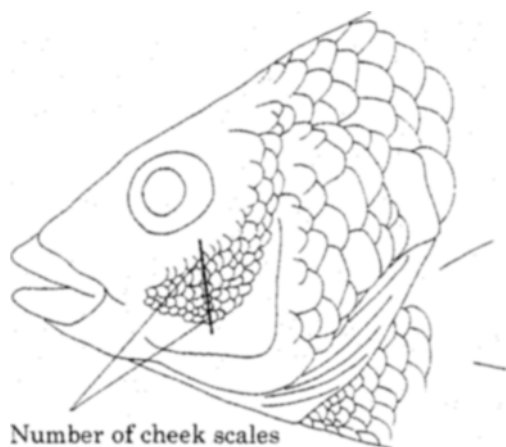


Fig. 1. Method for cheek scale counts in *Pseudolabrus* species.

metric differences were analyzed by *t*-test.

TP and IP represent terminal color phase and initial color phase, respectively, following Warner and Robertson (1978).

Institutional codes follow Leviton et al. (1985); and NMCI indicates Noto Marine Center, Ishikawa Prefecture, Japan.

Pseudolabrus Bleeker, 1862

(Japanese name: sasanohabera-zoku)

Pseudolabrus Bleeker, 1862: 102 (type species, *Labrus rubiginosus* Temminck & Schlegel, 1846).

Description. Dorsal fin rays IX, 11; anal fin rays III, 10; pectoral fin rays ii (rudimentary, unbranched distally)+11 (branched distally); pelvic fin rays I, 5; gill-rakers 15–24; branchiostegal rays 6; predorsal scales 4–11; cheek scales 2–8; pored lateral line scales 25–26 (usually 26); scales above lateral line 2–4; scales below lateral line 6–8; vertebrae 9+16.

Body elongate, compressed. Head compressed, naked except for cheek and opercle. Snout pointed. Mouth terminal; posterior end of upper jaw not reaching below anterior margin of eye. Jaw teeth caniform in two rows; anterior teeth of outer row enlarged, 11–14 progressively smaller canines posteriorly; inner row of 5–8 small canines anteriorly; one (sometimes two) enlarged canine(s) at posterior end of upper jaw.

Lower pharyngeal plate broadly Y-shaped, robust; transverse limb with a medial posterior patch of large blunt, conical or molariform teeth and two or three rows of smaller conical teeth; anterior median limb narrow, with two or three irregular rows of small conical teeth. Preopercle entire; dorsal and anal spines robust, progressively longer posteriorly. Lateral line abruptly bent downward below ninth to eleventh dorsal rays; laterosensory canal tube bifurcate or biserially branched.

Dorsal fin slightly convex; its base very long; each membrane of spinous portion a little notched. Anal fin slightly convex. Basal portion of dorsal and anal fins with a low scaly sheath or naked. Pelvic fin short, beginning below lower base of pectoral fin. Caudal fin rounded to truncate with slightly produced uppermost (lowermost) ray in mainly TP, a little round in juvenile.

Remarks. *Labrus rubiginosus* Temminck & Schlegel, 1846, the type species of *Pseudolabrus*, is a junior synonym of *Labrus eoethinus* Richardson, 1846; it is also a junior primary homonym of *Labrus rubiginosus* Richardson, 1846 and a junior secondary homonym of *Julis? rubiginosus* Richardson, 1843 (see below).

Key to East Asian species of *Pseudolabrus*

- A. Two rows of white spots above lateral line; lowermost dark stripe behind eye extending horizontally backward above pectoral fin base (in TP), or reaching backward to middle of opercle (in IP); TP, body greenish (brick red in specimens from deeper water), and with large black blotch on spinous dorsal region between fourth and sixth spines; lengths of the first dorsal, third anal and pelvic spines somewhat shorter than those of *P. eoethinus* *P. sieboldi*
- B. No white spots on body; lowermost dark stripe behind eye reaching diagonally backward to upper edge of pectoral fin base; TP, body yellow after fourth dorsal spine, and without large black blotch on dorsal fin; lengths of the first dorsal, third anal and pelvic spines somewhat longer than those of *P. sieboldi* *P. eoethinus*

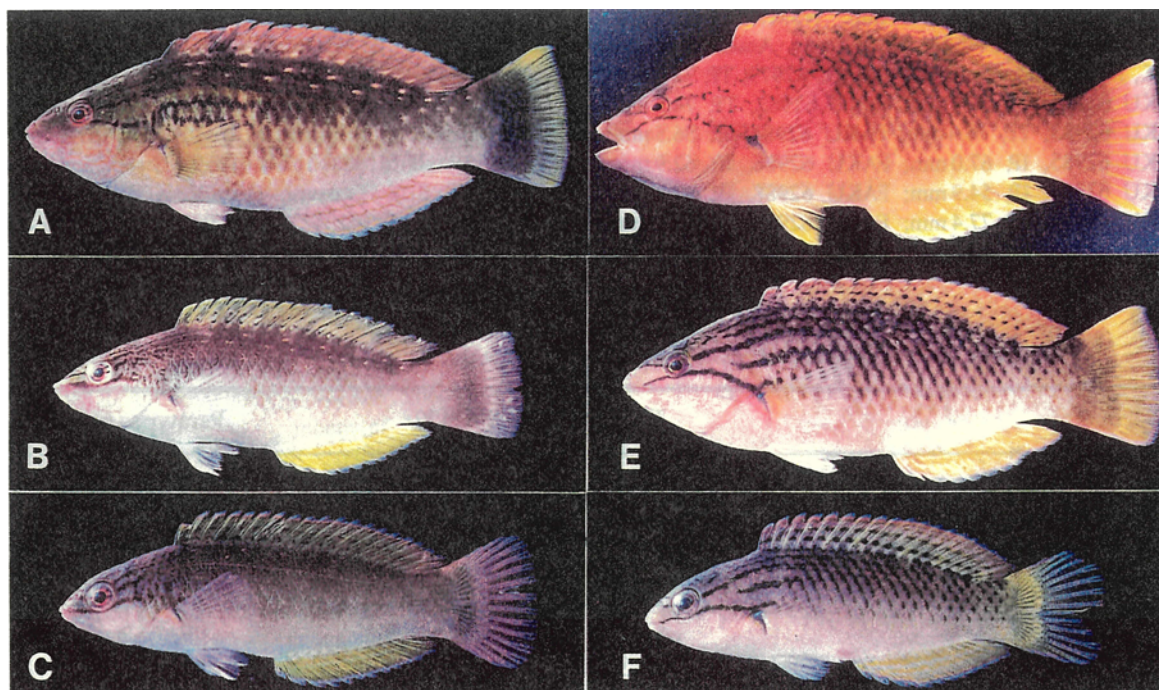


Fig. 2. Lateral views of the two *Pseudolabrus* species. A) TP of *P. sieboldi* sp. nov., FAKU 61472 (holotype), 116.7 mm SL; B) IP of *P. sieboldi*, FAKU 61524 (paratype), 81.1 mm SL; C) young of *P. sieboldi*, FAKU 61527 (paratype), 38.9 mm SL; D) TP of *P. eoethinus*, FAKU 61548, 183.4 mm SL; E) IP of *P. eoethinus*, FAKU 61479, 112.2 mm SL; F) young of *P. eoethinus*, FAKU 61528, 37.0 mm SL.

Pseudolabrus sieboldi sp. nov.

(New Japanese name: hoshi-sasanohabera)

(Fig. 2A, B, C)

Labrus rubiginosus Richardson, 1846:4: 255 (Japan; secondary junior homonym of *Julis? rubiginosus* Richardson, 1843).

Labrus rubiginosus: Temminck & Schlegel, 1846. 5: 165 (in part) (Japan).

Labrichthys rubiginosa: Günther, 1862: 114 (Japan).

Labrichthys rubiginosus sp.: Steindachner & Döderlein, 1887: 272 (Japan).

Pseudolabrus japonicus (non Houttuyn): Jordan & Snyder, 1902: 625 (southern Japan); Okada et al., 1935: 183, pl. 96-1 (Japan); Kamohara, 1958: 7, pl. III-fig. 3 (Kochi, Japan); Masuda et al., 1975 (in part): pl. 106-G (Japan); Chyung, 1977 (in part): pl. 242-2 (Pusan, Korea); Araga, 1984 (in part): pl. 200-B (Japan); Russell, 1988 (in part): pl. 2H (Shirahama, Japan); Kim and Kang, 1993: 86, fig. 289 (Korea); Shen, 1993 (in part): pl. 152-8 (Taiwan); Kim et al., 1994 (in part): photo. in 100 (Korea); Masuda and Kobayashi, 1994 (in part): 258, pls. 5-8 (Izu, Japan); Yoo and Lee, 1995: 147, 2 photos (Cheju Is.).

Pseudolabrus miles (non Bloch & Schneider): Kamohara, 1958: 7, pl. II-fig. 3 (Kochi, Japan).

Bodianus vulpinus (non Richardson): Shen, 1984 (in part):

pl. 362-13 (Taiwan) (misidentification).

Holotype. FAKU 61472, TP, 116.7 mm standard length, Morode Beach, Ehime Pref., Japan, 2-5 m depth, angling, collected by K. Mabuchi, 5-8th May 1995.

Paratypes (60 specimens). Morode Beach, Ehime Pref., Japan, May 1995—AMS I. 37876-001 (2 specimens), TP, 114.8 mm, IP, 81.1 mm; FAKU 61468, IP, 82.8 mm; FAKU 61469, TP, 97.7 mm; FAKU 61471, IP, 85.4 mm; FAKU 61477, IP, 40.3 mm; FAKU 61481, IP, 81.6 mm; FAKU 61482, IP, 93.4 mm; FAKU 61483, IP, 83.8 mm; FAKU 61484, IP, 95.8 mm; FAKU 61485, TP, 99.6 mm; FAKU 61486, IP, 97.6 mm; FAKU 61487, IP, 91.2 mm; FAKU 61488, IP, 84.4 mm; FAKU 61489, IP, 84.1 mm; FAKU 61490, IP, 98.0 mm; FAKU 61495, TP, 103.1 mm; FAKU 61496, IP, 91.6 mm; FAKU 61510, IP, 64.5 mm; FAKU 61511, IP, 57.6 mm; FAKU 61512, IP, 54.0 mm; FAKU 61513, IP, 48.3 mm; FAKU 61515, IP, 61.2 mm; FAKU 61516, TP, 99.4 mm; FAKU 61517, IP, 92.0 mm; FAKU 61519, IP, 99.6 mm; FAKU 61521, TP, 137.3 mm; FAKU 61525, TP, 120.4 mm; FAKU 61527, IP, 38.9 mm; FAKU 61533, IP, 87.9 mm; FAKU 61535, IP, 78.8 mm; FAKU 61536, IP, 79.9 mm; FAKU 61538, TP, 108.2 mm; FAKU 61539, IP, 97.6 mm; FAKU 62997, TP, 109.4 mm; FAKU 62998, TP, 99.9 mm; FAKU 62999, TP, 106.3 mm; FAKU 63039, TP, 119.4 mm; FAKU 63040, TP, 101.2 mm;

NSMT-P 52896, TP, 113.4 mm; NSMT-P 52897, IP, 89.0 mm; USNM 344685, IP, 81.2 mm. Arakashi, Ehime Pref., Japan, November 1994—FAKU 62979, TP, 72.1 mm; FAKU 62980, TP, 76.9 mm; FAKU 62982, TP, 74.5 mm; FAKU 62983, TP, 76.4 mm; FAKU 62984, IP, 56.5 mm; FAKU 62985, IP, 67.0 mm; FAKU 62986, IP, 62.9 mm; FAKU 62987, IP, 54.9 mm; FAKU 62988, IP, 67.7 mm; FAKU 62989, IP, 77.4 mm; FAKU 62990, IP, 47.1 mm; FAKU 62991, IP, 62.3 mm; FAKU 62992, IP, 70.6 mm;

FAKU 62993, IP, 50.8 mm; FAKU 62994, IP, 39.7 mm; FAKU 63036, IP, 55.3 mm; FAKU 63037, IP, 58.4 mm; USNM 344684, TP, 84.4 mm.

Other materials. 166 specimens not counted and measured except for the standard length: 28.5–189.9 mm SL. Japan—FAKU 61568–61574, 61659 (8 specimens: 108.8–150.8 mm SL), Tsukumo Bay, Noto Peninsula. FAKU W120, W121, W203, W214, 18001, 18002, 18016, 18017, 18062, 40113, 40114, 40134, 40135, 41523, 41528, 42226,

Table 1. Counts and proportional measurements of *Pseudolabrus sieboldi* sp. nov.

	Holotype FAKU 61472	Paratypes (n=60)
Color phase	TP	TP(19), IP(41)
Standard length (mm)	116.7	38.9–137.3 (60)
Dorsal fin rays	IX, 11	IX (rarely VIII), 11 (60)
Anal fin rays	III, 10	III, 10 (60)
Pelvic fin rays	I, 5	I, 5 (60)
Pectoral fin rays	ii, 11	ii, 11 (60)
Caudal fin rays	14	14 (58)
Lateral line scales	26	23–26 (60)
Scales above lateral line	4	4 (60)
Scales below lateral line	8	7–8 (58)
Predorsal scales	10	8–15 (54)
Cheek scales	6	3–7 (60)
Vertebrate	9+16	9 (rarely 8)+16 (29)
Gill rakers	18	14–19 (19)
In % of standard length		
Body depth	33.2	25.3–36.3 (60)
Head length	32.2	31.0–37.1 (60)
Head width	16.9	13.7–18.4 (60)
Snout length	11.1	9.2–11.7 (60)
Length of upper jaw	8.0	6.2–10.0 (60)
Orbit to angle of preopercle	11.2	8.9–12.7 (60)
Length of orbit	5.9	5.8–10.2 (60)
Interorbital width	8.3	7.4–9.1 (60)
Suborbital width	5.6	3.6–6.0 (60)
Predorsal length	32.8	31.4–37.9 (60)
Length of dorsal fin base	57.3	50.6–60.9 (60)
Length of first dorsal spine	4.0	3.0–6.2 (60)
Length of ninth dorsal spine	9.0	9.1–12.7 (60)
Length of longest dorsal ray	13.2	11.6–15.9 (60)
Length of anal fin base	33.1	27.0–34.4 (60)
Length of first anal spine	4.0	3.0–6.2 (60)
Length of third anal spine	8.5	8.1–10.7 (59)
Length of longest anal ray	12.0	11.1–15.8 (60)
Depth of caudal peduncle	15.2	14.3–16.8 (60)
Length of pectoral ray	19.4	19.1–24.1 (60)
Length of pelvic fin	14.4	12.9–17.0 (60)
Length of pelvic spine	8.8	7.3–10.8 (59)

Numbers of specimens are in parentheses.

42227, 42230–42232, 42241–42247, 100541 (31: 80.1–170.3), Maizuru Bay, Kyoto Pref. FAKU 58264–58270, 58508 (8: 65.4–161.0), 34°54'N, 131°7'E, Sea of Japan. FAKU 58507 (119.9), 35°25'N, 130°32'E, Sea of Japan. FAKU 57876, 57877 (2: 137.3–166.7), 34°18'N, 130°6'E, Sea of Japan. FAKU 57694 (185.1), 34°53'N, 129°42'E, Sea of Japan. FAKU S134, S135, S208, S209, S249, 101544, 101545, 101761 (9: 105.3–187.2), Tsushima Is. FAKU 61547, 62306 (2: 148.1–164.9), Karekinada Sea, Wakayama Pref. FAKU 61543, 61577 (2: 78.9–126.9), Shirahama, Wakayama Pref. FRLM 7837, 12050, 12508 (3: 109.1–133.6), off Wagu, Mie Pref. FRLM 006668, 7714, 10039, 10265 (4: 104.3–125.5), off Koshika, Mie Pref. FRLM 005420, 005639, 006356, 006665, 006775, 7228, 7700, 10599 (8: 100.4–128.9), mouth of Ago Bay, Mie Pref. FRLM 005452, 005454, 5465, 6744, 6745 (5: 74.8–138.2), Zaga I., Ago Bay, Mie Pref. NMCI-P 37–39 (3: 119.2–131.3), Akazaki, Noto Peninsula. NMCI-P 190, 208–210, 239, 255, 449, 450, (8: 28.5–136.45), Tsukumo Bay, Noto Peninsula. NSMT-P 509 (140.0), Sadogashima I., Sea of Japan. NSMT-P 44507 (2: 146.5–153.7), Hegurajima I., Noto Peninsula. NSMT-P 5684, 5685, 5687, 5688, 5707, 8926 (6: 121.4–151.0), Tsushima Is. NSMT-P 1901, 1903 (2: 104.4–116.6), Amakusa, Kumamoto Pref. NSMT-P 45572 (24.2), southeast of Boso Peninsula. NSMT-P 2231 (97.2), Tateyama, Chiba Pref. NSMT-P 21055 (12: 107.6–167.0), off Shimoura, Uraga Channel. NSMT-P 20995 (6: 113.0–159.4), off Kurihama, Uraga Channel. NSMT-P 46219 (3: 103.5–125.8), Jogashima I., Miura Peninsula. NSMT-P 2249 (133.6), Misaki, Miura Peninsula. NSMT-P 19265 (2: 167.0–189.9), off Ito, Izu Peninsula. NSMT-P 19150 (89.0), Jogasaki, Izu Peninsula. NSMT-P 19809 (146.4), off Akazawa, Sagami Bay. NSMT-P 1199 (176.1), Suruga Bay. NSMT-P 34578 (70.1), Numazu, Suruga Bay. NSMT-P 46620 (144.4), Bentenjima I., Hamanako Lake. OMNH-P 4337, 4741 (2: 102.6–119.0), Kasumi, Hyogo Pref. OMNH-P 7120, 7122 (2: 139.8–152.0), Shirahama, Wakayama Pref. OMNH-P 6905 (60.5), Minabe, Wakayama Pref. OMNH-P 6906, 6907 (2: 88.3–92.8), Aogishi, Wakayama City. OMNH-P 6908 (114.5), Misaki, Osaka Pref. OMNH-P 6901–6903 (3: 101.8–119.5), off Kobe, Osaka Bay. ZUMT 32378, 32379, 41337, 41338 (4: 97.4–132.3), Toyama Bay. ZUMT 5343 (122.4), Kunda Bay, Kyoto Pref. ZUMT 48069, 48070 (2: 103.6–110.6), Hirado, Nagasaki Pref. ZUMT 48271, 48272, 49940 (3: 115.6–120.9), Fukue-jima I., Goto Is. ZUMT 35443–35448 (6: 110.2–148.0), Okinohata, Ariake Sea. ZUMT 56850 (109.9), Aburatsubo, Miura Peninsula. ZUMT 55525 (121.5), Kii Peninsula. Korea—FAKU 60718 (95.8), Sogwipo, Cheju I.

Description. Meristic and morphometric characters presented in Table 1.

First dorsal spine rather short, 3.0–6.2% SL (regression equation; $Y=5.54-0.0124X$; $r=0.437$, $n=61$, $p<0.05$; Fig. 3A). Third anal spine rather short, 8.1–10.7% SL ($Y=10.7-0.0150X$; $r=0.485$, $n=60$, $p<0.05$; Fig. 3B). Pelvic spine

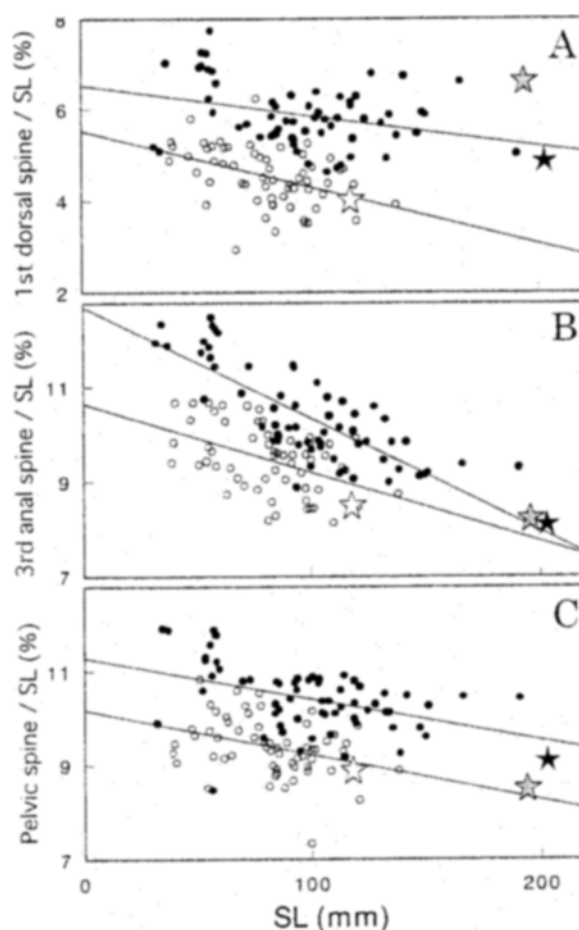


Fig. 3. Relationships between three metric characters and standard length in *Pseudolabrus sieboldi* sp. nov., “hoshi-sasanohabera” (○) and *P. eoethinus*, “aka-sasanohabera” (●). Open, solid and shaded star symbols represent the holotype of *P. sieboldi*, holotype of *P. eoethinus* and lectotype of “*Labrus rubiginosus* Temminck & Schlegel,” respectively. A) First dorsal spine; B) third anal spine; C) pelvic spine.

rather short, 7.3–10.8% SL ($Y=10.2-0.00981X$; $r=0.358$, $n=60$, $p<0.05$; Fig. 3C).

Color when fresh. — Sexually dichromatic. TP (Fig. 2A): ground color greenish brown (brick red in specimens from deeper water); darker on dorsal parts of head and body; dorsal part of body with 19–23 whitish spots in two alternating rows between base of dorsal fin and lateral line; several indistinct additional whitish spots on lateral side of body. Head changing into pale green during courtship. Iris reddish (yellowish) orange with blue ring. Dorsal surface of head without dark lines (Fig. 4A). Upper part of

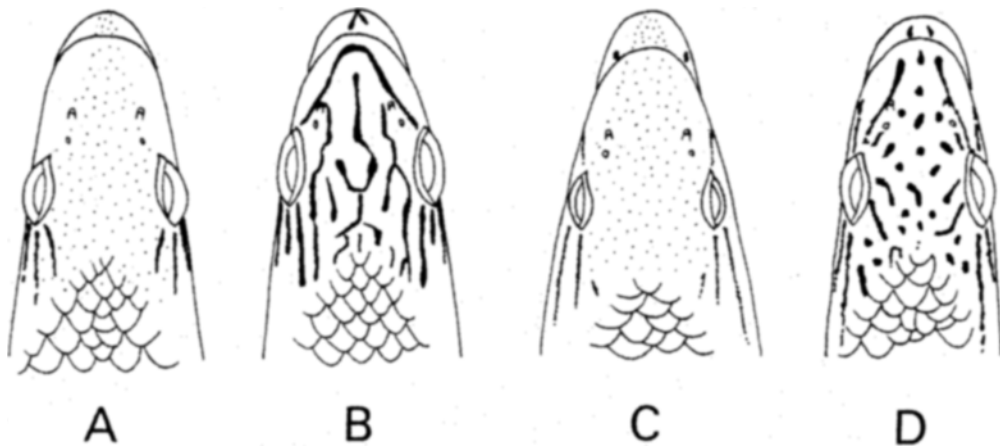


Fig. 4. Dorsal surface of the head in two *Pseudolabrus* species. A) TP of *P. sieboldi* sp. nov.; B) IP of *P. sieboldi*; C) TP of *P. eoethinus*; D) IP of *P. eoethinus*.

head and body with five black (brown) narrow longitudinal stripes; first stripe along dorsal fin base, second from eye to below last dorsal ray, third on lateral line from eye to below last dorsal ray, fourth from above pectoral fin base to below posterior part of spinous dorsal region, fifth on midline of body from above pectoral fin base to below seventh dorsal spine; fourth and fifth stripes joining on posterior edge of opercle and reaching eye. Throat and thoracic region and ventral part of body pale violet (pale pink); reddish orange (yellow) reticulations on cheek and throat. Dorsal fin with pale blue distal margin and with black blotch on membrane between fourth and sixth spines; upper half with orange or dark reddish reticulations, and lower half with many orange or dark reddish vermiculating lines. Anal fin with blue distal margin; mesial half with two longitudinal orange (dark reddish or yellow) lines, distal half with orange or dark reddish reticulations. Pectoral fin orange yellow. Pelvic fin pale pink. Caudal fin dark on scaly region, yellow on posterior region.

IP (Fig. 2B): ground color reddish brown (red in specimens from deeper water); darker on dorsal parts of head and body; dorsal side of body with 19–23 whitish spots in two alternating rows between base of dorsal fin and lateral line; flank with two or three longitudinal rows of white spots. Uppermost stripes on each side joining across snout and running back to anteriomedial

margin of orbit; lower stripe running from middle of upper lip backwards to ventral margin of orbit. Iris reddish (yellowish) orange with blue ring; two pairs of dark bar before and behind pupil. Head behind eye with three dark brown short stripes. Dorsal surface of head with dark brown vermiculating lines (Fig. 4B). Thoracic region whitish to pale violet. Cheek and throat with reddish orange reticulations. Scales on abdominal part of body with narrow white margin changing into small white spot near pectoral fin. Dorsal fin pale yellow with two rows of black spots and pale blue distal margin. Anal fin whitish yellow with three narrow longitudinal deep yellow stripes and pale blue distal margin. Pectoral fin transparent with blue bar at upper part of base. Pelvic fin whitish transparent. Caudal fin reddish brown on scaly region, pale reddish brown on rays.

Young (30 mm SL; Fig. 2C) have almost the same coloration as IP.

Color in preservation. — TP: ground color brown, darker on dorsal part of head and body. Stripes on upper part of body and head behind eye dark. Pale spots on side of body sometimes obscure. Reticulations on cheek and throat dusky or completely faded. Fins transparent, except for dark caudal fin. Dorsal fin with black blotch between fourth and sixth spines. Lines on dorsal and anal fins black or obscure. Dark bar at upper part of pectoral fin base.

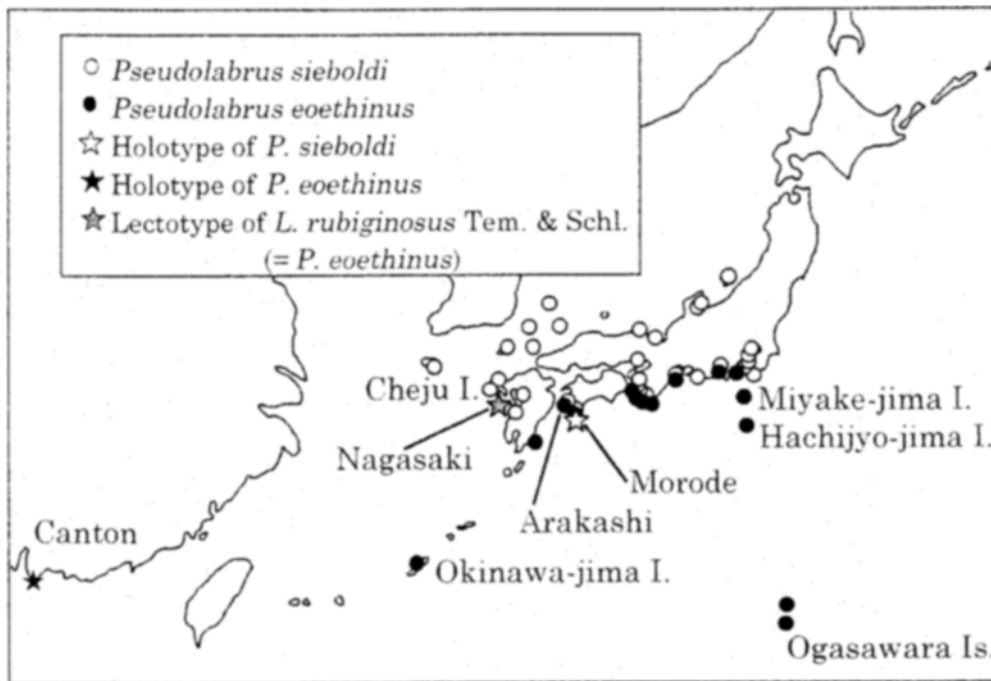


Fig. 5. Geographic distributions of *Pseudolabrus sieboldi* sp. nov. and *P. eoethinus*, based on collected specimens.

IP: ground color pale brown, brown on dorsal part of head and body. Stripes on snout and behind eye and lines on dorsal surface of head dark. Pale spots on side of body obscure. Fins transparent. Two rows of dots on dorsal fin dark. Bar at upper part of pectoral fin base dark.

Distribution. This species occurs along the coasts of southern Japan, Cheju Island (Fig. 5), and Taiwan (Shen, 1984, 1993). It is very common on the coasts of the Sea of Japan, but somewhat rare on the Pacific coasts. It inhabits rocky reefs shallower than 100 m depth.

Etymology. The specific name "*sieboldi*" refers to Philipp Franz von Siebold who provided a figure of the Japanese species of *Pseudolabrus* for the first time.

Discussion. The original description and figure of *Labrus rubiginosus* Temminck & Schlegel, 1846 roughly agree with our "hoshisasanohabera." The use of the name, *Labrus rubiginosus*, however, has been confused.

According to Boeseman (1947), the descrip-

tion of *Labrus rubiginosus* Temminck & Schlegel, 1846 was based on eight syntypes from Bürger's and von Siebold's collections belonging to the National Museum of Natural History, Leiden; he designated one of the Bürger's specimens, RMNH 1219 as the lectotype of *Labrus rubiginosus* Temminck & Schlegel. Judging from the condition of a stripe on the opercular region, lengths of the first dorsal and third anal spines, and relatively large standard length (M. van Oijen, pers. comm.), RMNH 1219 is conspecific with our "aka-sasanohabera," *Pseudolabrus eoethinus* (Richardson, 1846) (Fig. 3). The name, *Labrus eoethinus* Richardson, was published in April, 1846. However, Pisces Part IX of Ph. von Siebold's *Fauna Japonica*, which contains the original description and figure of *Labrus rubiginosus* Temminck & Schlegel, was published in May, 1846 (Akihito, 1966). *Labrus rubiginosus* Temminck & Schlegel, 1846 thus is a junior synonym of *Pseudolabrus eoethinus* (Richardson, 1846).

Richardson (1846) also described one of Bürger's Japanese specimens belonging to the British Museum (now the Natural History Mu-

seum, London) using the yet to be published name, *Labrus rubiginosus* of Temminck & Schlegel. The description agrees well with our "hoshi-sasanohabera" in having a dark spot on the spinous portion of the dorsal fin and some white spots on the back. According to Art. 50 (a) (ICZN, 1985), Richardson's *Labrus rubiginosus* is an available name, and *Labrus rubiginosus* Richardson, 1846 is a senior homonym of *L. rubiginosus* Temminck & Schlegel, 1846.

The use of the name "*Labrus rubiginosus*" has a further problem. *Labrus rubiginosus* is preoccupied by *Julis? rubiginosus* Richardson (1843), a synonym of *Pseudolabrus miles* (Bloch & Schneider, 1801) according to Russell (1988). Both *Labrus rubiginosus* Richardson, 1846 and *L. rubiginosus* Temminck & Schlegel, 1846 are therefore junior secondary homonyms of *Julis? rubiginosus* Richardson, 1843 in the genus *Pseudolabrus*. Consequently, the name, *Labrus rubiginosus* Richardson, 1846 cannot be applied to our "hoshi-sasanohabera." We therefore apply the new name *Pseudolabrus sieboldi* to our "hoshi-sasanohabera."

Steindachner and Döderlein (1887) reported *Labrichthys rubiginosus* sp. based on specimens from Japan, recognizing three variations among the species. Based on the colorations noted by Steindachner and Döderlein (1887), the variations are all identifiable with *P. sieboldi*. They synonymized *Labrichthys affinis* of Döderlein's new species with their *L. rubiginosus*; they recognized *L. affinis* as one of the three variations of their *L. rubiginosus*. Russell (1988) included *Labrichthys affinis* as a name in synonymy of "*P. japonicus*," but *L. affinis* is a nomen nudum, and is therefore not available.

The description of *Pseudolabrus japonicus* by Jordan and Snyder (1902) from the coast of southern Japan agrees well with *P. sieboldi*. Their male and female of *P. japonicus* correspond with our TP and IP of *P. sieboldi*, respectively.

The coloration of *P. japonicus* by Russell (1988) agrees well with that of *P. sieboldi*. But, he mistakenly described the color phases; the TP of his *P. japonicus* is the IP of *P. sieboldi*, and the IP of his *P. japonicus* is the TP of *P.*

sieboldi.

The labrid specimen identified as *Pseudolabrus miles* by Kamohara (1958) is the IP of *P. sieboldi* judging from the coloration shown by him.

***Pseudolabrus eoethinus* (Richardson, 1846)
(new Japanese name: aka-sasanohabera)
(Fig. 2D, E, F)**

Labrus eoethinus Richardson, 1846.4: 255 (Canton, China).
Labrus rubiginosus Temminck & Schlegel, 1846.5: lectotype (RMNH 1219) (Nagasaki, Japan).
Pseudolabrus japonicus (non Houuttuyn): Wu, 1985: 278, fig. 551 (Dongshan, Fujian; Taiwan); Masuda et al., 1975 (in part): pl. 106-F (Japan); Shen, 1984 (in part): pl. 106-362-53 a, b (Taiwan); Araga, 1984 (in part): pl. 200-A (Japan); Shen, 1993 (in part): pl. 152-7 (Taiwan); Masuda and Kobayashi, 1994 (in part): 258, pls. 3-4 (Izu, Japan).

Material examined. 124 specimens: 31.8-207.2 mm SL; 65 specimens counted and measured are shown by asterisk (*). China—BMNH 1968.3.11:14, 1980.1.29: 1* (Holotype of *Labrus eoethinus*, registered twice) (202.5 mm SL). Canton, China Sea. Japan—FAKU 60672 (176.0), Ogasawara Is. FAKU 60673 (154.5), Haha-jima I., Ogasawara Is. FAKU 60399 (159.9), Shionomisaki Promontory, FAKU 61548-61567, 62295-62305, 62307, 62308 (33 specimens: 142.3-207.2). Karekinada Sea, Wakayama Pref. FAKU 22911, 61546, 61575, 61576, 61578-61580 (7: 57.0-189.1), Shirahama, Wakayama Pref. FAKU 61491-61494,* 61497-61499,* 61505-61508,* 61514,* 61518,* 61520,* 61523,* 61526,* 61528,* 61530,* 61532,* 61537,* 61540-61542,* 62995,* 62996,* 63038* (35: 31.8-190.3), Morode Beach, Ehime Pref. FAKU 63001-63026,* 63033-63035* (29: 51.9-165.5), Arakashi, Ehime Pref. FAKU 16955, 103303 (2: 73.9-102.5), Okinawa-jima I. FRLM 7815 (115.7), Ikanoura, Mie Pref. FRLM 005439 (168.0), mouth of Ago Bay, Mie Pref. FRLM 007080 (120.1), Zaga I., Ago Bay. NSMT-P 20993 (109.3), Mito-hama, Miura Peninsula. NSMT-P 30374 (32.6), Miyake-jima I., Izu Is. NSMT-P506 (119.4), Hachijo-jima I., Izu Is. NSMT-P 39292 (191.1), Chichi-jima I., Ogasawara Is. NSMT-P 34578 (117.7), Numazu, Suruga Bay. NSMT-P 45496 (123.8), Toi-misaki Promontory, Miyazaki Pref. OMNH-P 652, 653 (2: 123.1-161.9), Kii-oshima. OMNH-P 7121, 7123 (2: 140.4-173.0), Shirahama, Wakayama Pref. OMNH-P 6904 (96.6), Aogishi, Wakayama City. RMNH 1219* (Lectotype of *Labrus rubiginosus* Temminck & Schlegel) (194), Nagasaki.

Description. Meristic and morphometric characters presented in Table 2.

First dorsal spine rather long, 4.6–7.8% SL (regression equation: $Y=6.53-0.00665X$; $r=0.317$, $n=62$, $p<0.05$; Fig. 3A). Third anal spine rather long, 8.9–12.5% SL ($Y=12.7-0.0238X$; $r=0.783$, $n=63$, $p<0.05$; Fig. 3B). Pelvic spine

rather longer, 8.5–11.9% SL ($Y=11.3-0.00875X$; $r=0.425$, $n=62$, $p<0.05$; Fig. 3C).

Color when fresh. — Sexually dichromatic. TP (Fig. 2D): ground color on head and body purple red (red in specimens from deeper water)

Table 2. Counts and proportional measurements of *Pseudolabrus eoethinus*

	Holotype BMNH 1968. 3. 11: 14, 1980. 1. 29: 1	Lectotype of <i>Labrus rubiginosus</i> Tem. & Schl.: RMNH 1219	FAKU specimens listed in material list ($n=63$)
Color phase	TP?	TP?	TP(8), IP(55)
Standard length (mm)	202.5	194	31.8–190.3 (63)
Dorsal fin rays	IX, 11	—	IX, 11(63)
Anal fin rays	III, 10	—	III, 10 (63)
Pelvic fin rays	I, 5	—	I, 5 (63)
Pectoral fin rays	ii, 11	—	ii, 11 (rarely 12) (63)
Caudal fin rays	14	—	14 (rarely 13) (61)
Lateral line scales	26	—	24–26 (62)
Scales above lateral line	3	—	3–4 (53)
Scales below lateral line	8	—	7–8 (59)
Predorsal scales	unable to count	—	9–19 (50)
Cheek scales	5	—	3–6 (63)
Vertebrate	unable to count	—	9+16 (21)
Gill rakers	unable to count	—	16–21 (20)
In % of standard length			
Body depth	33.4	—	28.0–39.9 (63)
Head length	28.7	—	31.3–37.8 (63)
Head width	unable to measure	—	12.5–18.9 (63)
Snout length	9.7	—	8.9–12.9 (63)
Length of upper jaw	7.1	—	7.5–9.7 (63)
Orbit to angle of preopercle	11.2	—	9.0–12.3 (63)
Length of orbit	5.5	—	5.1–10.4 (63)
Interorbital width	unable to measure	—	7.5–10.5 (63)
Suborbital width	4.8	—	3.6–6.6 (63)
Predorsal length	32.5	—	32.0–40.1 (63)
Length of dorsal fin base	62.5	—	53.5–63.8 (63)
Length of first dorsal spine	4.9	6.7	4.6–7.8 (62)
Length of ninth dorsal spine	9.4	—	6.9–13.4 (63)
Length of longest dorsal ray	12.4	—	12.2–16.6 (63)
Length of anal fin base	30.3	—	26.4–33.5 (63)
Length of first anal spine	4.2	—	3.7–7.1 (63)
Length of third anal spine	8.1	8.2	8.9–12.5 (63)
Length of longest anal ray	12.1	—	11.6–15.1 (63)
Depth of caudal peduncle	12.9	—	13.7–16.4 (63)
Length of pectoral ray	20.0	—	20.8–26.5 (63)
Length of pelvic fin	unable to measure	—	14.0–18.9 (63)
Length of pelvic spine	9.1	8.6	8.5–11.9 (62)

Numbers of specimens are in parentheses.

before about fourth dorsal spine, yellow after fourth dorsal spine, darker dorsally, and with many oblique faint dark lines and oblique rows of faint dark spots corresponding with scale rows mesially and posteriorly. Head with stripes as in IP, but obscure. Dorsal surface of head lacking dark marks (Fig. 4C). Iris red with blue ring (obscure). Ventral part of head and thoracic region pale violet; one or two pair(s) of obscure black marks on chin. Dorsal fin red before about fourth spine, yellow or greenish yellow posterior to it with pale distal margin, orange lines near distal margin, a row of yellow vermicular marks below orange line and two wavy orange lines in greenish yellow area. Anal fin yellow with pale violet distal margin, red line near distal margin, and three longitudinal deep yellow stripes. Pectoral fin transparent, orange near base with blue bar at base. Pelvic fin yellow. Caudal fin reddish brown on scaly region, pale red on rays, yellow on membrane between rays.

IP (Fig. 2E): ground color brownish red (scarlet in specimens from deeper water), deeper on dorsal parts of head and body. Snout with two black stripes; uppermost stripe running from near tip of snout to eye, lower stripe running from near posterior edge of upper lip back to ventral margin of eye. Iris reddish orange with bluish ring (obscure); two pairs of dark bars before and behind pupil. Dorsal surface of head with many short black bars or spots (Fig. 4D). Head behind eye and dorsal surface of anterior part of body with three broad black (golden when alive, turned into black after death) stripes; uppermost stripe on lateral line from eye to below about sixth dorsal spine; middle stripe from opercle to below about sixth dorsal spine; lowermost stripe from lower stripe on snout to upper edge of pectoral fin base. Nape with three narrower longitudinal black (golden when alive) lines. Middle and posterior parts of body with many oblique dark lines and oblique rows of dark spots corresponding with scale rows. Ventral part of head and thoracic region pale pink to pale violet; one or two pair(s) of black marks on chin. Dorsal fin orange yellow (red) with pale blue distal margin, orange (yellow) stripe near distal margin, and three rows of black spots. Anal fin pale yellow (pale red) with pale blue

distal margin, orange (yellow) submarginal stripe, and two longitudinal deep yellow stripes. Pectoral fin transparent, orange near base, with blue bar at fin base. Pelvic fin pale pink (pale red). Caudal fin brown (red) on scaly region; yellow (pale red) on rays; orange (pale yellow) on membrane between rays.

Young (30 mm SL; Fig. 2F) are similar in coloration of IP.

Color in preservation. — TP: ground color brown, darker on head. Stripes on head obscure. Dorsal surface of head dark brown. Throat dark. Chin with one or two pair(s) of dark marks. Dorsal fin dusky. Pectoral fin with dark bar at base.

IP: ground color on dorsal part of head and body brown. Stripes on head and body dark brown. Dorsal fin with three rows of dark spots. Pectoral fin with dark bar at base.

Distribution. This species occurs along the Pacific coasts of southern Japan, Okinawa-jima Island, Ogasawara Islands, southern coasts of China (Fig. 5), and Taiwan (Shen, 1993); it is very common along the Pacific coasts of southern Japan. It inhabits rocky reefs at depths shallower than 30 m.

Discussion. Richardson (1846) described a new labrid species, *Labrus eöthinus*, based on a single specimen from Canton, China and a drawing, no. 197 in the Reeves Collection. The holotype (BMNH 1968.3.11:14–1980.1.29:1) agrees with our “aka-sasanohabera” in the length of the first dorsal, third anal and pelvic spines (Fig. 3). In addition, Reeves’s drawing, no. 197 shows the typical IP coloration of “aka-sasanohabera.” We therefore apply the name, *Pseudolabrus eoethinus* to this species (diacritic marks are not allowed in the ICZN, 1985 [Article 32, d, i, 2].)

As stated in the discussion of *P. sieboldi*, the lectotype of *Labrus rubiginosus* Temminck & Schlegel agrees with “aka-sasanohabera.” *Labrus eöthinus* Richardson was published in April 1846, which was one month before the publication date of *L. rubiginosus* Temminck & Schlegel. Therefore, *L. rubiginosus* Temminck & Schlegel is not only a junior homonym of *L. rubiginosus* Richardson, but also a junior synonym of *L. eöthinus* Richardson.

Relationship

Besides the differences in coloration noted in the above key to the two species, *Pseudolabrus sieboldi* differs from *P. eoethinus* in lengths of the first dorsal, third anal and pelvic spines (Fig. 3), and in the counts of predorsal, cheek scales and gill-rakers (Table 3). Lengths of these spines are shorter in *P. sieboldi* than in *P. eoethinus*. These lengths are significantly different (*t*-test, $p=0.05$) for regression intercepts (first dorsal spine, $t=2.42$, $df=120$; third anal spine, $t=5.17$, $df=120$; pelvic spine, $t=2.76$, $df=119$). *Pseudolabrus sieboldi* has fewer predorsal scales and gill-rakers than *P. eoethinus*, but the former has more cheek scales than the latter. These counts also are significantly different (Mann-Whitney *U*-test, $p=0.05$: predorsal scales, $z=6.66$; cheek scales, $z=3.68$; gill-rakers, $U=84.5$).

Pseudolabrus sieboldi and *P. eoethinus* are biologically distinct. Underwater observations at Arakashi, Ehime Prefecture (Matsumoto et al., 1997) show *P. sieboldi* to be reproductively isolated from *P. eoethinus*. In addition, two types of chromosomal numbers were found in "*Pseudolabrus japonicus*" by Ojima (1983). Ueno (1995) reported the specimens of "*P. japonicus*" from shallower waters at the southern coasts of Wakayama Prefecture have $2n=42$ chromosomes, while specimens from deeper

water have $2n=48$. Based on our collections, *P. sieboldi* occurs in shallower water, and *P. eoethinus* occurs in deeper waters on the southern coast of Wakayama Prefecture; though the vertical distributions of the two species overlap widely. We therefore suppose that the chromosomal number of *P. sieboldi* is $2n=42$ and that of *P. eoethinus* is $2n=48$.

Nakazono (1979) reported the reproductive behavior of "*P. japonicus*" at Tsuyazaki, Fukuoka Prefecture. His "*P. japonicus*" can be identified as *P. sieboldi*, since *Pseudolabrus eoethinus* is not distributed in the coasts of northern Kyushu and Sea of Japan.

Among the *Pseudolabrus* species, *P. sieboldi* is similar to two south-western Pacific species, *Pseudolabrus luculentus* (Richardson) occurring at the Kermadec Islands, Norfolk Island, Lord Howe Island, and offshore islands of north-eastern New Zealand and *Pseudolabrus guentheri* Bleeker occurring in eastern Australia from Lindeman Island to Montague Island (Russell, 1988). The IP of *P. sieboldi* shares with *P. luculentus* a reddish ground color, two or three dark stripes on before and behind eye, dark lines on dorsal surface of head, and white spots rows on flank; but the IP of *P. luculentus* differs from that of *P. sieboldi* in having three broad reddish stripes on ventral part of head and thoracic region, and grayish area on dorsal membranes be-

Table 3. Three meristic characters showing the differences between *Pseudolabrus sieboldi* sp. nov. and *P. eoethinus*

	Predorsal scales												<i>n</i>			
	8	9	10	11	12	13	14	15	16	17	18	19				
<i>P. sieboldi</i>	8	14	9*	10	6	6	1	1	–	–	–	–	55			
<i>P. eoethinus</i>	–	3	–	5	7	6	5	14	6	1	2	1	50			
	Cheek scales					Gill rakers										<i>n</i>
	3	4	5	6	7	14	15	16	17	18	19	20	21			
<i>P. sieboldi</i>	1	11	26	18*	5	61	1	3	3	9	3*	1	–	–	20	
<i>P. eoethinus</i>	2	22	36*	3	–	64	–	–	1	7	3	6	2	1	20	

*Includes holotype.

tween first and third dorsal spines. The TP of *P. sieboldi* shares with *P. guentheri* a greenish ground color, black blotch on anterior part of dorsal spinous region and stripe on head behind eye running from ventral margin of orbit through above pectoral fin base; but *P. guentheri* differs from *P. sieboldi* in having the ventral part of head with broad longitudinal stripe and the dorsal part of the body without distinct white spots. The IP of *P. guentheri*, however, shows two rows of black spots on the dorsal part of the body.

P. eoethinus is similar to the two sexually monochromatic species of the *Pseudolabrus*, *P. semifasciatus* Rendahl from the Easter Island and *P. torotai* Russell & Randall from the island of Rapa. The TP of *P. eoethinus* resembles these two Southern Hemisphere species in the bicolor coloration of the body; but, the two species differ from the TP of *P. eoethinus* in having several transverse dark bars on the side of the body.

Discussion of “*Pseudolabrus japonicus*”

Since Jordan and Snyder (1902) lumped together several nominal species, the species called “*sasanohabera*” in Japanese has been identified with *Pseudolabrus japonicus* (Houttuyn). The characters of *Labrus japonicus* in Houttuyn’s (1782) original description, however, are quite different from those both of *P. sieboldi* and *P. eoethinus*: dorsal fin with 10 spines and 11 soft rays, anal fin with 3 spines and 5 soft rays, pectoral fin with 16 soft rays and caudal fin with 18 soft rays in Houttuyn’s (1782) “*japonicus*,” but 9 spines and 10–11 soft rays, 3 spines and 10 soft rays, 13 soft rays and 12 soft rays respectively in the latter two species.

We cannot find any labrid species in Japanese waters with five anal fin soft rays (Shimada, 1993). As the type specimen of *L. japonicus* Houttuyn is lost, we regard *Labrus japonicus* Houttuyn as a *nomen dubium*.

Steindachner (1867) identified a labrid specimen sent from China as “*Labrichthys gymnogenis* Günther?” Russell (1988) regarded this specimen as “*P. japonicus*.” *Labrichthys gymnogenis* belongs to the genus *Notolabrus*. Stein-

dachner’s description of the specimen, especially the characters of the jaw teeth, and its color, agrees well with those of shallow water juveniles of *Notolabrus gymnogenis*. However, the collecting site of the specimen is problematic. *Notolabrus gymnogenis* is an Australian species which does not occur in the Northern Hemisphere, and we suspect the collecting site of the specimen mistakenly reported.

Araga (1984) pointed out two populations of “*P. japonicus*”: one, inhabiting shallow rocky reefs of protected areas, mature even at small size; and the other, inhabiting fairly deep rocky reefs of open coast, growing up larger than the former. His observations of “*P. japonicus*” were made in the southern coasts of Wakayama Prefecture, Japan (C. Araga, pers. comm.). The former and the latter of his two populations roughly correspond with *P. sieboldi* and *P. eoethinus*, respectively. However, the photographs presented by Araga (1984) are the TP of *P. eoethinus* (pl. 200-A) and the IP of *P. sieboldi* (pl. 200-B).

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